Kiwiprops™

CONTENTS OF THIS MANUAL

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KIWI FEATHER PROP

Kiwiprops™

A new composite propeller for yachts ...

While much has been written on the very substantial performance improvements and user benefits that new materials and technologies have made available to yachting, much of it originating from our local marine industries, these have been very much
focused above the waterline.

As the result of long term dissatisfaction with the performance and value propositions available to our own yachts from existing propellers, we have set out to completely rethink from a zero base the design options available today for the optimal propeller unit. This means attaching equal weight to the economics of the unit, both in initial purchase and ongoing life cycle costs as to the design.

The problems of the traditional folding propeller have been well known for some time. A lack of blade area leading to poor thrust and motoring performance, particularly in adverse conditions. A very high radius of inertia, which coupled with a high mass leads to very significant vibration problems in real world applications over time. This is driven by the need to keep sufficient mass in the tips of the blades to make them operate to any reasonable level of performance in reverse. What is often overlooked in this design approach is that the significant volume that the blades occupy generates a hydro dynamic shock as the blades sweep past the bottom of the vessel. Water is incompressible, and the volume of water that the blade displaces appears as further vibration. The only solution to this for a given clearance is to lower the speed of the blade and / or make the tip of the blade as thin as possible.

As the vibration just from the rotating mass is a function of the radius of the mass, the mass and in particular the radius of the mass are critical design parameters in seeking a smooth running unit. A design optimised for smooth operation will be as light as possible, with the mass concentrated at the centre of the unit. This is the exact opposite of the traditional folder. The benefits of this approach has already delivered dramatic improvements in stern bearing life, the bane of many yacht owners, as one would expect from the very significant reductions in moments of inertia or flywheel effect. Remember a typical stern bearing will have some 10~20 thou of clearance when new, and much more as it wears.

Our unit brings the many benefits of today's technology to an essential device which has seen little change or improvements since Herreshoff's first folding propeller early this century. The hydro dynamic design problems of all propellers are complex and even more so when they are required to minimise drag when sailing but at the same time deliver the maximum thrust to a vessel typically with limited power and high windage.

Thrust is a function of blade area. There is no compromise.

To increase the thrust from a given power, blade area must be increased. The obvious way to achieve this is to go to more blades for a given diameter. In the absence of a simple cost effective three bladed feathering unit many have chosen to stick with the traditional fixed three bladed unit to obtain reasonable motoring performance but at a huge cost in terms of sailing performance.

The three bladed composite design of the ***Kiwiprop™*** captures the very significant thrust benefits available from the substantially increased blade area and at the same time addresses the well known problems of corrosion, wear, weight, vibration and poor reverse thrust inherent in the traditional two bladed folding unit. Choosing a feathering design which eliminates gears by utilising injection moulded blades of Zytel™, a DuPont composite, allows for the economical production of three bladed propellers in the under 55 horsepower ranges where the fixed three bladed and two bladed folding propeller have predominated over long periods of time.

While three bladed geared feathering designs have been the propeller of choice for all round yachting performance, they have significant design problems preventing their widespread uptake particularly in the markets of under fifty horsepower where the great volume of propellers are installed. Firstly they are expensive due to the complex machining required with each unit. Each blade requires an individual. machined bevel gear in addition to the gear in the central boss.

Far worse from a sailors perspective, and which is not often recognised, the blades remain parallel to the shaft, not the water flow which introduces a significant drag penalty and causes unacceptable autorotation of the shaft when sailing. You will note that all drawings of geared feathering propellers are taken from the perspective of the shaft, and appear to show a unit with very minimal projected area. This is most misleading as with typically a shaft angle of say 10 ~ 15 degrees and a buttock line aft of say 5 ~ 10 degrees, the propeller is " seeing " the water at an angle of typically 15 ~ 20 degrees. This generates a large projected blade area which translates to drag and oscillation with all it's attendant problems of noise, wear and reduced sailing performance. Any oscillation will introducing significant wear to the internal mechanisms where it is always hard to maintain adequate lubrication in the harsh underwater environment.

Auto feathering units which self pitch should really be costed with an expensive shaft lock and all it's attendant problems when comparing competing units. Not all gearboxes have the ability to lock the shaft if they depend upon the engine running to energise the internal clutches

The ***Kiwiprop™*** by eliminating the gears, and utilising near neutral buoyancy Zytel™ allows each individual blade to freely weather vane into the water flow that it currently sees, irrespective of shaft angle, leeway or sea motion thus always minimising drag and reducing any autorotation to very low levels.

Zytel™ lowers the total weight of the unit to under 3.5 kgs, which coupled with the thin blade tips of this design dramatically lowers the moments of rotational inertia and hydro dynamic shock for very smooth motoring while retaining full reverse thrust and eliminating blade corrosion issues. The thin blade tips also increase the thrust available by reducing the power consumed by the rotational drag.

The blades, which are the only moving parts when sailing, are filled with a high quality grease. Centrifugal force when motoring ensures the grease is retained in the blade thus addressing the important ongoing lubrication issue, which is a prerequisite for minimal wear over time.

This propeller has been developed, engineered and tested very carefully over a period of some six years. An extensive and ongoing database of every unit installed allows for ongoing monitoring and performance evaluation with accurate diameter and pitch recommendations.

Careful design and engineering has allowed us using just six standard components to cater for both shaft and saildrives, left and right hand, 15.50 to 18.50 inch diameter (nominal measure) and all pitches by virtue of the adjustable pitch feature. This allows us to cater for virtually every installation in the 15 ~ 55 horsepower range, which is the great bulk of the market volume wise, at very much lower prices than existing feathering propellers.

Not only are the ***Kiwiprop™*** units cheaper and we believe virtually maintenance free but produce significantly more thrust than competing units primarily due to their careful blade design. Horsepower required approximates a function of diameter to the 5^{th} power in these sizes. Thus very careful attention to tip design is critical, something often overlooked with competing designs.

The tradeoff for any flat blade design (required for the feathering function) as boat speed increases is a fall in relative efficiency. By starting from a much higher base however, our experience on a number of different installations of top speed in calm conditions, is equal or better depending upon the quality of the original installation. Hull displacement speed constraints will generally determine top end motoring capabilities in calm conditions.

The unit really comes into it's own however when motoring into adverse conditions. With the very significant extra thrust available from the three blades, which perversely increases as boat speed falls, boat speed is maintained at higher levels than competing units.

We feel this technology now allows yacht owners to afford the best of both worlds. The all round motoring capability, light weight and minimum maintenance of a three bladed fixed propeller coupled with minimum drag for optimal sailing performance. Many of our users are reporting significant increases in sailing and motoring performance, particularly when punching into a head sea, coupled with very much smoother running and an excellent reverse capability.

We set out to offer three bladed performance at two bladed prices !

With more thrust, particularly in reverse, one third the weight, minimum corrosion potential, full lubrication of all moving parts and less than half the price of competing units, we feel we have achieved our objective and are confident that this propeller will over time become the propeller of choice in its target market segments.

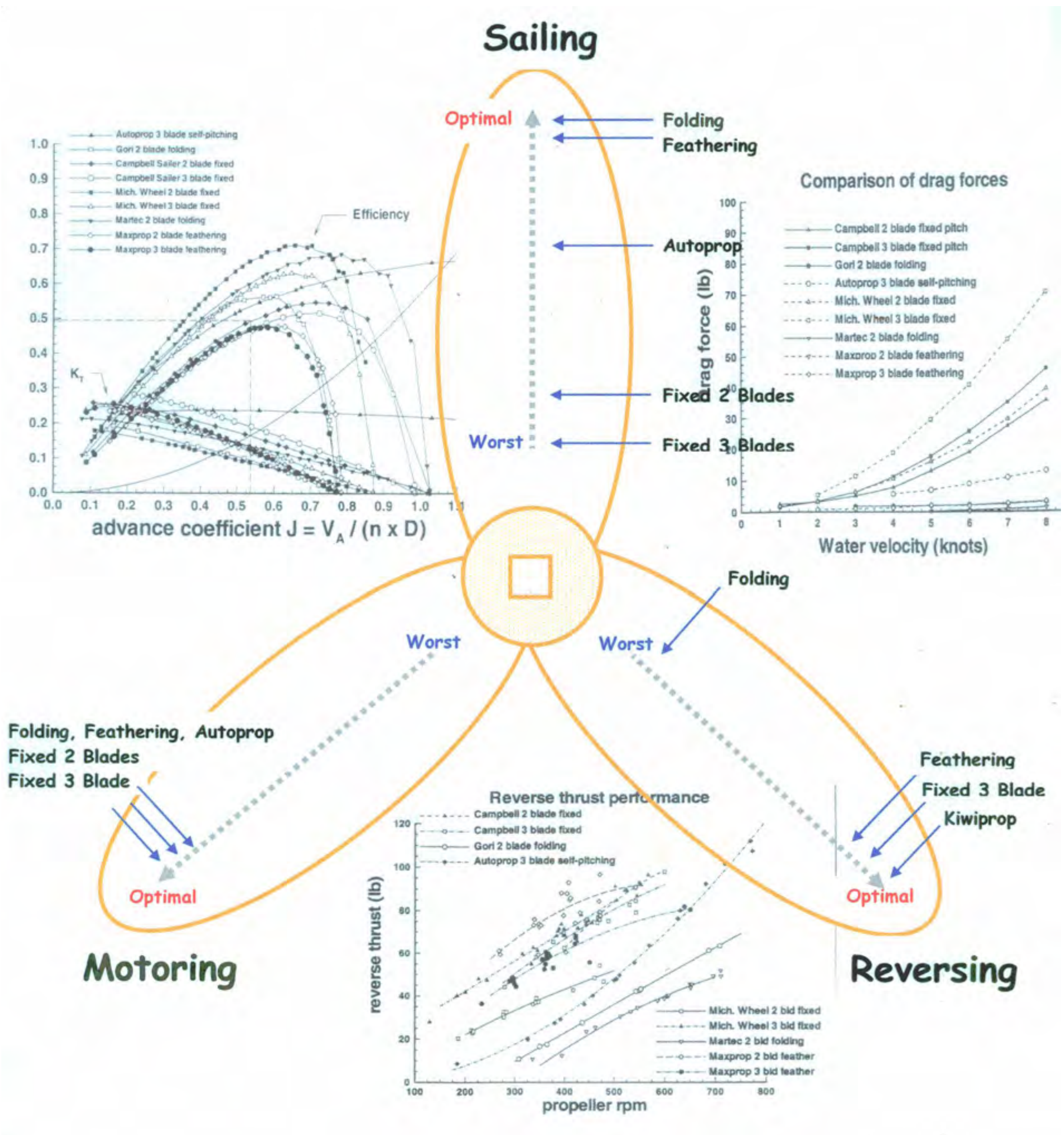
From an ongoing service aspect the commonality, interchangeability and economics of the various components allows us to offer exchange blades for the inevitable problems that will arise.

The relatively high value and limited weight of the unit means prompt delivery worldwide via NZ Post or DHL from New Zealand at reasonable prices.

Propeller Functionality: Trade-offs by Type of Unit

The following schematic illustrates where each type of unit is ranked from a theoretical perspective against the three functions that any propeller has to perform on a yacht based on a typical engine and reduction gearbox.

***AW* data is taken from MIT test reports in "Practical Sailor" October 1993 and January 1995**



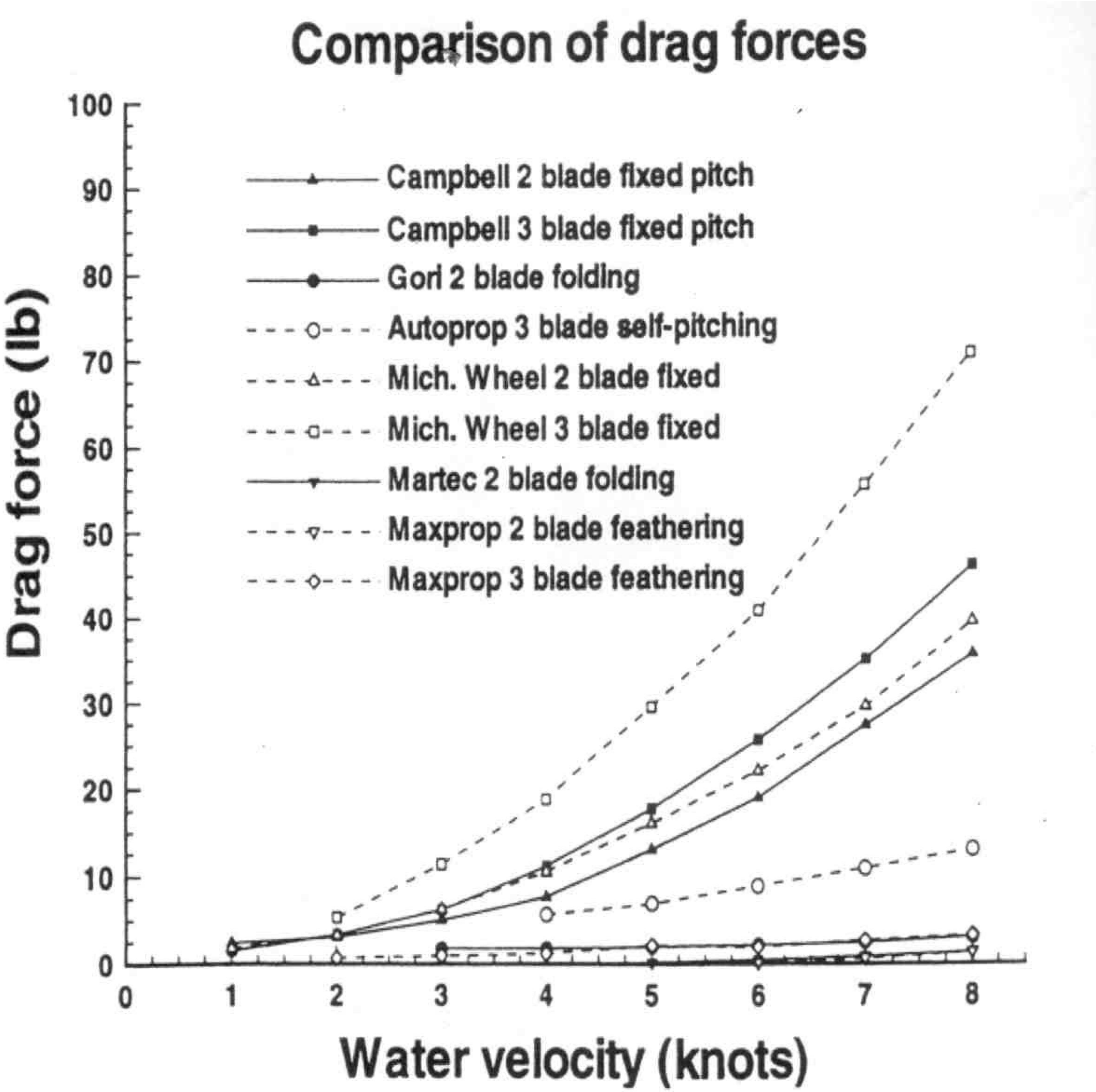
Propeller Functionality Comparision Table

February 2005

Functionality Required of Propeller Unit	IMPORTANCE 0 to 9 = MOST	*RATING* Autoprop	*BY TYPE:* Fixed 2 Bladed	Fixed 3 Bladed	*0 = WORST to 9 = BEST* Folding 2 Bladed	Folding 3 Bladed	*FOR EACH FUNCTION* Kiwiprop 3 Bladed	Feathering 2 Bladed	Feathering 3 Bladed
Motoring Speed at Cruise RPM	9	9	8	9	8	9	9	8	9
Reverse Thrust - Max rpm	9	9	8	9	8	9	9	8	9
Drag when Sailing - *On* and Off Wind	9	5	2	0	9	8	8	7	7
Reverse Thrust - Low engine rpm	5	9	8	9	0	0	9	8	9
Ease of Installation	4	5	9	9	0	0	9	0	0
Low Mass	5	0	7	5	1	0	9	2	0
Low Moment of Inertia - Saildrive & Shaft	3	0	7	5	2	0	9	2	0
Minimal Corrosion Potential	8	0	0	0	0	0	9	0	0
Internally Lubricated	6	0	9	9	0	0	9	9	9
Blade Sacrifice in Catastrophe	3	0	0	0	0	0	9	0	0
Simple Blade replacement option	2	7	0	0	7	7	9	0	0
Initial Cost of Unit	7	0	9	8	5	4	5	2	0
Low Cost Blade Replacements	1	3	0	0	3	3	9	0	0
	TOTALS:	**226**	**356**	**330**	**233**	**216**	**539**	**276**	**261**

Graph is taken from MIT test reports in "Practical Sailor" October 1993 and January 1995 issues - for 16" props

NB: Tests were conducted prior to development of the Kiwiprop unit



Kiwiprops™

Kiwiprop Order Specification Sheet

Page 1/3

Return the first sheet completed to: order@kiwiprop.us or Fax to: +1 (310) 657-7882
Or mail to: Kiwiprop.us PO Box 11722 Marina Del Rey, CA 90295
Phone: +1 (310)591-8010 Toll Free +1 (877) kiwi USA

Name of Owner: **Phone:**

Contact Address:

Ship to Address:

Phone # for Courier Delivery: **email:**

Name of Boat:
Designed by:
Displacement:
Length Overall:
Length Water Line:

Local Agent's Name if you are not dealing direct:

Required by Date:

PAYMENT METHODS:

We accept both Mastercard and Visa and online Bank Transfer Payments.

The amount will be converted to NZ dollars at the mid rate on the day plus 0.5 cents.
The currency translated charges, over which we have no control, should not exceed the quoted price due to changes in the foreign exchange rate before translation.

Visa / Mastercard Account #	*Expiry Date*	*Card Initials & Name*
	/	

NB: For internet security reasons users may wish to phone or fax credit card information ……

ENGINE MAKE & MODEL:

SAE Horsepower …….. @ RPM ……….
Max 1 hour rpm rating

Reduction Gear Ratio in Ahead:

Reduction Gear Ratio in Astern:

Rotation in Ahead: [Viewed from astern]

Normal Cruising rpm:

NB: Gearboxes with lower reduction ratios in Astern than Ahead will not achieve full engine rpm in Astern due to the higher shaft speeds

NB: All Saildrives have the same reduction ratio in Ahead and Astern and normally rotate in a Left Handed or Counter Clockwise direction

NB: Many modern reduction boxes can run in either direction to select different Ahead ratios

CAUTION: V Drives *may* reverse rotation

SHAFT: *see page 3 …*

Diameter:
Taper Ratio:
Taper length Shaft:
[Do not measure off existing propeller]
Keyway Size & Length:
Thread OD:
Thread Length:
Thread Type:

SAILDRIVES:

Model #:

All S/Drives except Nanni, Beta & Selva have SAE 16/32 Splines on a 28 mm shaft with an M16 x 2 nut & rotate anticlockwise in ahead. New Volvo's & Yanmar's - rotation is optional.

Yanmar SD40/50 Saildrives take M20 x 2 nuts. SONIC take ⅝" UNC with extra 12 mm Collar.

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Continued page 2/3

SHIPMENT DETAILS:

We can generally dispatch a unit following receipt of all the required information and order confirmation within 3 to 4 working days.

Units will normally be shipped by DHL using their Air Express courier service which typically targets 2 ~ 5 working day delivery to most North American addresses and less to Australian customers. This Air Express service will incur an additional delivery charge of US $ 50 or equivalent per unit.

Air International using the Postal Service has proved very reliable and cost effective and will target a longer delivery period of 5 – 10 working days in return for a saving of US $ 50 or equivalent.

The units are carefully packed in individual foam cartons and shipped door to door with full insurance. A copy of the installation and operating manual with a signed copy of the warranty will be included in the carton. We will advise shipment details by e-mail or fax.

NB: Customers are responsible for any local taxes and charges that may apply ...

Indicate here if you wish to use the slower Post Office Air International service and save the US $ 50 express delivery charge. → ☐

POWER RANGE CONSTRAINTS:

The smallest unit available has a nominal diameter of 15.50" - the largest 18.50".
NB: The actual maximum diameter at the tips will be ~ 0.50" greater than the nominal diameter.

These are suitable for engine / reduction options in the power and shaft speed ranges that deliver less than 55 hp at shaft speeds of more than ~ 1340 rpm at the top end of the range.

At the bottom of the range they require more than ~ 15 hp at shaft speeds of less than 1400 rpm in ahead, and less than ~ 1250 rpm in reverse. *[The lower reverse speed constraint is required to accommodate the extra power required from the 23+ deg of reverse pitch]*

CAUTION: *These units are not recommended for boats with continuous sailing speeds in excess of 15 knots or for catamarans that may lift a hull when sailing. They are not recommended for use in mud berths or areas where there are extreme levels of scale deposits or sand in the water as both will interfere with ongoing lubrication of the blades on their mountings.*

CORROSION ISSUES:

The units do not accommodate a zinc anode. With large proportions of the components by area composites, the unit does not need a zinc sacrificial anode nor can they be attached to the nut for example as it does not conduct.

The AB2 components have the same electro-potential as 316 Stainless Steel.

All Saildrives have the anode on the housing. Shaft drives would need to mount any zinc anode on the shaft in front of the unit assuming space was available.

EXISTING PROPELLER : *Optional*

Diameter / Pitch / # of Blades:

Type / Manufacturer:

Normal cruising RPM Engine:

Normal cruising speed knots:

Maximum speed achieved:

INITIAL PITCH SETTING:

Unless requested otherwise - the unit will be delivered with the pitch targeted to allow the engine to achieve it's rated max rpm which is required for warranty purposes on all new engines.

Higher pitch settings will improve cruise speed for a given rpm at the expense of achieving maximum engine rpm.

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Continued page 3/3

SAE & ISO ATTACHMENT OPTIONS AVAILABLE EX STOCK:

Shaft Diameter	Taper Ratio	Shaft Length	Boss Length	Thread OD & Type	Thread Length	Square Keyway
1.000"	SAE 1:16	2.750"	3.000"	0.750" UNC	1.438"	0.250"
1.125"	SAE 1:16	3.125"	3.375"	0.750" UNC	1.438"	0.250"
1.250"	SAE 1:16	3.500"	3.750"	0.875" UNC	1.625"	0.313"
25 mm	ISO 1:10	53-55 mm	60 mm	M16 x 1.5	25 mm	6 mm
30 mm	ISO 1:10	70-75 mm	80 mm	M20 x 1.5	30 mm	8 x 7mm
28 mm	S/Drives	3.000"	3.125"	M16 x 2.0	25 mm	Spline
28 mm	SD40-50	3.000"	3.125"	M20 x 2.0	25 mm	Spline
1.000" NZ	SAE 1:16	2.250"	2.500"	0.625" UNC	1.250"	0.250"
1.250" NZ	SAE 1:16	3.000"	3.250"	0.750" UNC	1.500"	0.313"

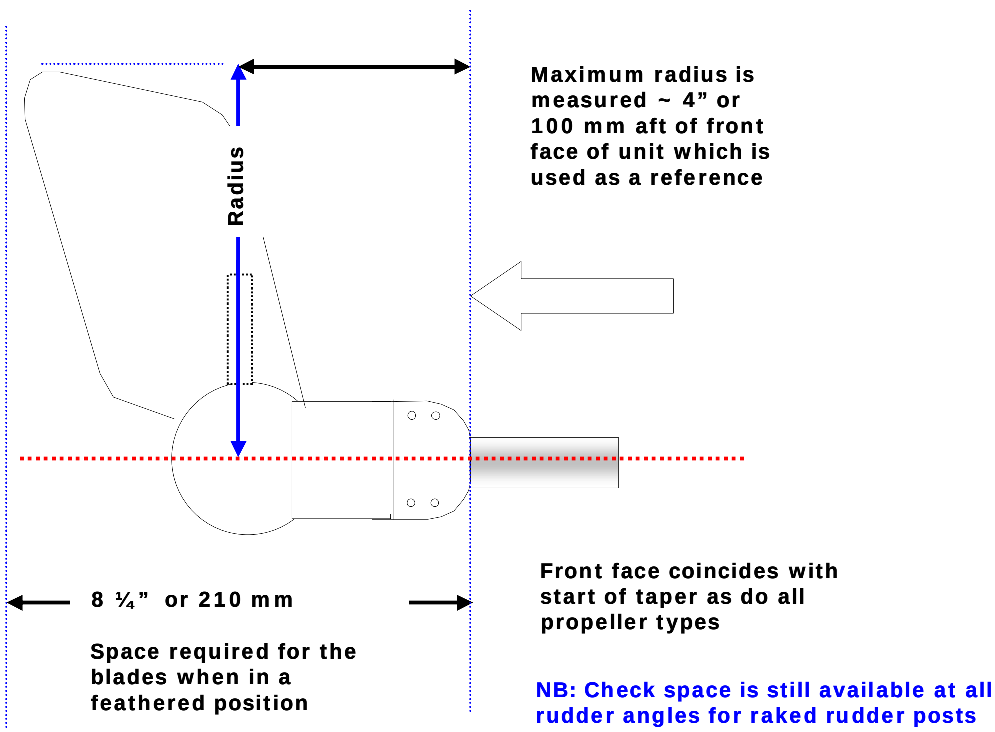
Blank bored bosses are available for local machining to fit non-standard tapers and nuts ….

All SAE tapers reduce in diameter by 1/16" for every inch of taper – ISO by 1 mm every 10 mm.
All North American manufactured and most Australian shafts will follow the SAE standard exactly.
In NZ & Australia taper length may vary, and must be specified, with 0.625" or 0.750" BSW nut optional.
You will need to confirm these dimensions on imported vessels or those which may have had the shaft replaced and which may not be standard. NB: BSW is the same as UNC in these sizes

The above ISO tapers and nuts cover all Beneteau, Bavaria and Jeanneau specifications but are technically the old ISO standards. Check the keyway dimensions carefully for all metric shafts.

NB: A new key is only supplied with SAE 1.250" shafts

SPACE REQUIREMENTS:



Minimum clearance to hull:

Installation angle of shaft: **Relative to the hull section above the propeller:**

CAUTION: ***These units are not recommended where the water flow due to the buttock lines / shaft angle is at a high angle relative to the propeller shaft eg > 30 deg***

Any unusual details of clearance, apertures, rudders etc:

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KIWI FEATHER PROPS - BENCHMARK INSTALLATIONS .... *as at: Jan 2006*

Engine	*Model*	*Drive*	*Hand*	*H'Power SAE*	*@RPM Max*	*Redn Ahead*	*Ratio Rev*	*Shaft Max*	*Nominal OD"*	*Pitch Kiwi*	RPM Max	KFP	*Ref*
ARONA	A1000	Shaft	RH	23	2800	2.40		1167	17.00	22		147	1
BETAMARINE	BV1305	Shaft	RH	35	3600	2.47		1457	17.00	21		374	1
	BD722	Shaft	RH	20	3600	2.05		1756	15.50	18		6251	1
	BD722	Shaft	RH	20	3600	2.60	2.13	1385	15.50	22		6189	1
	BETA	Shaft	RH	37	3000	2.00		1500	17.00	20		103	3
BMC	Captain	Shaft	RH	38	3500	2.00	2.00	1750	16.50	21		3XX	1
	Commodore	Shaft	LH	45	3000	2.00		1500	18.00	22		077	1
	FISHERBOY	Shaft	LH	52	3000	2.00		1500	18.50	22		315	1
	Thornycroft	Shaft	LH	50	3000	2.00		1500	18.50	22		077	2
BMW	D50-2	Shaft	LH	46	3000	1.95	1.86	1538	17.00	22		5213	1
BUKH	DV10ME	Shaft	RH	10	3000	2.50		1200	15.50	20		5187	1
	DV20ME	Shaft	RH	20	3000	2.50		1200	16.50	22		6160	1
	DV20SME	S/Drive	LH	20	3000	2.25		1333	16.00	21		487	1
	DV18SME	S/Drive	LH	18	3600	2.25		1600	15.50	18		361	1
	DV24ME	Shaft	RH	24	3600	3.00	3.00	1200	17.00	22		4130	1
	DV24SME	S/Drive	LH	24	3600	2.25		1600	16.00	19		453	1
	DV30SME	S/Drive	LH	30	3600	2.25		1600	16.00	21		020	1
	DV32SME	S/Drive	LH	32	3600	2.25		1600	16.50	21		473	1
	DV36SME	S/Drive	LH	36	3600	2.25	2.25	1600	16.50	21		4159	1
	DV36SME	Shaft	RH	36	3600	3.00		1200	18.50	23		282	1
	DV48SME	S/Drive	LH	48	3600	2.25		1600	17.00	22		351	1
DROFIN	12/M	Shaft	RH	12	3000	2.30		1304	16.00	20		119	1
FARRYMAN	Farryman	Shaft	RH	29	2400	2.00		1200	17.00	21		005	5
FORD	FORD	Shaft	LH	50	3300	2.00		1650	18.50	22		134	. 1
	FORD	Shaft	RH	14	2600	2.00		1300	15.50	20		4138	1
	XLDMP	Shaft	LH	45	3000	2.00		1650	17.00	21		5264	1
	XLDMP	Shaft	RH	50	3400	2.50		1360	18.50	22		163	1
ISUZU	2AB1	Shaft	RH	25	2800	2.14		1308	18.50	22		386	1
	ISUZU	Shaft	RH	35	2800	2.00		1400	16.50	21		302	2
	ISUZU	Shaft	RH	50	2800	2.00		1400	18.50	22		241	1
	ISUZU	Shaft	RH	35	2800	2.01		1393	17.75	20		034	1
	ISUZU	Shaft	RH	35	2800	2.01		1393	17.00	21		3110	1
	ISUZU	Shaft	LH	50	3400	2.10		1619	18.50	22		105	1
	ISUZU	Shaft	RH	50	3000	2.57		1167	18.00	23		124	1
KUBOTA	Kubota	Shaft	RH	15/18	3600	2.21	3.12	1629	15.50	18		3108	1
	3C093	Shaft	RH	19	2800	2.47	2.36	1134	16.50	22		4139	1
Refer to Nanni	BD722	Shaft	RH	20	3000	2.00	3.00	1500	15.50	20		3103	1
	Kubota	Shaft	RH	22	3600	2.00		1800	16.50	18		008	3
	Kubota	Shaft	RH	22.5	3600	2.70		1333	16.00	21		350	1

KIWI FEATHER PROPS - BENCHMARK INSTALLATIONS .... *as at: Jan 2006*

Engine	*Model*	*Drive*	*Hand*	*H'Power SAE*	*@RPM Max*	*Redn Ahead*	*Ratio Rev*	*Shaft Max*	*Nominal OD"*	*Pitch Kiwi*	RPM Max	KFP	*Ref*
KUBOTA	**Kubota**	**Shaft**	**RH**	**27**	**2800**	**1.86**		**1505**	**16.00**	**22**		**344**	**1**
	Kubota	**Shaft**	**RH**	**28**	**3000**	**2.60**		**1154**	**17.00**	**22**		**162**	**1**
Refer to Nanni	**NANNI**	**Shaft**	**RH**	**50**	**2800**	**2.74**		**1022**	**18.50**	**21**		**048**	**1**
	S/Drive	**S/ Drive**	**LH**	**43**	**2600**	**1.66**		**1566**	**18.50**	**21**		**121**	**1**
	S/Drive	**S/Drive**	**LH**	**33**	**2800**	**1.66**		**1687**	**17.00**	**21**		**121**	**2**
	V-1200B	**Shaft**	**RH**	**28**	**3000**	**2.00**		**1500**	**16.50**	**21**		**278**	**1**
	V-1200B	**Shaft**	**RH**	**25**	**3000**	**2.00**		**1500**	**16.00**	**21**		**283**	**1**
LISTER	**LPWS4**	**Shaft**	**RH**	**32**	**2500**	**2.09**		**1196**	**17.00**	**21**		**046**	**1**
	LQW2	**Shaft**	**RH**	**23**	**3300**	**2.00**		**1650**	**15.50**	**19**		**286**	**1**
		Shaft	**RH**	**45**	**3000**	**2.63**		**1141**	**18.50**	**22**		**301**	**1**
LOMBARDINI	**LDW1003**	**S/ Drive**	**LH**	**28**	**3600**	**2.18**		**1651**	**15.50**	**20**		**348**	**2**
	LDW1404	**S/Drive**	**LH**	**36**	**3600**	**2.18**		**1651**	**16.00**	**20**		**452**	**2**
	LDW1003	**Shaft**	**RH**	**28**	**3600**	**2.60**	**2.13**	**1385**	**16.50**	**22**	**4146**		**1**
	LDW1404	**Shaft**	**RH**	**39**	**3600**	**2.50**	**2.50**	**1440**	**17.00**	**22**			
MAZDA	**Mazda**	**Shaft**	**RH**	**60**	**3000**	**1.88**		**1596**	**18.50**	**21**		**324**	**1**
MITSUBUSHI	**S4L**	**Shaft**	**RH**	**37**	**3000**	**2.00**		**1500**	**17.00**	**22**		**255**	**1**
	Mitsubushi	**Shaft**	**RH**	**20**	**3000**	**2.75**		**1091**	**16.50**	**21**		**246**	**1**
NANNI	**2.50HE**	**Shaft**	**LH**	**14**	**3600**	**2.62**	**2.18**	**1374**	**15.50**	**20**	**6002**		**1**
	3.75HE	**Shaft**	**RH**	**21**	**3600**	**2.60**		**1385**	**16.00**	**20**		**317**	**1**
Refer to Kubota	**3.90**	**Shaft**	**RH**	**19**	**3000**	**1.79**	**1.86**	**1676**	**15.50**	**18**	**3137**		**1**
	3.90	**Shaft**	**RH**	**19**	**3000**	**2.05**	**1.90**	**1463**	**15.50**	**20**	**3140**		**1**
	390HE	**Shaft**	**RH**	**22.5**	**3600**	**2.72**	**1.86**	**1324**	**15.50**	**21**		**274**	**2**
	4.110	**S/Drive**	**LH**	**30**	**3600**	**2.40**		**1500**	**16.00**	**22**		**359**	**1**
	4.150HE	**Shaft**	**RH**	**37.5**	**3000**	**1.88**		**1596**	**17.00**	**20**		**273**	**1**
	4.150HE	**Shaft**	**RH**	**37.5**	**3000**	**2.60**		**1154**	**18.50**	**23**	**5245**		**1**
	4.150HE	**S/Drive**	**RH**	**37**	**3000**	**2.00**	**2.00**	**1500**	**17.00**	**22**		**388**	**1**
	4.190HE	**Shaft**	**RH**	**50**	**2800**	**2.14**		**1308**	**18.50**	**23**		**498**	**2**
	4.190HE	**Shaft**	**RH**	**43**	**2800**	**2.63**		**1065**	**18.50**	**23**		**131**	**1**
	4.190HE	**Shaft**	**RH**	**43**	**2800**	**1.80**	**1.80**	**1556**	**17.00**	**22**	**5075**		**1**
	HD150	**S/Drive**	**LH**	**37**	**3000**	**2.31**	**2.31**	**1299**	**17.00**	**23**		**3XX**	
	NANNI	**Shaft**	**RH**	**21**	**3600**	**2.20**		**1636**	**16.00**	**18**		**230**	**3**
NANNI	**Nanni**	**S/ Drive**	**RH**	**21**	**3600**	**2.20**		**1636**	**16.00**	**18.5**		**051**	**2**
PALMER	**Atomic 4**	**Shaft**	**RH**	**27**	**3200**	**2.00**		**1600**	**17.00**	**21**		**039**	**2**
PERKINS	**4.107**	**Shaft**	**LH**	**52**	**4000**	**1.50**		**2667**	**16.00**	**20**		**245**	**1**
	4.107	**Shaft**	**RH**	**45**	**3600**	**2.00**	**2.83**	**1800**	**16.50**	**21**		**384**	**1**
	4.107	**Shaft**	**LH**	**36**	**3600**	**2.20**		**1636**	**16.50**	**22**		**128**	**1**
	4.108	**Shaft**	**RH**	**45**	**3000**	**1.99**		**1508**	**17.00**	**21**		**056**	**2**
	4.108	**Shaft**	**RH**	**45**	**3000**	**2.00**		**1500**	**17.00**	**23**		**291**	**1**
	4.108	**Shaft**	**RH**	**50**	**4000**	**2.57**		**1556**	**18.50**	**23**		**409**	**1**

KIWI FEATHER PROPS - BENCHMARK INSTALLATIONS .... *as at: Jan 2006*

Engine	Model	Drive	Hand	H'Power SAE	@RPM Max	Redn Ahead	Ratio Rev	Shaft Max	Nominal OD"	Pitch Kiwi	RPM Max	KFP	Ref
PERKINS	4.108	Shaft	RH	50	3400	2.00		1700	16.50	21		341	1
	4.108	Shaft	LH	45	3200	2.10		1524	17.00	20		357	1
	4.108	Shaft	RH	45	3600	2.70		1333	18.50	22		151	1
	4.108	Shaft	LH	50	4000	2.91		1375	18.50	23		3139	1
	4 CYL	Shaft	RH	30	2400	2.00		1200	18.50	23		144	1
	M20	Shaft	RH	18	3600	2.72	2.15	1324	16.00	19		3115	1
	M25	Shaft	RH	25	3600	2.60		1385	16.50	21		243	1
	M30	Shaft	RH	29	3000	2.04	2.50	1471	15.50	20		444	1
	M50	Shaft	RH	50	3000	2.00		1500	18.00	21		253	1
	M50	Shaft	RH	50	3000	2.10		1429	18.50	22		154	1
	Perkins	Shaft	LH	44	2000	2.00		1000	18.50	23		352	1
SOLE	Mini 13	Shaft	RH	13	3000	1.90		1579	15.50	18		146	1
	Mini 14	Shaft	RH	13	3000	1.90		1579	15.50	18		380	1
	Mini 23	Shaft	RH	23	3600	2.00		1800	16.00	19		123	1
	Mini 23	Shaft	RH	23	3600	2.00		1800	16.00	19		149	1
	Mini 26	Shaft	RH	26	3600	2.25		1600	16.00	20		250	1
	Mini 31	Shaft	RH	31	3000	2.00		1500	16.50	21		4103	1
	Mini 34	Shaft	RH	34	3200	2.00		1600	16.50	21		062	1
	Sole 44	Shaft	RH	44	3000	2.00		1500	17.00	21		363	1
THORNEYCROFT	T110	Shaft	RH	35	3500	1.96		1786	16.00	20		118	2
TOYOTA	Unique	Shaft	RH	40	3000	2.00		1500	16.00	22		122	1
UNIVERSAL	3240	Shaft	RH	32	2800	2.10		1333	16.50	21		061	1
	5444	Shaft	RH	44	3000	2.00	2.00	1500	17.00	23		4126	1
	5432	Shaft	RH	32	2800	2.14		1308	17.00	22		371	1
	M25XP	Shaft	RH	23	3200	2.00	2.00	1600	15.50	19		6172	1
	M40	Shaft	RH	35	3300	1.90		1737	16.00	20		248	1
	M40	Shaft	RH	32	2800	1.80		1556	16.50	21		401	1
	M40	Shaft	RH	32	2800	2.14		1308	17.00	21		275	1
UNIVERSAL	M50	Shaft	RH	44	3000	1.90		1579	17.00	21		304	1
VETUS	M3.09	Shaft	RH	25	3600	2.60	3.00	1385	16.50	21		4162	1
	M4.14	Shaft	RH	31	3100	1.79	1.86	1732	16.00	20		3114	1
VOLVO	2002	S/Drive	LH	18	3200	2.20		1455	15.50	20		4178	1
	2002	Shaft	LH	18	3200	2.37		1350	16.00	21		216	1
VOLVO	2002	Shaft	LH	18	3200	3.00	3.00	1067	17.00	23		4160	2
	2003	Shaft	RH	28	3200	2.14	2.57	1495	16.00	21		356	3
	2003	S/Drive	LH	28	3200	2.20		1455	16.50	21		5170	1
	2003	Shaft	LH	28	3200	2.37	2.72	1350	16.50	21		6003	2
	2003	Shaft	LH	28	3200	3.00		1067	18.50	23		381	2

KIWI FEATHER PROPS - BENCHMARK INSTALLATIONS .... *as at: Jan 2006*

Engine	*Model*	*Drive*	*Hand*	*H'Power SAE*	*@RPM Max*	*Redn Ahead*	*Ratio Rev*	*Shaft Max*	*Nominal OD"*	*Pitch Kiwi*	*RPM Max*	*KFP*	*Re*
VOLVO	**2020**	**Shaft**	**RH**	**18**	**3600**	**2.37**	**3.00**	**1519**	**15.50**	**20**		**3101**	**1**
	2020	**S/Drive**	**LH**	**18**	**3600**	**2.47**	**2.47**	**1457**	**15.50**	**20**		**5013**	**1**
	2030	**Shaft**	**RH**	**28**	**3600**	**2.35**	**2.72**	**1532**	**16.00**	**22**		**5147**	**1**
	2030	**Shaft**	**LH**	**28**	**3600**	**2.72**	**2.37**	**1324**	**16.00**	**22.5**	**Space**	**471**	**1**
	2030	**Shaft**	**LH**	**28**	**3600**	**2.72**	**2.37**	**1324**	**16.50**	**22**			
	2030	**S/ Drive**	**LH**	**28**	**3600**	**2.47**		**1457**	**16.50**	**21**		**445**	**1**
	2040	**S/Drive**	**LH**	**38**	**3600**	**2.47**		**1457**	**17.00**	**22**		**5207**	**1**
	2040	**Shaft**	**LH ?**	**38**	**3600**	**2.14**		**1682**	**16.50**	**22**		**4107**	**1**
	2003T	**S/Drive**	**LH**	**43**	**3200**	**2.24**		**1429**	**17.00**	**22**		**383**	**1**
	2003T	**Shaft**	**LH**	**43**	**3200**	**2.37**		**1350**	**17.00**	**23**		**5069**	**2**
	2003T	**Shaft**	**LH**	**43**	**3200**	**3.01**	**3.01**	**1063**	**18.50**	**23.5**		**5051**	**1**
VOLVO	**D1-20**	**130S**	**LH**	**18**	**3200**	**2.19**	**2.19**	**1461**	**15.50**	**22**		**6151**	**2**
	D1-30	**130S**	**LH**	**28**	**3200**	**2.19**	**2.19**	**1461**	**16.50**	**21**			
	D2-40	**130S**	**LH**	**39**	**3200**	**2.19**	**2.19**	**1461**	**17.00**	**22**			
	D2-40	**Shaft**	**RH**	**40**	**3200**	**2.14**	**2.14**	**1495**	**17.00**	**23**	**3200**	**6261**	**1**
	D2-40	**S/Drive**	**LH**	**39**	**3200**	**2.19**	**2.19**	**1461**	**17.00**	**22**		**6259**	**1**
	D2-55	**130S**	**LH**	**52**	**3000**	**2.19**	**2.19**	**1370**	**18.50**	**23**			
	D2-55	**Shaft**	**RH**	**53**	**3000**	**2.23**		**1345**	**18.50**	**23**		**290**	**1**
	D2-55A	**S/Drive**	**LH**	**52**	**3000**	**2.20**	**2.20**	**1364**	**18.50**	**23**		**3100**	**1**
VOLVO	**MD11B**	**Shaft**	**LH**	**23**	**2500**	**1.91**		**1309**	**16.00**	**21**		**389**	**1**
	MD11C	**S/Drive**	**LH**	**23**	**2500**	**1.66**		**1506**	**16.00**	**21**		**322**	**1**
	MD11C	**Shaft**	**LH**	**23**	**2500**	**2.25**		**1111**	**16.50**	**20**		**028**	**1**
	MD11D	**S/Drive**	**LH**	**25**	**3000**	**2.20**		**1364**	**16.50**	**21**			**1**
	MD7B	**Shaft**	**LH**	**13**	**2600**	**1.91**		**1361**	**15.50**	**20**		**385**	**. 1**
	MD7B	**S/Drive**	**LH**	**17**	**3000**	**2.20**		**1364**	**16.00**	**21**		**137**	**1**
	MD7B	**Shaft**	**LH**	**17**	**3000**	**2.40**		**1250**	**16.50**	**21**		**157**	**1**
	MD17C	**Shaft**	**LH**	**35**	**2500**	**1.91**		**1309**	**18.50**	**22**		**5068**	**1**
	MD17C	**S/Drive**	**LH**	**35**	**2500**	**1.66**		**1506**	**16.50**	**22**		**458**	**1**
VOLVO	**MD22L**	**Shaft**	**RH**	**49**	**3000**	**1.95**	**1.95**	**1538**	**17.00**	**22**		**4163**	**1**
	MD22L	**S/Drive**	**RH**	**49**	**3000**	**2.20**		**1364**	**18.50**	**22**		**284**	**1**
	Volvo	**Shaft**	**LH**	**58**	**2800**	**2.00**		**1400**	**18.50**	**22**		**346**	**1**
VW	**GOLF**	**Shaft**	**RH**	**40**	**3600**	**1.88**		**1915**	**17.00**	**20**		**298**	**1**
WATERMOTA	**Sea Panther**	**Shaft**	**LH**	**30**	**3000**	**2.00**		**1500**	**17.00**	**21**		**239**	**1**
	Sea Wolf	**Shaft**	**LH**	**30**	**3000**	**2.00**		**1500**	**16.50**	**22**		**001**	**5**
WESTERBEKE	**W21**	**Shaft**	**RH**	**21**	**3000**	**2.00**	**2.00**	**1500**	**15.50**	**20**		**4137**	**1**
	W30	**Shaft**	**LH**	**30**	**3000**	**2.00**	**2.00**	**1500**	**16.50**	**21**		**6098**	**1**
	W30B	**Shaft**	**RH**	**27**	**3600**	**2.47**	**2.47**	**1457**	**16.00**	**21**		**5011**	**1**

KIWI FEATHER PROPS - BENCHMARK INSTALLATIONS .... *as at: Jan 2006*

Engine	*Model*	*Drive*	*Hand*	*H'Power SAE*	*@RPM Max*	*Redn Ahead*	*Ratio Rev*	*Shaft Max*	*Nominal OD"*	*Pitch Kiwi*	*RPM Max*	*KFP*	*Re*
WESTERBEKE	W35B	Shaft	RH	32	3500	2.47	2.36	1417	16.50	21		5091	1
	W38B	Shaft	LH	37	3500	2.00	2.00	1750	15.50	20		5104	2
	W42B	Shaft	RH	42	3500	2.00	2.00	1750	15.50	20		5104	2
	W49	Shaft	RH	49	2900	2.10		1381	17.00	22		335	1
YANMAR	2GM	Shaft	RH	15	3600	2.62	3.20	1374	16.00	20		231	1
	2GM20	Shaft	RH	18	3600	2.21	3.20	1629	15.50	18		5197	1
	2GM20	Shaft	RH	18	3600	2.62	3.20	1374	16.00	20		5221	1
	2GM20	Shaft	LH	18	3600	3.06	2.14	1176	16.50	20		326	1
	2GM20SD	S/Drive	LH	18	3600	2.64		1364	16.00	20		5030	1
	2QM15	Shaft	RH	15	3000	2.14		1402	16.00	18		354	1
	2QM20	Shaft	RH	20	2800	2.01		1393	17.00	20		057	2
	2QM20	Shaft	RH	20	2800	2.14		1308	17.00	22		4173	1
	2QM20	Shaft	RH	20	2800	2.80		1000	18.00	20		O09	4
	2QM20	Shaft	RH	20	2700	3.00		900	18.50	20		019	1
	2QM20	Shaft	RH	20	2800	3.20		875	18.50	21		5188	1
YANMAR	3GMD	Shaft	RH	22	3600	2.60	3.20	1385	16.00	21		327	1
	3GMSD	S/Drive	LH	22	3600	2.64		1364	16.00	20		328	1
	3GM30	Shaft	RH	27	3600	2.21	3.20	1629	16.00	20		038	2
	3GM30	Shaft	RH	27	3600	2.36	3.20	1525	16.00	21		158	1
	3GM30	Shaft	RH	27	3600	2.36	3.20	1525	16.00	22		3106	1
	3GM30	Shaft	RH	27	3600	2.64		1364	16.50	22		5130	1
	3GM30	Shaft	RH	27	3600	3.20	3.20	1125	17.00	22		4145	1
	3GM30SD	S/Drive	LH	27	3600	2.64		1364	16.50	22		271	1
	3GM30SD	S/Drive	LH	27	3600	2.64		1364	16.50	22	3350	6329	. 1
YANMAR	3YM20C	S/Drive	LH	21	3600	2.64		1364	16.00	21		4152	1
	3YM30	Shaft	RH	29	3600	2.21	3.20	1629	16.00	20		5042	1
YANMAR	3YM30	Shaft	RH	29	3600	2.64	3.20	1364	16.50	22		5232	1
	3YM30	Shaft	RH	29	3600	2.64	3.20	1364	17.00	21		5232	2
	3YM30	Shaft	RH	29	3600	3.20	3.20	1125	17.00	23		5163	1
	3YM30SD	S/Drive	LH	29	3600	2.64		1364	17.00	22	3550	6330	1
YANMAR	3HM	Shaft	RH	27	3200	2.14		1495	16.50	22		382	1
	3HM30	Shaft	RH	27	3200	2.36	3.20	1356	15.50	23		6327	1
	3HM35	Shaft	RH	34	3200	2.14		1495	16.50	22		339	1
	3HM35	S/Drive	LH	35	3200	2.60		1231	17.00	22		126	1
	3HM35	Shaft	RH	30	3200	2.83		1131	18.50	23		332	1
	3HM35F	Shaft	RH	35	3200	2.83		1131	18.50	23		116	3
YANMAR	3JH2CE	S/Drive	LH	38	3600	2.31		1558	17.00	22		228	1
	3JH2TCE	S/Drive	LH	47	3600	2.31		1558	17.00	22		343	2

KIWI FEATHER PROPS - BENCHMARK INSTALLATIONS .... as at: Jan 2006

Engine	Model	Drive	Hand	H'Power SAE	@RPM Max	Redn Ahead	Ratio Rev	Shaft Max	Nominal/ OD"	Pitch Kiwi	RPM Max	KFP	Ref
YANMAR	3JH2TE	S/Drive	LH	47	3600	2.45		1469	18.50	21		210	1
	3JH3BE	Shaft	RH	40	3800	2.36		1610	16.50	22		5148	1
	3JH3C	S/ Drive	LH	40	3800	2.31		1645	16.50	22		461	1
	3JH3C	Shaft	LH	40	3500	2.36	3.20	1483	17.00	20		394	1
	3JH3C	Shaft	RH	40	3500	2.60	2.60	1346	17.00	22		373	1
	3JH3C	Shaft	RH	40	3800	2.64	3.20	1439	17.00	23		5010	1
	3JH3C	Shaft	RH	40	3800	3.20	3.20	1188	18.50	23		4117	1
	3JH3E	Shaft	RH	40	3800	2.61	3.20	1456	17.00	22		4115	1
	3JH3E	Shaft	RH	40	3800	2.61	3.20	1456	17.00	23		5086	1
	3JH4	S/Drive	LH	40	3000	2.32	2.32	1293	18.50	22			
	3JH4	Shaft	LH	40	3000	2.33	2.32	1288	18.50	22		5289	1
	3JH4	Shaft	RH	40	3000	2.10	2.10	1429	17.00	22		6145	1
YANMAR	3QM30H	Shaft	RH	33	2600	1.91		1361	18.50	22		331	1
	3QM30H	Shaft	RH	30	2800	2.03		1379	17.00	23		342	1
	3QM30	Shaft	RH	30	3400	2.14		1589	17.00	21		111	1
	4JB3BE	Shaft	RH	56	3600	2.64		1364	18.50	23		294	1
YANMAR	4JH	Shaft	RH	44	3600	2.17		1659	17.00	22		110	1
	4JHE	Shaft	RH	44	3600	2.62		1374	18.50	22		3130	1
	4JH2	Shaft	RH	50	3600	2.14	2.14	1682	17.00	22		5034	1
	4JH2CE	S/Drive	LH	51	3800	2.31	2.31	1645	17.00	23		379	1
	4JH2E	Shaft	RH	51	3600	2.62		1374	18.50	23		5107	1
	4JH3CE	S/Drive	LH	55	3800	2.32	2.32	1638	17.00	23		482	1
	43H3E	Shaft	RH	41	3800	2.63	3.20	1445	17.00	21		3104	1
	4JH4		LH	50	3000	2.32	2.32	1293	18.50	23		5059	.1
	4JHZ-TE	Shaft	RH	46	3600	2.17		1659	18.50	21		305	1

SIZING COMMENTS: The above diameter and pitch settings have been successful on a particular installation.
As a general rule faster boats such as cats will require higher pitch settings - generally 1 deg.
Shaft angle and water flow to the prop both have significant effects on power required.
The same engine in different states of repair will deliver different power curves.
Blocked engine exhaust risers are the most common cause of power loss and failure to achieve expected rpm.
Unless identical - the above will only serve as the best available guide to sizing.
Personal choice is also a factor - different users prefer different throttle settings at cruise.
Variable Pitch allows the user to create what is an optimal propeller setting for their particular situation.

DIAMETERS: The above diameters are nominal and represent the diameter at the center of the face relative to an injection molded blade.
The actual diameter required at the tips 4ins or ~ 100 mm aft of the start of the taper will be ~ 1/2" greater than the nominal diameter.
Because the tips are raked there is not a commensurate reduction in maximum diameter.

Nominal in inches	15.50	16.00	16.50	17.00	18.50
Actual Max OD:	~16.00"	~16.50"	~17.00"	"17.50"	"19.00" This is the actual diameter at the tips when motoring

Kiwiprops™

CONTENTS OF THIS MANUAL

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INSTALLATION:

Refer first to exploded diagram on page 9 below and to the picture of the boss on page 2 ….

You are now the proud owner of an original *Kiwiprop™* which has been carefully designed and engineered to deliver many years of carefree service on your vessel. There are some very simple recommendations you should be aware of to ensure your *Kiwiprop™* will continue to deliver trouble free performance in the years ahead.

Before fitting your new *Kiwiprop™* to a shaft first check that the shaft is free to rotate and can be spun easily by hand to ensure correct feathering.

**Remove the nut from the Boss of the propeller by releasing the 2 x M8 locking screws.
Remove the key from the keyway on the shaft to enable correct mounting checks.**

To ensure the key is sized correctly, mount the unit without the key, to ensure the taper is tight, and then again with the key to ensure it is not binding on the keyway which can then be ground down if required. Mark the front face of the propeller on the taper in each case.
All 1.125" and 1.250" units mount 0.250" and 0.625" respectively down from the taper start.

Wipe all mating surfaces clean and lightly smear with a marine grease including both keyways. Check that the taper length will allow the nut to pull the propeller tight on to the shaft. In all cases the boss should protrude ~ ¼" or 6 mm aft of the small end of the taper, which is the SAE / ISO standard, to ensure the nut pulls up on the boss correctly and doesn't first bind on the thread giving only the appearance of correct mounting.

Check the fitting of the nut prior to finally mounting the propeller with key by ensuring the nut will freely go right down the thread. This will ensure the nut will subsequently push the rear face of the boss tightly onto the taper when mounted. Remove any burrs or impediments to the smooth operation of the nut. Smear the thread with a marine grease.

Failure to tighten the boss onto the taper and key with the nut will result in a loose mounting with subsequent shearing the key and loss of the entire propeller.

A new key will be supplied for all 1 ¼" shafts with one face ground down by 0.030" which allows for a common boss size. Ensure the ground face is mounted outwards. Always replace any key that is old or shows any signs of corrosion. Keys are usually only a brass and will corrode rapidly. The shearing of a corroded key will result in the automatic loss of your new propeller.

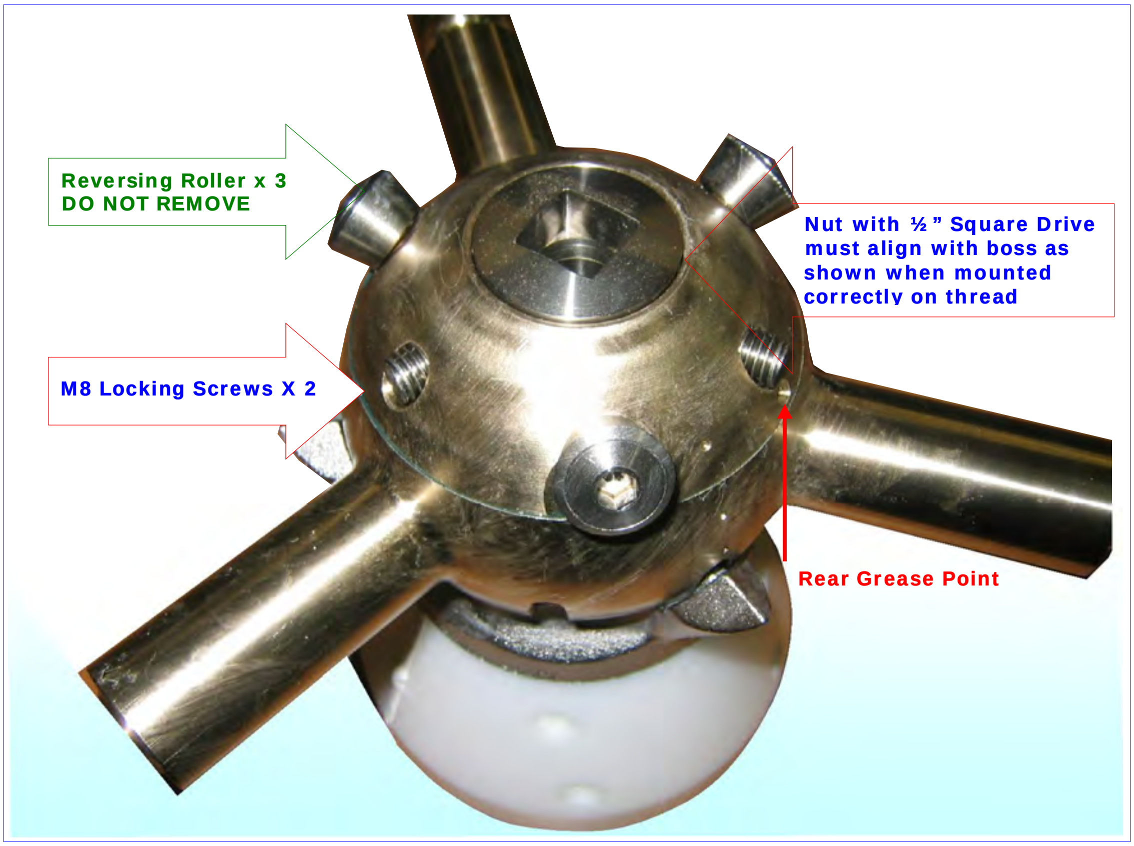
NB: The key must not protrude aft past the small end of the taper and over the thread section.

**Saildrives require a similar approach. Ensure that both internal and external splines are scrupulously clean to avoid binding and that the ~10 mm thick collar with shield which acts as a seal guard is on the shaft. Check the Delrin nose cone is not binding on the zinc. Some units such as Lombardini come with collars and washers which must be mounted.
All Saildrives require that the distance from the end of the spline to the face taking the thrust is exactly 3.000". All Saildrive propellers then have bosses which are ~ 3.125" long to ensure they pull up tight on the thrust face before the M16 (M20 for Yanmar SD40 or SD50 Saildrives) nut starts to bind at the end of the thread.**

The photograph below shows a boss without the blades attached and clearly identifies the nut with it's ½" square drive recess and the two M8 locking screws that must first be backed off to allow for removal of the nut from the unit. Also apply Loctite™ to the thread on the nut.

These same M8 locking screws must then be coated in Loctite™ before being wound back into the boss and tightened down to ensure the nut retaining the propeller is correctly locked in.

NB: A FAILURE TO TIGHTEN THESE TWO LOCKING SCREWS AND SECURE ALL THREADS WITH LOCTITE™ WILL INVARIBLY LEAD TO THE LOSS OF THE ENTIRE PROPELLER UNIT OVER TIME ON A SAILDRIVE UNIT. THIS IS NOT SO CRITICAL ON A TAPERED SHAFT MOUNTING - BUT STILL RECOMMENDED.



Do not overtighten the nut which attaches to any standard ½ inch socket driver. This is particularly important on tapered shafts when you need to remove the propeller and when using the Delrin nut option. Just nip it up using no more than an extra 10 foot lbs of torque or 14 Newton meter. This is equivalent to the weight of a one gallon or five litre can of water suspended on your socket driver one foot or 300 mm from the nut.

Apply a drop of **Loctite™** to the **2 x M8 Locking screws** shown above located on the hub of your Kiwiprop which are used to then lock the nut onto the shaft using the appropriate Allen key. **Also apply Loctite™ to the retaining nut on Saildrive installations.**

Again .. do not overtighten, particularly when using the Delrin nut.

NB: Saildrive nuts and their locking screw should be checked and re-tightened at each haul out as Splines by their nature may fret slightly in use and could loosen the locking screws.

To ensure the propeller feathers correctly, first throttle down to an idle, and then place the gearbox in neutral before stopping the engine. The shaft will then slow down as the blades align themselves with the water flow and quickly come to a stop. The shaft will then remain stationary without further attention.

Keep the gearbox in neutral whenever you are sailing.

You are now ready to enjoy the ongoing benefits from your new *Kiwiprops™* unit.

Please turn over for future maintenance and pitch adjustment recommendations.

PITCH SETTINGS:

The *Kiwi Feather Prop™* will have been set at the recommended pitch for your installation based on the engine model number, the reduction gear fitted and the particular characteristics you supplied of your vessel. You may however wish to take advantage of the simple pitch adjustment feature to accommodate the many variations between individual vessels and operating preferences and obtain the optimal motoring performance for your particular requirements. One turn of the 8 mm pitch screw in a clockwise direction to each blade in turn will equate to 3 degrees of pitch [not inches of pitch] and substantially increase the power required from the engine and drive train. This will translate to lower engine revs. We would recommend adjustments be made in no more than exact half turn increments to each blade, which has the effect of varying engine revs by some 300 ~ 400 rpm. Each installation is unique and only experience can deliver the appropriate settings and optimal cruising revs for your vessel. A pitch setting of 20 degrees equates to a normal pitch of ~ 11 to 12 inches.
[The required Allen key is 5/32" or 4 mm]

With the blade held pushed into the forward position to eliminate any slack and the aft face of the blade root aligned with the joint line between the mushroom end holding the reversing rollers which rotates and the boss which carries the blades, then the pitch is equal to 20 degrees on older blades. Allow for any wear showing on the rear surface of the blade.
For units with a serial # > 446 and new blade dies this equates to an 18 deg null.

Simply adding or subtracting one degree of pitch can then be executed by the above procedure using 1/3 rd of a turn = 1 degree of pitch. For example 22 degrees of pitch would be 2/3 rd of a turn in or clockwise from the 18 or 20 degree null reference.

The screws are self locking as Zytel is an Aramid and cut the last 5 threads into the blade. After pitch alteration place Loctite around the head of each pitch screw as extra insurance.
NB: Ceelon Thread Seal around the screw can be used to ensure the screw is sufficiently stiff if it has been caught – perhaps on a rope and moved slightly and become freer.

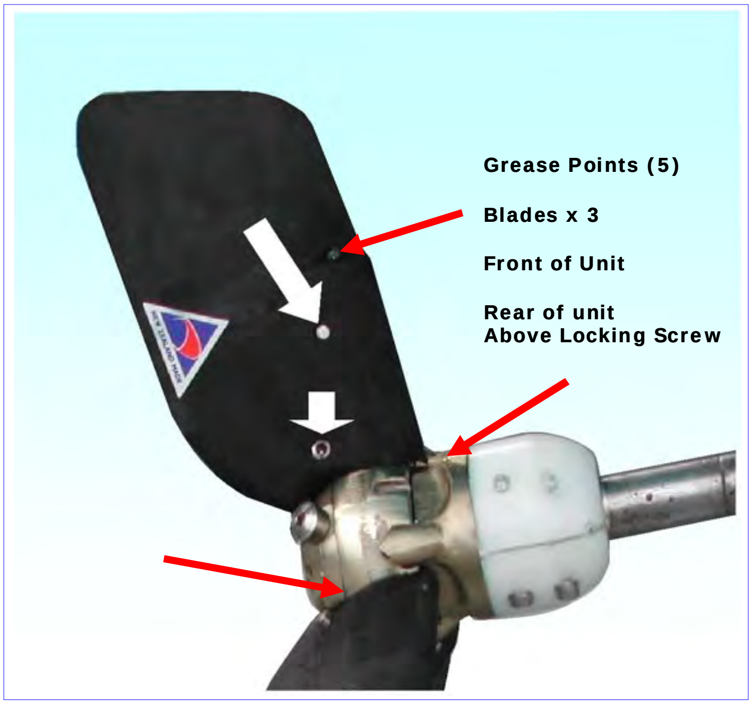
IMPORTANT:
To avoid damaging the blade roots in reverse by exceeding the designed pitch settings when increasing the pitch, first lock the propeller by engaging ahead with the engine stopped. Rotate the propeller by hand into the reverse position against the spring, and then only increase the pitch until the blade comes up against the reversing rollers.
You will not be able to exceed ~ 23.5 degrees of pitch on most units.

This represents the maximum pitch setting available from your *Kiwi Feather Prop™*.

LUBRICATION:

The *Kiwi Feather Prop* ™ contains lubricants sufficient until your next maintenance haulout. Each blade must then be greased via a lubrication point accessed by removing the small Pozidrive stainless screw on the blade face. In addition there are two small grease holes, one very close to the Delrin™ nose cone in the bronze casting that takes the thrust of the pitch screws and one near the outer perimeter of the bronze sphere at the rear of the unit. These have been chamfered to accept a standard needle nosed grease point. You will need to remove the outer guard off the needle. Each of these five grease points should then be filled with a high quality marine grease eg Shell™ Nautilus Marine Grease - NLGI No 2.

Check the reversing rollers are free to turn and free up if necessary



If operating or moored in very muddy environments or very shallow sandy water such that the propeller is continually operating in a sandy or dirt laden environment will require additional greasing of the blades. This will ensure that they maintain a clean bearing environment to minimise wear over time and ensure the reversing function operates correctly. Saildrive units left unused for long periods will experience zinc chloride deposits from the anode. Any dirt bound in grease will be highly abrasive and may stiffen the blades on their mountings so as to make correct reversing difficult. Reversing requires the blades are free to pivot.

NB: UNITS POST SERIAL # 6350 CONTAIN O-RINGS AT THE BLADE ROOT WHICH CAN BE DISPLACED WITH EXCESS PRESSURE. ONLY GREASE UNTIL BLADE IS FILLED WITH GREASE

ANTIFOULING:

To maintain the performance of any propeller it is essential to keep both faces, and in particular the tips clean. Barnacles and weed growth will have a serious impact on motoring performance. We recommend painting the whole propeller with a modern ablative antifouling which can be applied directly to the unit. The Zytel™ and Delrin™ require no special undercoats. While the paint will slowly erode from the tips of the blades over time this approach will still provide the best overall solution to fouling of the propeller. If not using a soft ablative paint that will wear away quickly with any contact from a moving blade, then care must be taken to ensure that the bottom root surface of the blade does not start to bind on the boss from a buildup of antifouling over time. **All Saildrives require non copper based antifouling. Always use the same antifouling on the propeller as the Saildrive.**

NB: Ensure there are no paint runs on the blade that can cause serious vibration problems.

REMOVAL OF BLADES:

Begin by marking each blade 1,2,3 with corresponding marks or reference positions on the boss which will not be removed in any subsequent cleaning operations. This is to ensure your pitch settings are retained correctly. Units with the later SS 316 investment cast pitch stops which are all identical can take any blade in any position and need not be numbered.

Remove the small Pozidrive screws halfway out the face of each blade which are used to grease the unit. Gently tap out with a pin punch of less than ¼" diameter each retaining pin that holds the blades. The blades can now be removed simply by sliding off the pin on the boss. Check for wear and corrosion on these pins which can be replaced if required.

Clean the pins and the interior of each blade carefully with a petroleum based cleaner eg Mineral Turps to ensure any old lubricant which will contain dirt and abrasives is all removed. Any areas where the blades may be binding should now become obvious from any wear patterns. These should be filed or sanded down. This is most likely to occur on the boss where the root of the blades can get caught with antifouling and or barnacles over time.

When both the mounting pin and the blade interiors are clean and dry you are now in a position to remount the blades on their correct pin and check for smooth rotation. Grease each pin hole. Smear a tablespoon of a good marine grease, Shell Nautilus Marine Grease, or similar lithium based, into the bore of each blade and also around the groove on the pin to ensure the assembly is full of grease when complete. Push the blade down fully and surplus grease will squirt from the grease hole, which must be open otherwise the blade will act like a hydraulic ram and become impossible to push back on.

Check the blade has been remounted on it's old pin. Now mount the retaining pin back into the reverse face of the blade from the side it came out of with a new wear face on the pin facing outwards. By tapping gently - reinsert the pin so that it is equidistant from each outer face of the blade. Refer photograph above for illustration.

Be careful to use a gentle striking motion with a small hammer slightly biased towards the leading edge of the blade, which will force the leading edge of the pin towards the trailing edge, to ensure it enters the hole on the opposite face cleanly. [The pin in effect pivots around the leading edge of the hole] Do not force with heavy striking. If aligned correctly it will require no more force to go in than required to take out. This should not be a problem, just a little care and common sense.

Replace the small Pozidrive screws after repeating the above process on each blade.

AUTO ROTATION:

If high speed autorotation occurs when sailing check for freedom of movement of each blade and the presence of foreign objects – typically fishing lines or pieces of rope, flotsam etc that has been picked up by the propeller.

Each unit is biased by modifying the last few millimeters of the trailing edge on one side to provide a slight camber to each blade so that any tendency to auto rotate will always be against the normal ahead direction. Normal operation will be for the prop to slowly slow down and then stop.

If it continues to turn slowly, there is no problem putting it into gear to prevent this. The blades are still feathered. The water flows around the propeller of any yacht are very complex and turbulent. Lee way and disturbances from the shaft and strut make specific predictions very difficult. Eliminating rotation will minimise any potential blade movement and thus wear over time.

IDLE SPEED:

The unit has been designed and tested to engage the smaller blades into reverse position at shaft rpm > 300 rpm and < 400 rpm which accommodates all popular engine and reduction gear combinations. Small engines with high reductions ie > 2.5:1 must ensure they have the idle set correctly to ensure reverse is engaged correctly. Reverse pitch is not adjustable but is always at a maximum and thus provides an immediate engine load which can stall smaller engines. Similarly engines with high idle speeds and low reductions will engage at high shaft speeds and cause harsh engagement as the dog clutch engages in the boss of the unit.

Many Yanmar/Hurth gearboxes are 3.2:1 in reverse irrespective of forward ratio which requires a minimum engine rpm idle of 960 set at the governor to achieve the above shaft rpm. Larger diameter propellers are less sensitive to shaft speed.

Check Oil levels in the gearbox to ensure correct engagement of hydraulic clutches.

REVERSING FUNCTION:

It is important to understand some of the issues that need to be considered when reverse is engaged with this unit.

NB: CHECK GEARBOX OIL LEVEL IS CORRECT TO ENSURE CORRECT CLUTCH ENGAGEMENT

Your Kiwiprop will automatically go to the maximum available pitch which is ~ 23 deg irrespective of the pitch that the blades have been set to in the ahead position. This is to ensure the propeller will deliver the maximum thrust in reverse at relatively low engine rpm.

The latest Yanmar gearboxes will go to ~ 3.2:1 reduction in reverse irrespective of the ahead ratio and will have very adequate power in reverse. Many of the older boxes have the same ratio in astern that they have in ahead, and in this case, they will be loaded by the difference in pitch between what the propeller is currently set to and the maximum of ~ 23 deg.

Some gearboxes, Lombardini for example, while having a 2.6:1 ratio in ahead only have a 2.18:1 ratio in astern, which means that the propeller shaft will turn at a proportionally higher speed in reverse. Couple this with the extra pitch and the engine will be highly loaded in reverse and unable to achieve the same rpm that it can in ahead. It is not possible to design any propeller that is optimal in ahead and reverse for quite different shaft speeds.

All Saildrives have the same reduction ratio in ahead and astern.

Smaller engines that are fully loaded in reverse from the above conditions will not be able to also run a compressor (which can require as much as 4 hp) and also run an alternator which can absorb ~ 1 hp (55 amps x 12 volts = 660 watts) when the battery is low.

Always ensure your freezer / fridge is turned off if you have a small engine, typically < 20 hp and a low reduction (ie high shaft speed) reversing function to avoid overloading the engine when reversing. Higher powered engines will not be affected to the same degree where these loads are a much smaller percentage of the available power.

REMOVAL OF THE UNIT:

If the unit is to be removed from the shaft this must be done with a puller.
Under no circumstances should the unit be removed with a hammer as this will damage the face of the unit and is likely to crack the Acetal nose cone.

DISASSEMBLY OF THE UNIT:

If disassembling the unit, which should not be necessary, ensure when pre-loading the internal torsion spring that the blades are held in the reverse position to avoid damaging the spring from over-winding when reverse is subsequently engaged. The nose cone must be sealed with white 3M 5200 Fast Cure on the joint lines and under the friction surface which assists in preventing the nose cone turning on the shaft under the torque from the spring. This includes the area under the thrust groove in the boss. Clean all the matching surfaces with Mineral Turps before applying no more than a very light smear of 3M 5200 including the area under the thrust groove to maximise the area of 3M 5200. Clean up with Mineral Turps and allow to dry.

Ensure the alignment marks are now correctly located as per the diagram on page 9.

It is critical to minimize any excess sealant flowing into the internal spring mechanism which when hardened will cause the spring to bind during the reverse function and take the reverse torque on the spring – not the drive mechanism - which will break the spring.

ANNUAL MAINTENANCE:

Whenever the boat is hauled is an opportunity to ensure the propeller receives the following checks to ensure it will continue to operate correctly into the future.

Check the attachment nut and associated locking screws have not moved.

Ensure the blades are free of barnacles and any marine growth. If the blades have been antifouled as recomended this will minimise growth but with the expected wear near the tips these will over time accumulate growth as the paint is ablated away. Any roughness on the blades will interfere with motoring performance. Sanding with wet and dry paper will restore the blades to their original condition. Antifoul as suggested above.

Sand fair any nicks and dings on the leading edge from collision with flotsam.

Check that the spring within the nose of the propeller will return the blades to the feathered position when the blades are forced into the reverse position whilst holding the shaft of the unit to wind up the spring. Refer carefully to the above notes on disassembly.

Check that each of the small reversing rollers are free to turn on the small stub shafts.

DO NOT attempt to remove these machine screws as they have been inserted with Loctite and are never intended to be removed. They can only be taken out with heat.
If tight they can be freed up with pliers and a thin lubricant such as a CRC spray.

Check that each of the blades is free to turn on it's shaft. Any stiffness here will impact on the overall ability of the unit to feather properly in all conditions. If it feels as if this situation will not be rectified with subsequent lubrication it will be necessary to remove the blade from it's mounting following the instructions detailed above. If the blade becomes free following the removal of the attachment pin – but not the blade then the binding will be under the root of the blade.

Careful observation of the blade and matching surfaces will indicate where the binding is occurring. It could be on the root of the blade from a buildup of marine growth and/or deposits which would need to be cleaned off. It could be foreign material in the surface between the blade and the pin. This would require that both surfaces be cleaned with a petroleum based cleaner such as mineral turps to remove all the grease and any contaminants. With only 0.003" clearance between the surfaces it takes very little to interfere with a smooth action about the pin.

While the blades are presoaked to pre-stress and stabilise them under water, Zytel is an aramid and may react further over time. If still binding on the shaft after cleaning the internal recess will need to be sanded with a piece of sandpaper on a round mandrel such as a piece of dowel or similar to remove any high spots which are causing the interference. Ensure the blade is cleaned thoroughly to remove all traces of abrasive prior to lubrication as detailed in the above section.

As a general guide each blade should fall slowly and smoothly under it's own weight when placed in a horizontal position after it has been lubricated and reassembled following the instructions above for blade removal.

Lubricate each blade in turn plus the nose and aft section of the unit as described in the section on lubrication detailed above. The unit should now be ready for another season.

The more regular lubrication the unit receives – the longer it will last.

TOOLS REQUIRED:

The tools and consumables required to mount the unit are summarised below:

- **½" Square Drive Socket Head**
- **4 mm or 5/32" A/F Hex or Allen Key**
- **Clean Rags with Mineral Turps or equivalent**
- **Marine grease & Loctite™**

BOATS STORED IN VERY LOW TEMERATURES:

In some situations around the world there will be operating environments where the vessel is stored on the hard over winter – typically where temperatures are below zero for extended periods. Obviously in this environment the moisture content of the air will be very low.

We have had reports that when exposed to temperatures as low as – 50 deg C the blades have stiffened up on their mountings. This could be due to the grease becoming stiff at these extreme temperatures or the blades drying out and contracting by a few thousands of an inch or ~ 0.05 mm. All aramids including Zytel absorb moisture and expand slightly. Blades are pre-soaked prior to final milling of the mounting hole to address this situation and are shipped with 0.006" or 0.15 mm of clearance on diameter over the mounting pins.

Always check the blades are free to feather if your vessel has been exposed to very long periods of extreme low temperatures.

NEW ENGINE WARRANTY ISSUES:

Engine manufacturers correctly require a new engine to reach it's rated max rpm for warranty purposes. Some modern engines tachometers are quite inaccurate and may also be driven off the alternator where new V belts typically can cause tachometer under reading errors of up to 350 rpm at 3600 rpm actual.

We can only respond to apparent propeller sizing issues with accurate data that has been obtained from a digital tachometer off the engine itself.

The propeller delivered will be sized to achieve rated max rpm as measured by a digital tachometer – not the tachometer supplied with the engine.

PERFORMANCE EVALUATION:

Evaluation of any propeller performance is always difficult given the problems of replicating an identical situation for any baseline comparison. Sea state, wind, fuel and water load, current, bottom state, dinghy etc will all contribute to changes in motoring performance.

Typically a new propeller has been fitted over winter and previous data may not be available or other additional changes have been made to the vessel.

It is important to ensure instruments are calibrated correctly prior to making comparative readings. Many engines for example now run the tachometer off the alternator so even a worn v-belt can change engine rpm readouts by effectively reducing the driven pulley diameter.

Using time over distance calculations to obtain boat speed requires an accurate knowledge of any current present.

New boat speed indicators may not be calibrated correctly – or the transmitter may have antifouling coverage affecting readout accuracy.

The average of two consecutive runs in opposite directions for a reasonable distance over the same course using a GPS in calm wind and water seems to deliver the most accurate results.

While the first evaluation will always be motoring – we stress that we would expect the benefits from your new propeller to be also manifested in improved sailing performance if you have replaced a fixed bladed propeller and in reversing function if you have replaced a folding type propeller. Sailing performance comparisons are even more difficult to quantify.

Remember that all feathering type propellers have flat blades with constant pitch from the tips to the blade roots. Other types have progressive pitch where the pitch varies from high at the blade root to low at the tips. The pitch at the tips of any feathering unit will thus be higher than on a fixed or folding type unit. At low engine and boat speeds you may notice a slightly different noise coming from the propeller which goes away as soon as the engine rpm are increased. This can be caused by slight cavitation off the tips of the blades. As boat speed builds the effective pitch decreases and the unit begins to operate in it's normal design range. This is exacerbated by high shaft angles and thus does not generally occur on Saildrives.

CUSTOMER FEEDBACK:

We would appreciate receiving feedback from each customer after using their Kiwiprop for a period. In particular data on maximum and cruising rpm with corresponding boat speeds and the relative performance of the unit with the previous propeller installation allows us to continuously refine sizing recommendations.

Comments as to how the unit performs can be e-mailed to: feedback@kiwiprop.us

Kiwiprops™

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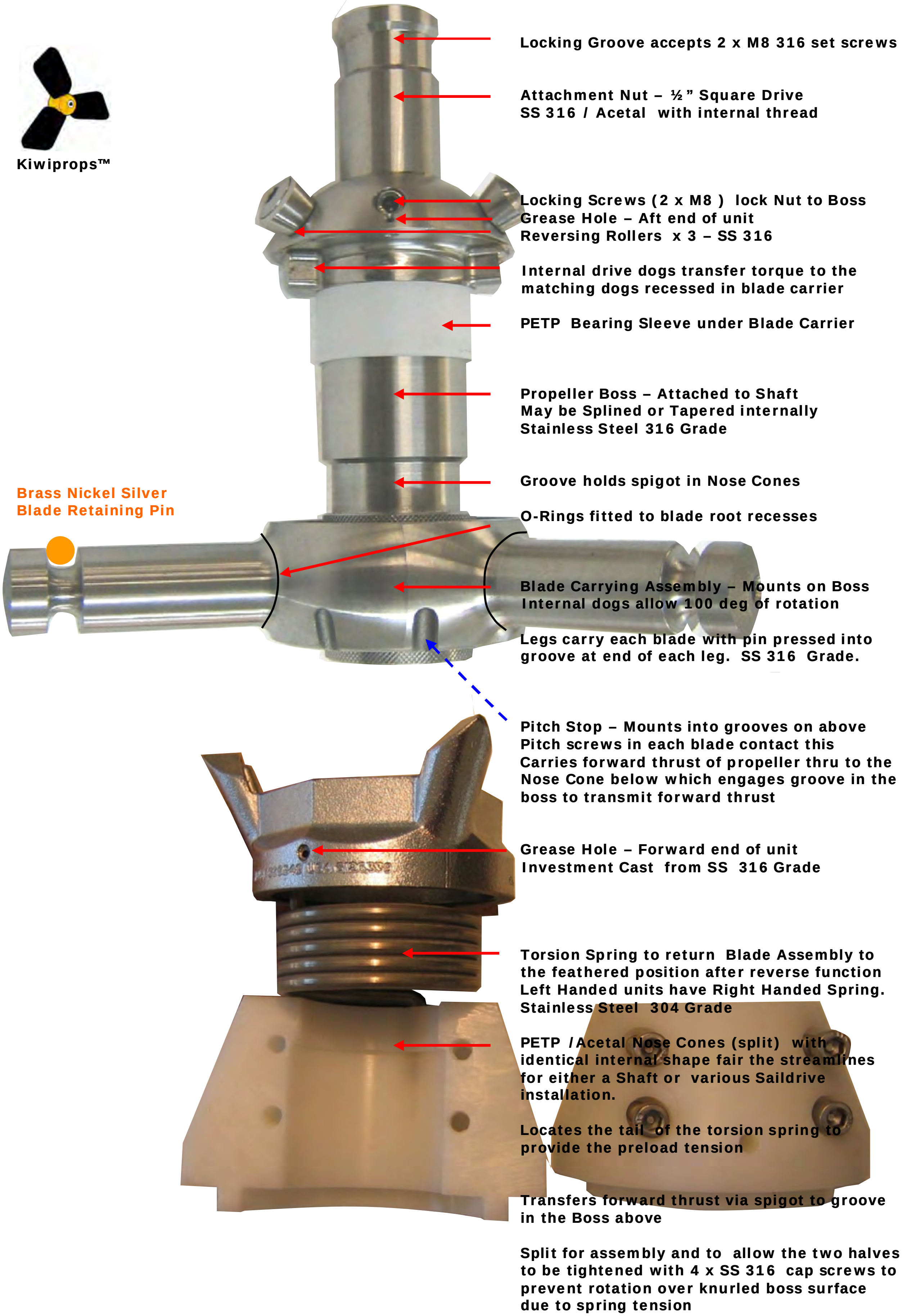
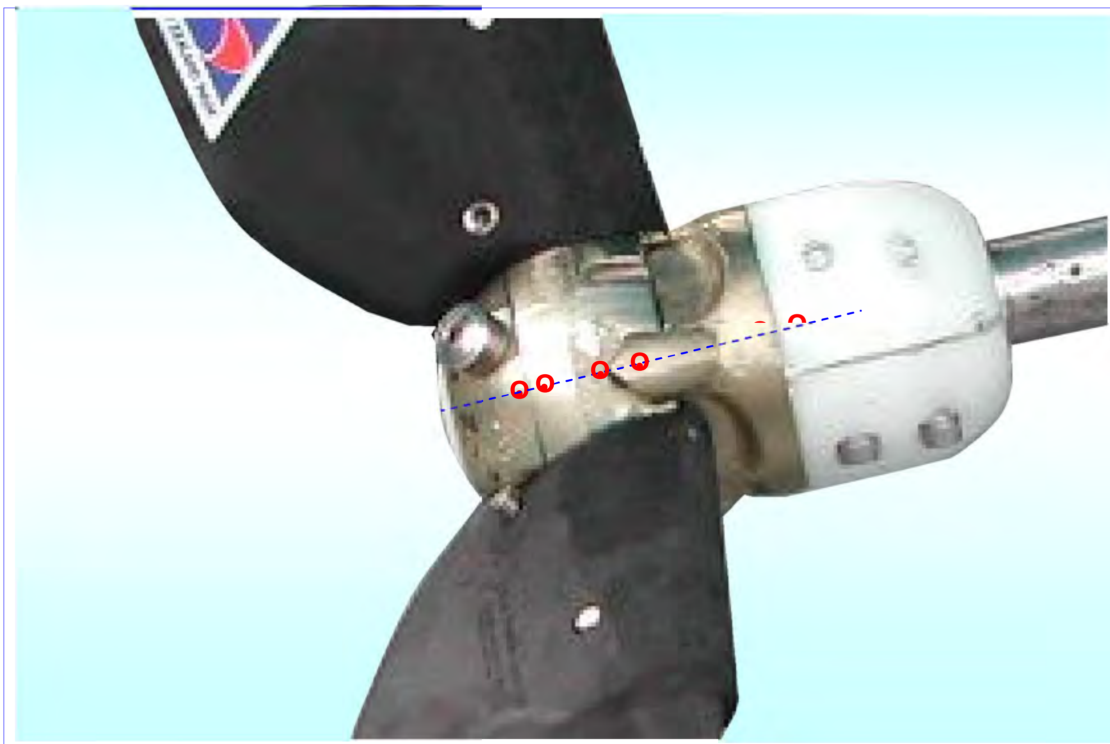
Kiwiprops™


Locking Groove accepts 2 x M8 316 set screws
Attachment Nut – ½ " Square Drive
SS 316 / Acetal with internal thread
Locking Screws (2 x M8) lock Nut to Boss
Grease Hole – Aft end of unit
Reversing Rollers x 3 – SS 316
Internal drive dogs transfer torque to the matching dogs recessed in blade carrier
PETP Bearing Sleeve under Blade Carrier
Propeller Boss – Attached to Shaft
May be Splined or Tapered internally
Stainless Steel 316 Grade
Brass Nickel Silver Blade Retaining Pin
Groove holds spigot in Nose Cones
O-Rings fitted to blade root recesses
Blade Carrying Assembly – Mounts on Boss
Internal dogs allow 100 deg of rotation
Legs carry each blade with pin pressed into groove at end of each leg. SS 316 Grade.
Pitch Stop – Mounts into grooves on above
Pitch screws in each blade contact this
Carries forward thrust of propeller thru to the Nose Cone below which engages groove in the boss to transmit forward thrust
Grease Hole – Forward end of unit
Investment Cast from SS 316 Grade
Torsion Spring to return Blade Assembly to the feathered position after reverse function
Left Handed units have Right Handed Spring.
Stainless Steel 304 Grade
PETP /Acetal Nose Cones (split) with identical internal shape fair the streamlines for either a Shaft or various Saildrive installation.
Locates the tail of the torsion spring to provide the preload tension
Transfers forward thrust via spigot to groove in the Boss above
Split for assembly and to allow the two halves to be tightened with 4 x SS 316 cap screws to prevent rotation over knurled boss surface due to spring tension

To assist with users in a situation where users have dis-assembled the unit for some reason and now need to ensure it is assembled correctly - a series of 5 pin punch marks is made down the length of the unit as shown in the picture below plus a small recess in the Acetal Nose Cone.

These extend from the Boss to the Blade Carrier down the leg of the tripod that is in line with these marks and then to the small hole drilled just as an indentation on the nose cone adjacent to the mark on the tripod.

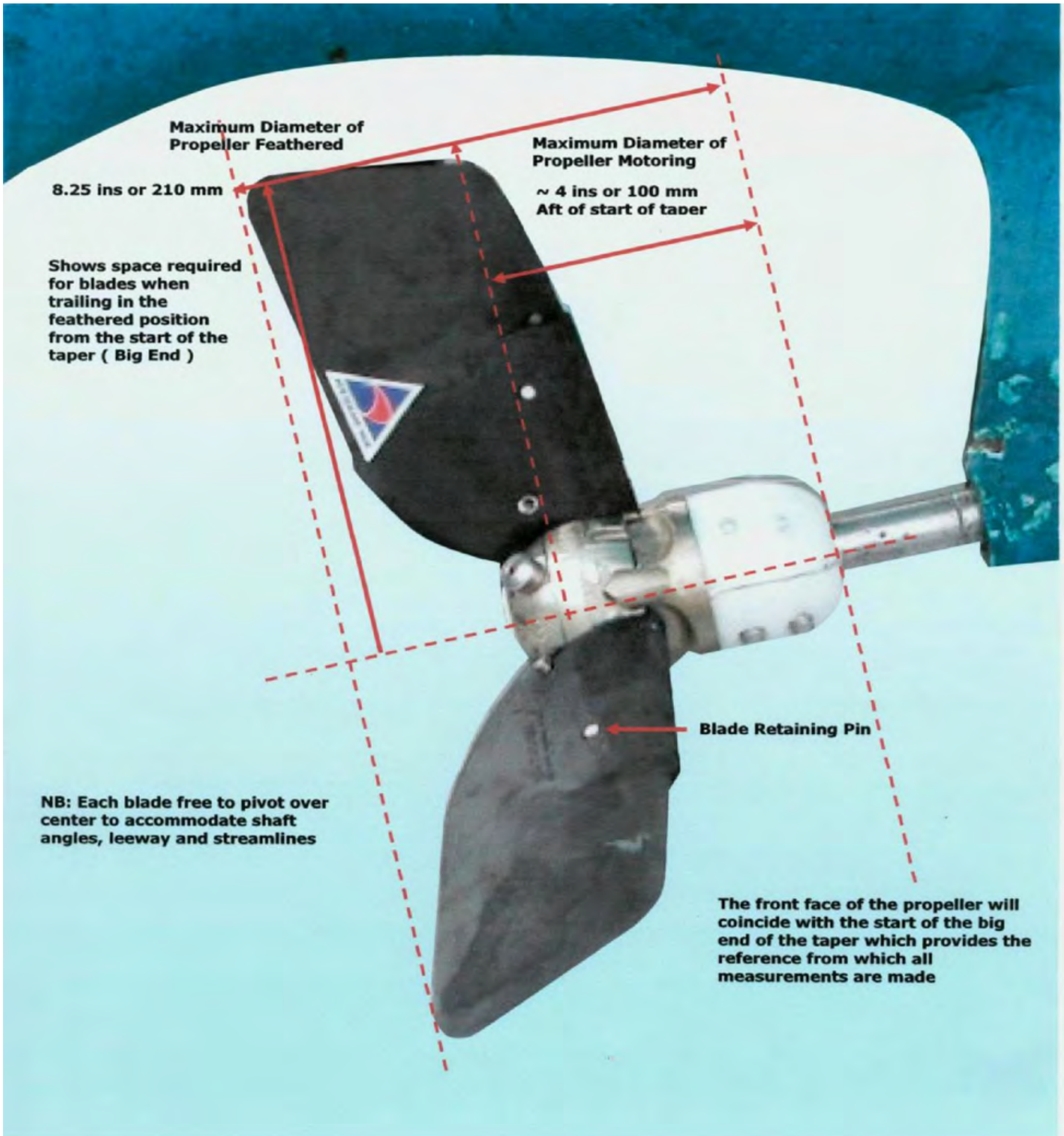
The correct re-assembly of the unit will require that all these marks are re-aligned after final assembly including the correct pre tensioning of the torsional spring inside the unit.



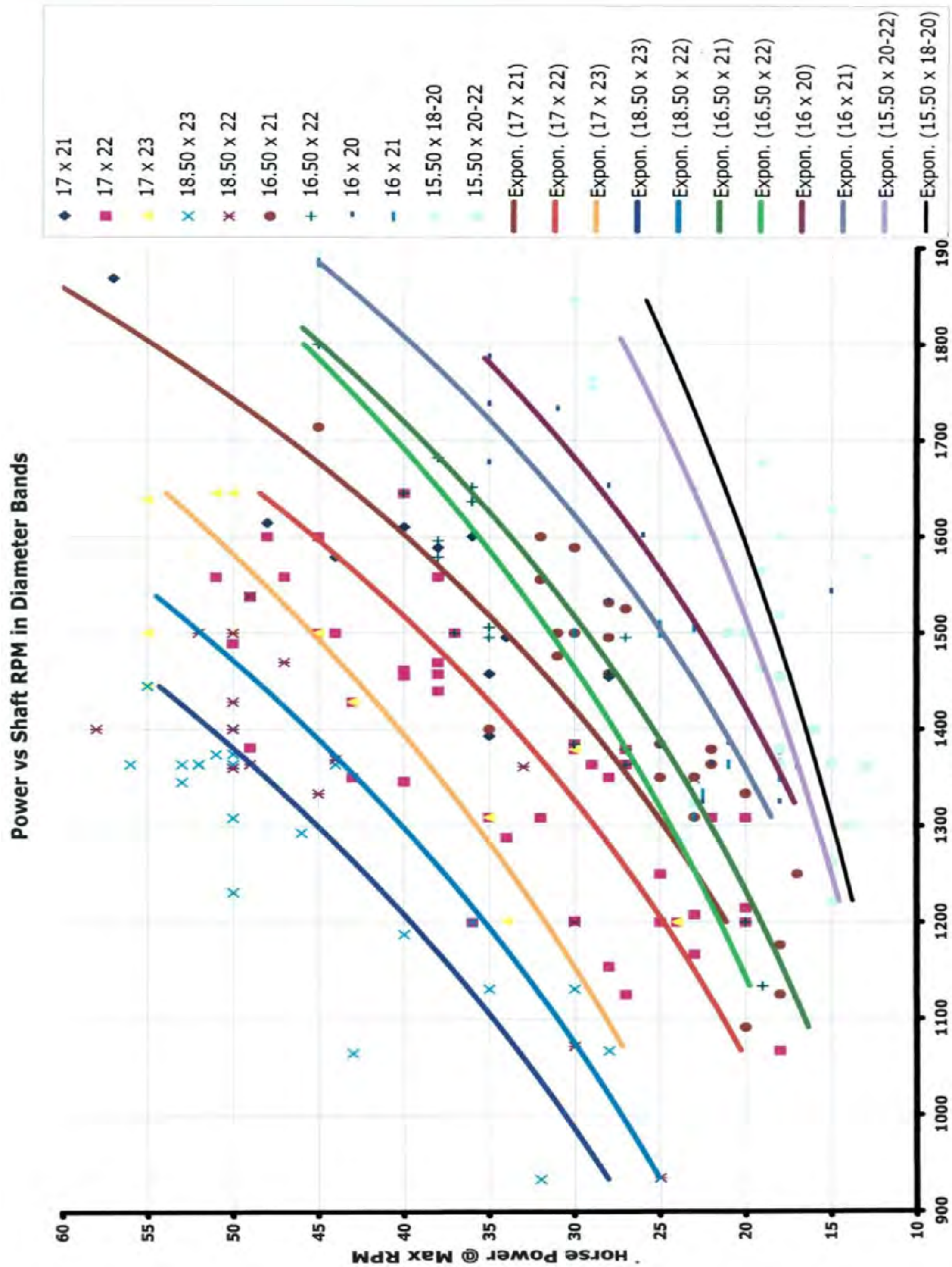
WARNING: Customers are strongly advised not to attempt to disassemble the unit unless this becomes absolutely essential. Re-assembly of all the components coupled with the need to ensure sealant is inserted into the nose cone whilst at the same time preloading the internal torsion spring makes for a tricky operation, particularly if no stub shaft is available to hold the unit whilst these operations are completed.

In the absence of a stub shaft to hold the unit during assembly - it will be necessary to mount the unit on the actual shaft or spline which can then be locked by engaging the gearbox

Installed Dimensions from Start of Taper **Dec 2005**



Maximum diameter when motoring will be ~ 4" or 100 mm aft of front face of propeller which starts on the big end of the taper. The 1.250" and 1.125" units mount 0.625" and 0.250" down from the start of the taper to retain boss commonality. These dimensions allow for this.


Power vs Shaft RPM in Diameter Bands
Horse Power @ Max RPM
Shaft RPM @ Max
17 x 21
17 x 22
17 x 23
18.50 x 23
18.50 x 22
16.50 x 21
16.50 x 22
16 x 20
16 x 21
15.50 x 18-20
15.50 x 20-22
Expon. (17 x 21)
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Expon. (15.50 x 18-20)