Warranty

The Company warrants each new Hamilton product to be free from defects in materials and workmanship under normal use and service, its obligations under this Warranty being limited to make good at its factory or at the factory of any subsidiary or branch of the Company the product or any part or parts thereof which shall be returned to it with transportation charges pre-paid and which its examination shall disclose to its satisfaction to have been defective provided that the product or such part or parts thereof shall be so returned to it not later than 12 months from the date of the original purchase from the Company or its authorised agents. No allowance shall be granted for any repairs or alterations made by the purchaser or his or its agent without the written consent of the Company. This Warranty is expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, including any liability under the Sale of Goods Act, 1908, and no other person or agent or dealer is authorised to give any other condition or warranty or to assume for the Company any other liability in connection with the sale of its products whether new or second-hand. Any obligation on the part of the Company under this Warranty does not apply to any Hamilton product which may have been repaired or altered in any way outside the factory of the Company or to damages caused in the opinion of the Company by overloading, misuse, mis-application, improper storage, abnormal wear and tear due to exposure to the elements, negligence, accident, or whilst being operated in any way other than in accordance with the operating and maintenance instructions of the Company nor does it apply to repairs made necessary by the use of parts or accessories not recommended by the Company. There is no liability on the part of the Company with respect to any items incorporated in any Hamilton product when such items have been manufactured by others and are warranted by their respective manufacturers in favour of the purchaser or when they are supplied by the Company on special order. The Company shall not be liable for any consequential loss or damage resulting directly or indirectly from any defect in the product the subject of this agreement. No liability on the part of the Company with respect to this Warranty shall extend to second-hand and reconditioned goods and the Warranty does not cover the cost of labour involved in the replacement of defective parts. No liability on the part of the Company with respect to this Warranty shall exist unless the registration card supplied by the Company is completed in every detail and returned to the Company.

C.W.F. HAMILTON & CO. LTD.

N.B. For Warranty conditions to apply, negative earth bonding instructions must be followed.

THIS PORTION MUST BE COMPLETED IN EVERY DETAIL AND RETURNED IMMEDIATELY TO:

C.W.F. Hamilton & Co. Ltd.
P.O. Box 709
Christchurch, New Zealand

Purchaser .....

Address .....

Model ..... Serial No. .....

Signed ..... Date .....

Dealer .....

Delivery Date .....

Dealer's Signature .....

Hamilton Jet

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GENERAL DESCRIPTION

The 1031 Hamilton Jet is a single stage high volume design, expressly intended for the efficient propulsion of high performance cruisers and small launches, using either modern high speed diesel or large gasoline marine engines.

A conventional inboard mountin g is used, with a simple rectangular intake hole in the hull bottom and a flexible seal at the transom. The intake is a specially developed extra short design, to enable very compact engine installation close to the stern.

All controls are inboard of the transom; an inspection hatch gives access to the interior of the intake, the impeller and the screen.

Construction is from LM6 corrosion-resisting, light alloy casings with type 316 stainless steel shaft and impeller. Jet parts are insulated against electrolytic corrosion. All nuts, bolts and other small fittings are in 316 stainless steel.

A built-in intake screen is standard equipment. The unit uses a Duplex high capacity thrust bearing, carbon face type gland, and water-lubricated cutless rubber rear bearing. Impeller and stator vanes are full axial flow design for maximum thrust and load-carrying with 4, 5 or 6 bladed impellers available for different horsepowers and revolutions.

The steering control is a single deflector design giving a full 25^{o} of deflection in either direction. The inboard lever can be simply connected to any Teleflex Morse type cable or to any pulley system. Steering loads have been balanced so the steering is finger-light at all speeds.

The reverse deflector is fully balanced and is operated by a simple Teleflex Morse cable and control unit. It retains the unique Hamilton Jet feature of full steering in any position, including "neutral".

The whole unit is designed for efficiency, compactness, lightness with ease of fitting and maintenance.

Hamilton Jet MODEL 13N

SPECIFICATION

TECHNICAL INFORMATION

B1 – 7 – 83

SCOPE OF USE

PLANING HULLS

Single Jet Unit : Approximately 6-9m boat length.
Minimum deadrise angle 8°.
Maximum loaded weight 4 tonnes.

Twin Jet Units : Approximately 7.5-11m boat length.
Minimum deadrise angle 8°.
Maximum loaded weight 8 tonnes.

For planing speeds over 20 knots ensure power/weight ratio in excess of 60 hp/tonne . For best handling use constant deadrise hull shapes.

Maximum planing boat ratings : 250 hp (186 kW) intermittent 150 hp (112 kW) continuous.

SLOW SPEED (DISPLACEMENT) HULLS

Single Jet Unit : Approximately 6-12m boat length.
Maximum loaded weight 8 tonnes.

Twin Jet Units : Approximately 7.5m-15m boat length.
Maximum loaded weight 15 tonnes.

Recommended length/beam ratios 4:1 to 7:1. Maximum slow speed rating 150 hp (112 kW) continuous.

EQUIPMENT & DIMENSIONS

Impeller Diameter	:	270mm (10½")		
Stages	:	1		
Impeller Options	:	160	205 or 250	330 or 440
Nozzle Diameter	:	155mm	160mm	170mm
Mounting	:	Standard inboard; 12° transom required; remote or close coupled engine.		
Screen Cleaning	:	Via inspection hatch		
Reverse Control	:	Hand lever and transom mount included. Fits to a Morse-Teleflex Push-Pull cable (available as optional extra).		
Steering Control	:	Hamilton pulley and wire system or Morse-Teleflex cable system (optional extra).		
Intake Screen	:	Aluminium fixed bar standard. Steel bar for shallow river use (optional extra).		
Unit Weight	:	Approximately 115 kg (250 lbs)		
Rotation	:	Left hand (anti-clockwise looking forward from stern).		
Coupling	:	Hardy Spicer 1500 flange, standard.		

MOMENTS OF INERTIA DATA

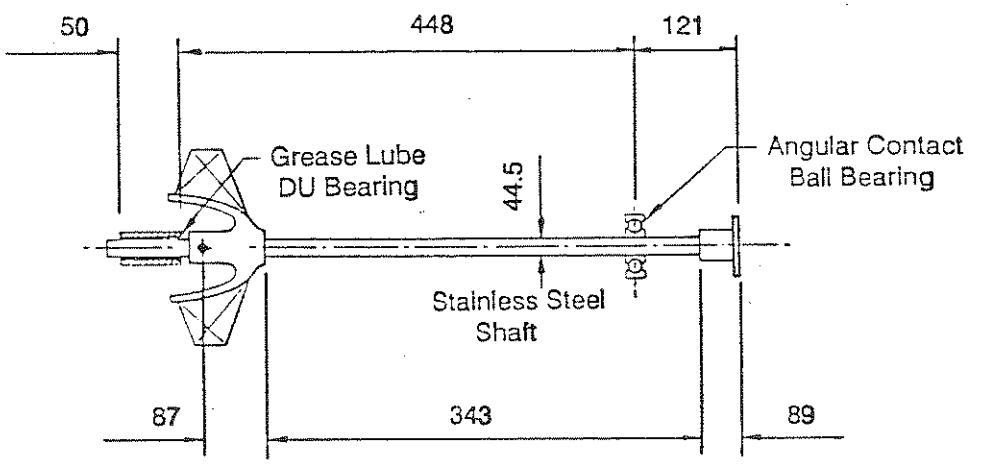
Impeller Type	Distance From Coupling Face (mm)	Mass (kg)	Moment of Inertia kgm²
160	520	6.4	.0383
205	519	7.2	.0405
250	516	7.1	.0437
330	518	8.2	.0498
440	513.5	8.3	.0485
Coupling Flange	280.	5.35	.0300
Mainshaft	339.	6.75	.0015

Mainshaft Diameter 44.5mm

MOMENTS OF INERTIA DATA :

A torsional vibration analysis should be undertaken for the complete engine, driveshaft and jet rotating assembly. The engine is the most complex and therefore the analysis is normally done by the engine supplier.

Details of the jet required for torsional vibration analysis are listed below :-



IMPELLER

M = 7.2kg Ip = 0.0405 kgm^2

SHAFT

M = 6.75kg Ip = 0.0015 kgm^2

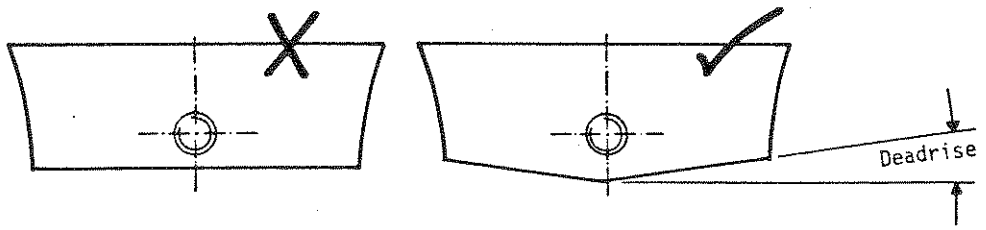
SPICER 1410 COUPLING
102757

M = 2.15kg Ip = 0.0029 kgm^2

1. HIGH SPEED (PLANING) CRAFT

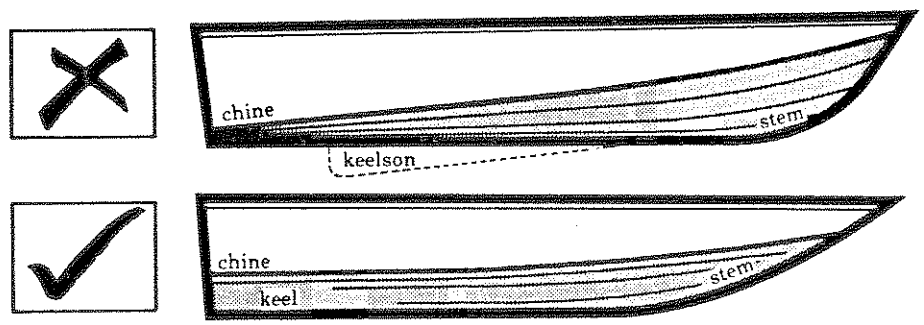
(a) HULL SHAPES

Some DEADRISE angle in planing hulls is desirable. 8^{o} minimum is recommended.



This will ensure that aerated water from the bow wave will not enter the jet unit causing slip and loss of power.

Monohedron lines are recommended i.e. chine and keel parallel, at least over the planing area.



Monohedron - constant deadrise or vee angle.

The STEM should be easy rising as a deep, fine forefoot can cause steering problems if the hull has any tendency to ride flat.

There must be NO KEEL, RUDDER, PLANING STRAKES OR ANY OTHER UNDERWATER APPENDAGES FOR AT LEAST 2m (7 ft) IN FRONT OF THE JET INTAKE. Such protrusions from the hull can interrupt water flow and divide water away from the intake. Strakes and/or keels outside the intake area are acceptable.

To ensure that the static draught is sufficient to PRIME THE JET UNIT, water must reach at least to the level of the main shaft when the boat is at rest.

(b) WEIGHT

Boat weight, when loaded is the most critical factor. Each effort to reduce loaded weight below the recommended limits will result in a more efficient boat.

$$\text{POWER TO WEIGHT RATIO} = \frac{\text{Total Power (hp)}}{\text{Loaded Boat Weight (tonnes)}}$$

FOR A SUCCESSFUL BOAT USE A POWER TO WEIGHT RATIO GREATER THAN 60 h.p. (45 kW) PER TONNE.

SINGLE JET UNITS are suitable for MAXIMUM LADEN WEIGHT up to approximately 4 TONNES.

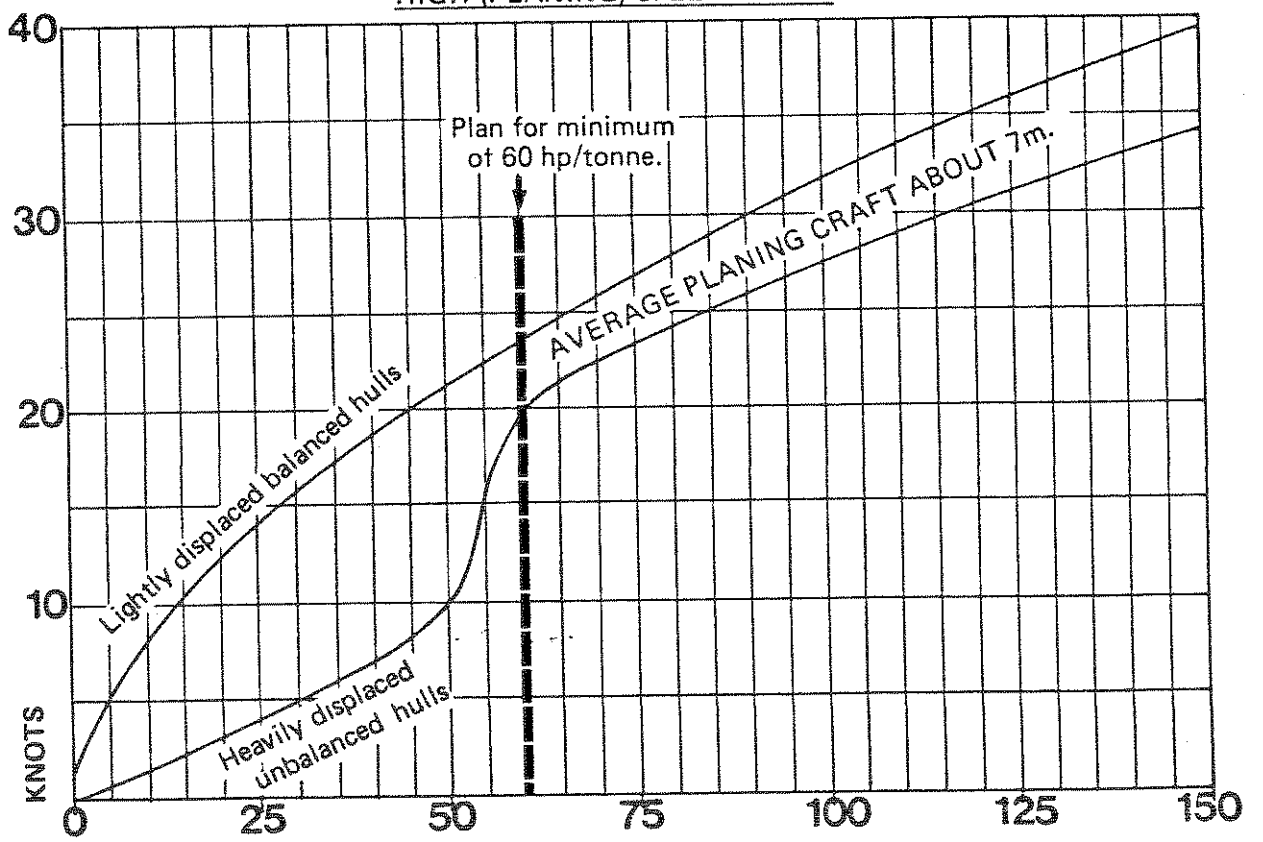
TWIN JET UNITS are suitable for MAXIMUM LADEN WEIGHT up to approximately 8 TONNES.

HIGH SPEED (PLANING) CRAFT (cont)

(d) SPEED PREDICTION WHERE THE HULL RESISTANCE IS NOT KNOWN.

1. Nominate speed required.
2. From the graph locate the necessary power/weight ratio to achieve this speed; assume average performance.
3. Estimate AUW (All-Up-Weight) = fully laden weight.
4. Multiply AUW x power/weight ratio = required h.p.
5. If this required h.p. exceeds the capability of the 1031 jet unit, (250 h.p. intermittent, 150 h.p. continuous) then select one or more units as appropriate to obtain the required h.p.
6. Select engine of required power.
7. Knowing engine/s and jet/s recalculate AUW and check again that this is within the capability of the jet/s.

APPROXIMATE SPEED GUIDE FOR AVERAGE WELL DESIGNED HIGH (PLANING) SPEED HULLS



EXAMPLE

1 and 2 — 25 knots ---------- 75 h.p./tonne

3 and 4 — estimate AUW 6 tonnes x PWR (75) = 450 h.p.

5 — $\frac{450 \text{ h.p.}}{250}$ = 1.8 jet units

6 — Therefore, use two jet units - requires $\frac{450 \text{ h.p.}}{2 \text{ jet units}}$ = 225 h.p./jet

Conclusion : O.K. for intermittent use. Throttle back for continuous cruise to 150 h.p. per engine.

HIGH SPEED (PLANING) CRAFT (Cont)

(c) SPEED PREDICTION WHERE THE HULL RESISTANCE IS KNOWN.

1. The speed required and the total hull resistance at that speed should be known. Using the graph, locate the intersection of T (Thrust) and Knots (Speed), this establishes the approximate engine horsepower required. It may become immediately obvious that multiple jet units are necessary, if the plot lies outside the dotted area. If twin jet units are necessary, divide the hull resistance by 2 for the thrust required. Similarly for three jet units divide the hull resistance by 3.

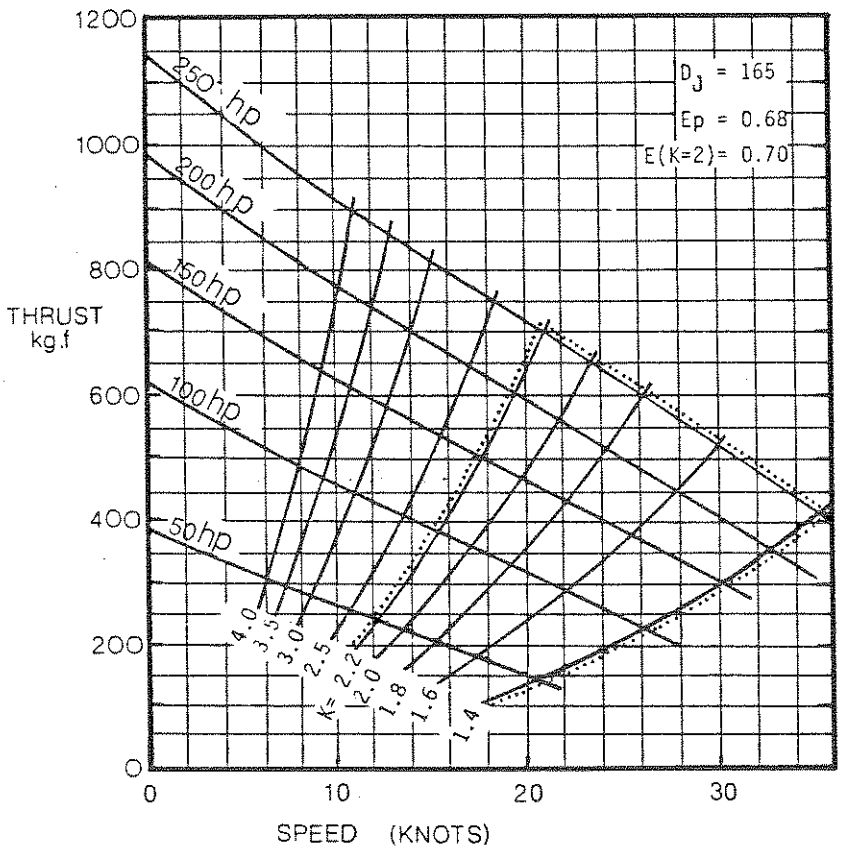
2. Reasonable propulsion efficiency occurs in the K range 1.4 to 2.2 (dotted on the graph). Outside this, efficiency may only be acceptable if other considerations, such as shallow draught or manoeuvrability are paramount.

3. Select a suitable engine of the required horsepower which matches the 1031 jet. (Refer "Matching engine and jet unit", (Pages E5-8-82, E6-8-82)

4. Recheck boat weight and hull resistance with selected engine/s.

5. Using graph replot hull resistance and compare with thrust from selected engine horsepower to check predicted speed.

DYNAMIC THRUST



2. SLOW (DISPLACEMENT) SPEED CRAFT

(a) HULL SHAPES

Use hulls with easily driven, fine lines. The preferred length/beam ratio is 5:1 or more.

Most conventional hulls suit Hamilton Jet propulsion however, the unit must be mounted so that it will prime i.e. water must reach at least to the level of the main shaft when the boat is at rest.

There must be NO KEEL, RUDDER, STRAKES OR ANY OTHER UNDERWATER APPENDAGES FOR AT LEAST 2m (7 ft) IN FRONT OF THE JET INTAKE. Keeling well forward of the intake (at least 2m) and/or twin keels abeam of the intake are acceptable.

Flat bottom hulls can be driven by jets but only at slow (displacement) speeds. However some deadrise is always preferable. Twin keels abeam of the intake are advisable.

(b) WEIGHT

Weight is not so critical for slow speed hulls where speed depends mostly on efficient hull shapes.

Power to weight ratios should be in the range 7-22 kW (10-30 h.p.) per tonne to ensure good manoeuvrability and reasonable efficiency.

SINGLE JET UNITS are suitable for SLOW SPEED HULLS up to approximately 8 TONNES LOADED WEIGHT.

TWIN JET UNITS are suitable for SLOW SPEED HULLS up to approximately 16 TONNES LOADED WEIGHT.

NOTE : For long, narrow slow speed boats and barges which are easily propelled the above weights may be at least doubled.

(c) SPEED PREDICTION WHERE HULL RESISTANCE IS KNOWN

Follow the instructions for high speed (planing) craft on page E3-8-82

(d) SPEED PREDICTION WHERE HULL RESISTANCE IS NOT KNOWN

For Craft up to 9m in length :-

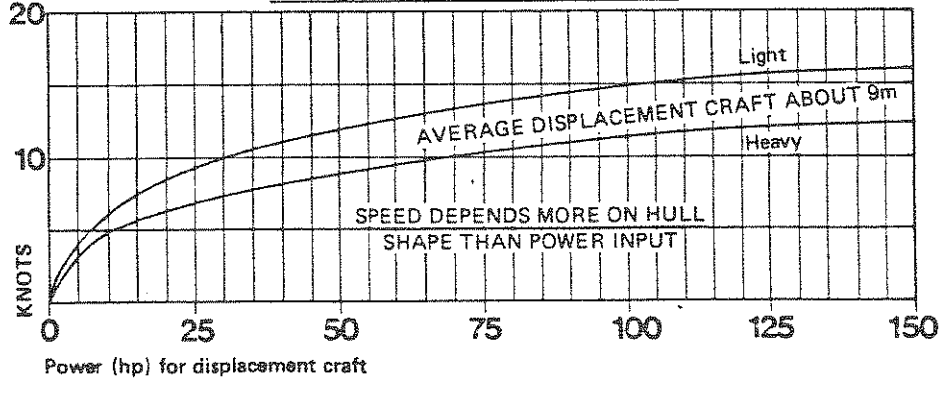
1. Nominate speed required. Note that achievable speed will depend more on suitable hull shape than on power input.
2. Using the graph select the necessary power to achieve the required speed.

For Craft over 9m in length :-

Twin jet units, triple or more jet units can be used. To determine the number of jet units required use the guidelines of 8 tonnes AUW per jet for this slow speed type of craft or for long narrow hulls and barges up to 16 tonnes AUW per jet unit.

150 H.P. PER JET UNIT IS THE MAXIMUM AND THE CONTINUOUS RATING OF THE 1031 JET UNIT FOR SLOW SPEED HULLS.

APPROXIMATE SPEED GUIDE FOR AVERAGE WELL DESIGNED SLOW (DISPLACEMENT) SPEED HULLS



MATCHING ENGINE AND JET UNIT

The 1031 Jet Unit is designed to match a selection of modern high speed diesel engines and can also be used in light duty applications with large gasoline engines 5.7 to 8 litres (350-460 CID) capacity. Maximum allowable revolutions are 3750 r.p.m.

For good performance, the weight of the engine should not be greater than 3.6 kg per h.p. (8 lbs per h.p. or 2.7 kg per kW).

For direct drive use a standard inboard marine engine but less transmission gearbox. Gearboxes are not normally necessary, however, a reduction gearbox can be used to obtain correct engine matching to jet unit. Step-up gearboxes are not recommended. There are advantages in using a reduction (or 1:1) gearbox i.e. to run the engine without running the jet unit or to reverse the rotation of the jet unit for clearing debris from the intake screen.

A suitable universal driveshaft or flexible coupling is required between the engine flywheel and the jet unit, or between gearbox flange and jet unit (refer Engine Installtion Page H2-8-82). The drive to the jet unit must be left hand rotation (anti-clockwise when looking forward from the stern).

A table of suitable diesel engines and impeller matching follows. If the chosen engine is not represented use the following guidelines to choose the impeller required.

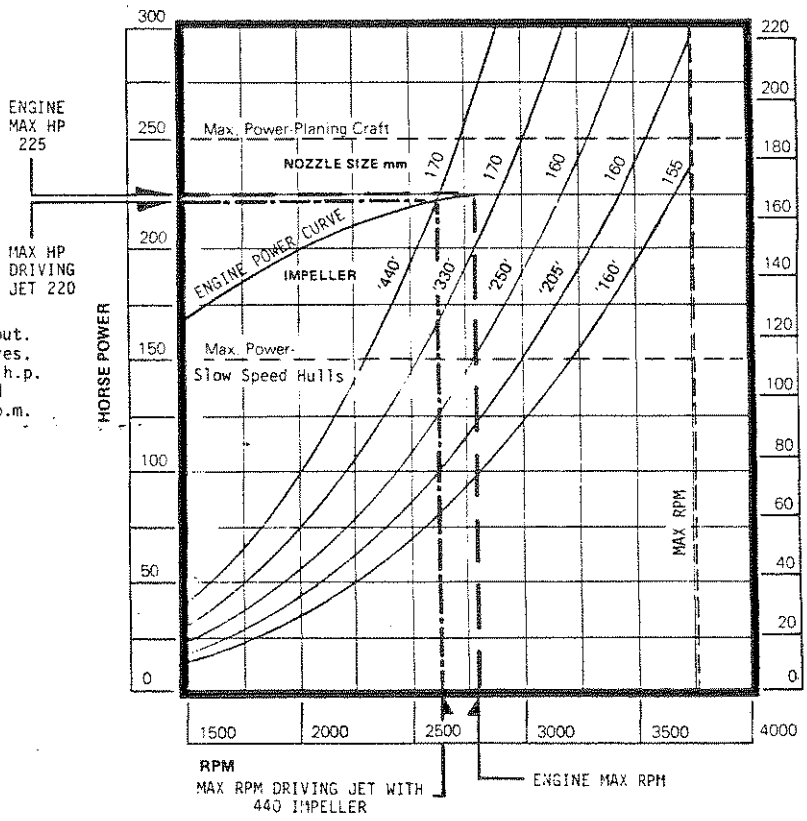
1. Determine the engine net h.p. curve against revolutions (b.h.p. or S.A.E. rated h.p. may be up to 20% higher than actually obtainable). Use flywheel h.p. for direct drive and shaft h.p. if using a gearbox. Plot on h.p./r.p.m. curve, below.

2. Knowing the maximum net h.p. choose the impeller which allows the engine to develop maximum r.p.m.

EXAMPLE -

To proceed, superimpose the engine power curve on the jet unit power requirement curve. The point at which the curves intersect gives the maximum R.P.M. obtainable from the engine when coupled to the jet unit. WHERE AN EXACT MATCH IS NOT POSSIBLE, CHOOSE THE NEXT COARSER PITCH IMPELLER, THUS OPERATING THE ENGINE SLIGHTLY BELOW ITS GOVERNED REVOLUTIONS.

Example engine 225 h.p/2800 r.p.m. maximum output. This lies between the 440 and 330 impeller curves. Choose coarser pitch 440 impeller. Max engine h.p. driving jet found at intersection of engine and 440 impeller curves. That is 220 h.p./2630 r.p.m.



3. For cruising, reduce revolutions as recommended by the engine manufacturers. Remember, at any reduced r.p.m. the power produced by the engine is only the power required by the jet unit. This is always less than the engine's capability. For most diesel engines, when matched to the 1031 jet at their maximum intermittent rating, a reduction of 200 rpm from full throttle rpm reduces the power output to a satisfactory cruise level.

Hamilton Jet MODEL 1031N

TECHNICAL INFORMATION

DESIGN GUIDE

E6–8–82.

DIESEL ENGINE MATCH

(Common marine engines matched to 1031 Jet Unit for High (Planing) speed applications)

These are direct drive matchings - a gearbox is not necessary. Many other matchings are possible with other engines not listed and also using reduction gearboxes. If in doubt consult C.W.F. Hamilton & Co Ltd.

MAKE	MODEL	LISTED MAX HP/RPM	IMPELLER & NOZZLE	DRIVING JET UNIT MAX HP/RPM	DRIVING JET UNIT CRUISE HP/RPM
BAUDOUIN	DF6SM	190/3000	250-160	190/3000	150/2800
	6F11SM	240/3000	330-170	237/2960	190/2750
	6F11SRM	306/3000	440-170	300/2900	240/2700
CATERPILLAR	3208NA	210/2800	330-170	210/2840	160/2600
(Light Comm.)	3208T	260/2800	440-170	260/2800	215/2600
(Pleasure)	3208T	300/2800	440-170	300/2900	240/2700
CHRYSLER	CM6-55.TI	200/3150	250-160	185/3000	145/2750
CRUSADER	9 Litre				
	Pleasure	190/2800	330-170	187/2730	153/2550
	Commercial	225/3200	250-160	225/3200	188/3000
CUMMINS	V504M	190/3300	205-160	191/3250	158/3050
	V555M	216/3300	250-160	200/3060	163/2860
	VT555M	252/3000	330-170	260/3050	212/2850
DETROIT					
(Bedford UK)	500M(6)	162/2800	250-160	153/2550	128/2400
(GM USA)	500N(V8)	165/3000	205-160	150/3000	125/2800
(GM USA)	500T(V8)	205/3000	250-160	190/3000	150/2800
	4-53T	180/2800	330-170	183/2710	145/2500
	6V-53N	197/2800	330-170	205/2815	160/2600
	6V-53T	260/2800	440-170	260/2800	215/2600
DUETZ	BF6L913	160/2800	250-160	160/2850	130/2650
	F5L 413FR	160/2500	440-170	155/2320	125/2150
	F6L 413FR	192/2500	440-170	192/2500	152/2300
FIAT	8061M	132/3200	160-155	125/3030	105/2850
	8061SM	165/3200	205-160	162/3070	130/2850
	8061SRM	220/3200	250-160	218/3160	178/2950
	8361M	170/2600	330-170	170/2650	135/2450
	8220M	200/2600	440-170	197/2520	150/2300
FORD *150	2704ET	150/2450	440-170	147/2270	128/2185
*180	2704ETI	180/2450	440-170	180/2450	140/2250
	2726T	146.3/2400	440-170	140/2250	105/2050
	2728TIM	194.8/2450	440-170	195/2510	150/2300
* DENOTES MODELS MARINISED BY SABRE, MERMAID, DOLPHIN, LANCING, LEHMAN, TEMPEST, WATERMOTA, LEES & OTHERS					
ISUZU	UM6BD1T	160/2700	330-170	153/2550	128/2400
MERCEDES	OM401	192/2500	440-170	192/2500	150/2300
NISSAN	FD6T	155/3200	205-170	152/3150	130/2950
PERKINS	T6.3544	150/2400	440-170	145/2270	108/2070
	T6.3544	185/2400	440-170	185/2470	142/2250
RENAULT	160DS	133/3000	205-170	133/3000	110/2800
	210DTS	172/2450	440-170	170/2400	132/2200
	240DTS	209/2900	330-170	207/2830	170/2650
STEWART &	DD500MN	165/3000	250-160	162/2870	132/2670
STEVENSON	DD500MT	205/3000	330-170	200/2800	162/2600
	4-53MTI	200/2800	330-170	183/2710	145/2500
	6V-53MN	220/2800	330-170	205/2815	160/2600
	6V-53MTI	300/2800	440-170	260/2800	215/2600
THORNYCROFT	T360	150/2400	440-170	145/2270	108/2070
	T360/1	180/2400	440-170	180/2450	140/2250
VALMET	611CS	154/2400	440-170	151/2300	115/2100
	611CSB	180/2400	440-170	180/2450	140/2250
VOLVO	TAMD40	155/3600	160-155	148/3200	122/3000
	TAMD60B	235/2800	440-170	230/2650	182/2450

DIESEL ENGINE MATCH

(Common marine diesel engines matched to 1031 Jet Unit for Slow (Displacement) speed applications)

These are direct drive matchings - a gearbox is not necessary. Many other matchings are possible with other engines not listed and also using reduction gearboxes. If in doubt consult with C.W.F. Hamilton & Co Ltd.

MAKE		MODEL	LISTED MAX HP/RPM	IMPELLER & NOZZLE	DRIVING JET UNIT MAX HP/RPM	DRIVING JET UNIT CRUISE HP/RPM
BAUDOUIN		DF4M	92/3000	160-170	90/2920	70/2700
		DF6M	138/3000	205-160	135/2900	110/2700
CHRYSLER		CM655NA	130/3150	160-155	120/3000	93/2750
DETROIT	Bedford	220M	65/2600	160-170	62.5/2600	50/2400
		330M	98/2600	205-160	93/2550	78/2400
		3-53N	98/2800	160-155	95/2770	75/2570
		4-53N	128/2800	250-160	130/2650	102/2450
DEUTZ		F4L912D	84/2800	160-170	84/2800	64/2600
		F5L912D	105/2800	160-155	105/2800	80/2600
		F6L912D	126/2800	205-160	126/2800	100/2600
FIAT		8035M	50/2600	160-170	47/2350	37/2170
		8061M	132/3200	160-155	125/3030	105/2850
FORD		2711E	71/2500	160-155	71/2520	62/2400
	*	2712E	80/2500	205-160	78/2420	68/2300
		2713E	100/2500	250-160	96/2400	85/2300
		2714E	108.5/2500	250-160	108/2500	92/2400
	*	2715E	120/2500	330-170	115/2320	100/2200
	*	2704ET	150/2450	440-180	147/2270	128/2185
		2722	75/2500	205-170	75/2500	58/2300
		2723	103.3/2500	250-160	100/2450	80/2250
		2725	114.7/2500	250-160	115/2550	90/2350
		2726T	146.3/2400	440-170	140/2250	105/2050
* DENOTES MODELS MARINISED BY SABRE, MERMAID, DOLPHIN, LANCING, LEHMAN, TEMPEST, WATERMOTA, LEES & OTHERS						
ISUZU		UM4BB1	80/2850	160-170	80/2850	65/2650
		UMD500	102/2700	205-160	98/2600	80/2400
		UM6BD1	130/2700	250-160	126/2630	108/2500
LISTER		HRW3MGR	44/2200	160-160	40/2100	30/1900
		HR 4MGR	59/2200	205-160	59/2200	43/2000
		HR 6MGR	88/2200	330-170	85/2100	65/1900
		HRW6MGR	100/2200	330-170	100/2200	75/2000
MERCEDES		OM314	80/2600	160-155	80/2620	58/2350
		OM352	125/2800	205-160	125/2820	94/2550
MITSUBISHI		6DS10M	72/2400	205-170	72/2400	54/2200
NISSAN		FD6	128/3200	160-160	122/3000	100/2800
		FD6T	155/3200	205-170	152/3150	130/2950
PERKINS		D3.152	44/2000	205-160	44/2000	32/1800
		4.236M	84/2800	160-170	84/2800	67/2600
		6.3544M	120/2800	205-160	117/2750	94/2550
		T6.3544M	150/2400	440-170	145/2270	108/2070
RENAULT		160DS	133/3000	205-170	133/3000	110/2800
STEWART & STEVENSON		3-53MN	115/2800	205-160	107/2670	90/2500
		4-53MN	155/2800	250-160	143/2740	122/2600
THORNYCROFT		250	80/2400	205-160	80/2400	60/2200
		345	113/2400	330-170	107/2260	90/2150
		380	120/2400	330-170	115/2320	88/2120
		402	130/2400	330-170	130/2420	100/2200
		T360	150/2400	440-170	145/2270	108/2070
VALMET (DIN B RATINGS)		311C	54/2400	160-170	54/2400	40/2200
		311CS	75/2400	205-160	73/2350	55/2150
		411C	73/2400	205-160	71/2330	55/2150
		411CS	101/2400	330-170	93/2150	70/1950
		611C	108/2400	330-170	100/2200	75/2000
VOLVO (LIGHT COMMERCIAL RATING)		TAMD40A	120/3000	160-155	120/3000	100/2800
YANMAR		4DH	74/2900	160-170	70/2670	36/2150
		6DH	112/2900	160-155	109/2900	53/2300
		6.354M	108/2800	205-160	114/2700	98/2600
		T6.354M	135/2400	440-170	130/2200	115/2100

GASOLINE ENGINES

(A) DIRECT DRIVE

Engine Size (Approx)	Impeller/ Nozzle	Approx Maximum HP/RPM	Approx Cruise HP/RPM
5.7 Litre (350 cu.in)	160-155	200/3600	130/3100
7.5 Litre (450 cu.in)	205-160	300/3750	175/3150

(B) WITH REDUCTION GEARBOX 1.5:1

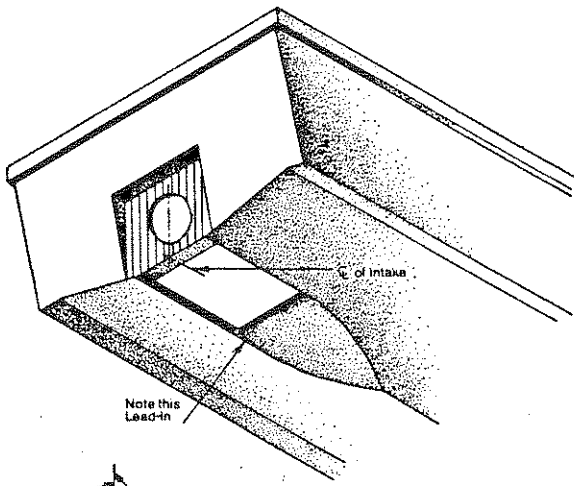
5.0 Litre (300 cu.in)	330-170	190/4125	115/3400

For Mercruiser, OMC, Chrysler, Volvo etc V8 marine gasoline engines find engine cubic capacity and match according to table above.

1. CONSTRUCTING A NEW HULL OF FIBREGLASS OR WOOD

Ideally the transom angle should be 12°. Where the transom angle is not 12° a small modified transom should be prepared, large enough to accept the jet unit transom seal plate. (Fig 1.) The sketch shows a transom angle greater than 12°.

FIG 1.



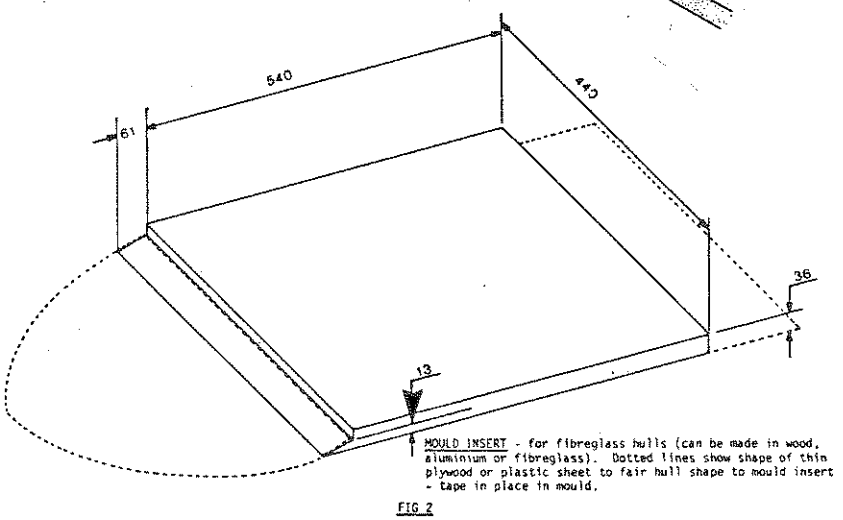


FIG 2

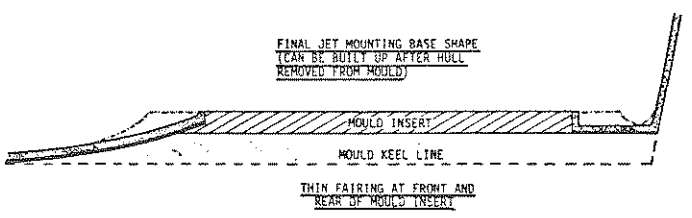


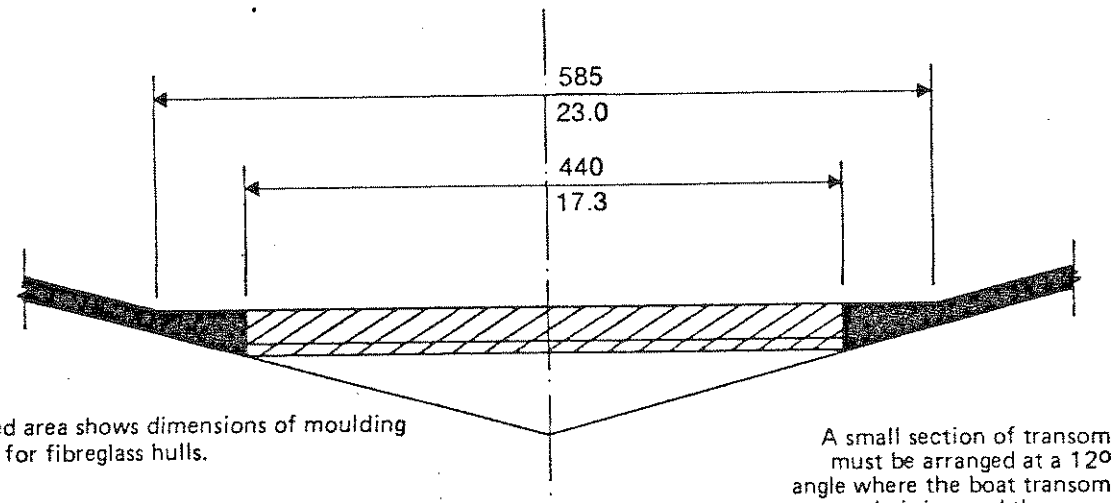
FIG 3

For a moulded fibreglass hull it is desirable to mould the intake block with the hull in the mould. Prepare an intake moulding block as shown (Fig 2), mould only the hull thickness initially, finishing the intake block can be done after the hull is removed from the mould. (Fig 3).

Prepare the intake block as shown on Page F2. Ensure that the top surface is flat and smooth over the area which receives the jet unit intake seal. The intake block thickness of 36mm is important to ensure that the screen is flush with the bottom of the boat. The "lead in" should be faired to the 13mm dimension to match the leading edge of the screen.

When the intake block is completed, draw on the outside of the transom the horizontal and vertical lines through the jet centre. Ensure that the vertical line matches the centre of the rectangular intake hole. Place the transom plate against the transom, lining up the cast centre lines on the plate with the lines drawn on the transom. Use the inside surface of the plate as a template and scribe the oval cut out line on the transom. Cut out the transom on this oval line. (Fig 1).

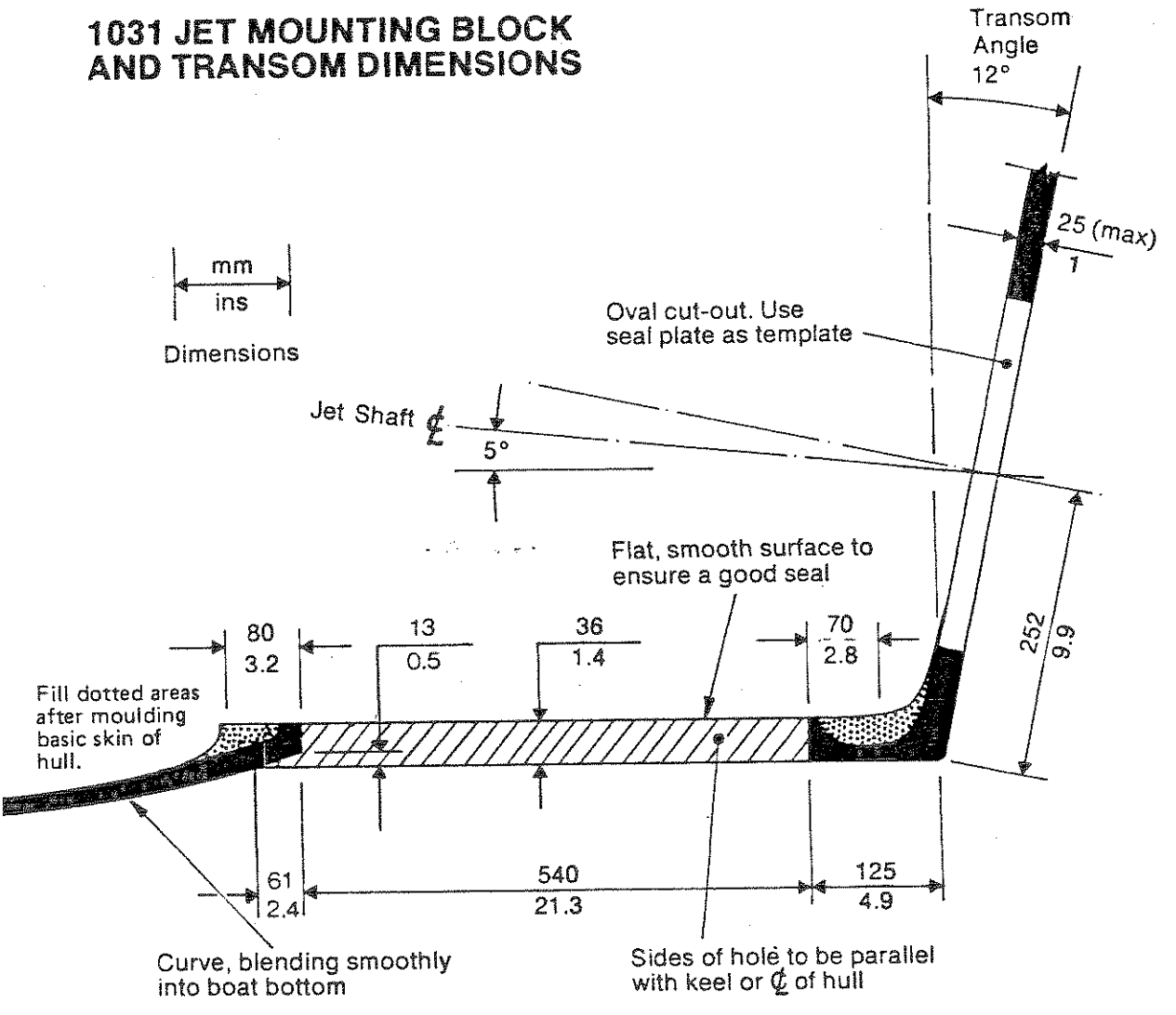
INSTALLATION



Shaded area shows dimensions of moulding block for fibreglass hulls.

A small section of transom must be arranged at a 12° angle where the boat transom angle is beyond the range (see Fig 1 Page F1).

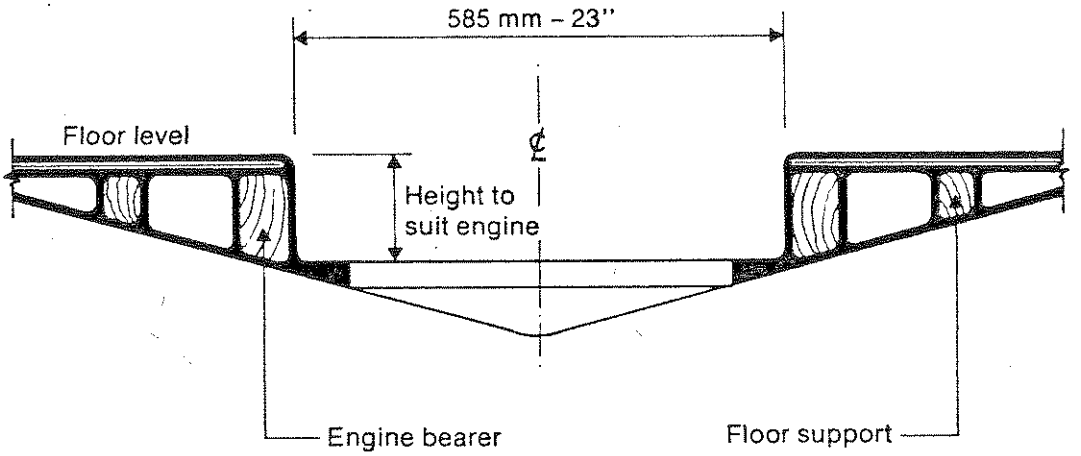
1031 JET MOUNTING BLOCK AND TRANSOM DIMENSIONS



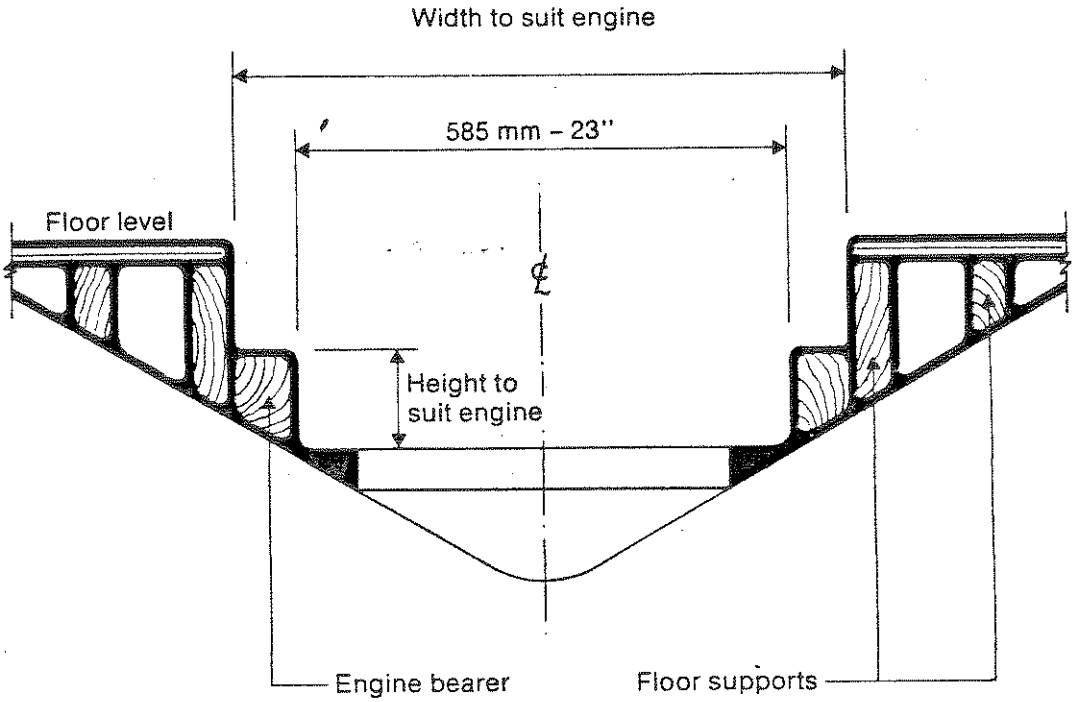
ENGINE COMPARTMENT

Leave an area clear of frames and floorboards down the centre of the boat for the engine and jet unit. The length of the recess will depend on the engine and coupling system used. With a deep vee hull, part of the engine may be below floor level, so make sure that there is adequate clearance around the engine for easy access.

SHALLOW VEE HULLS

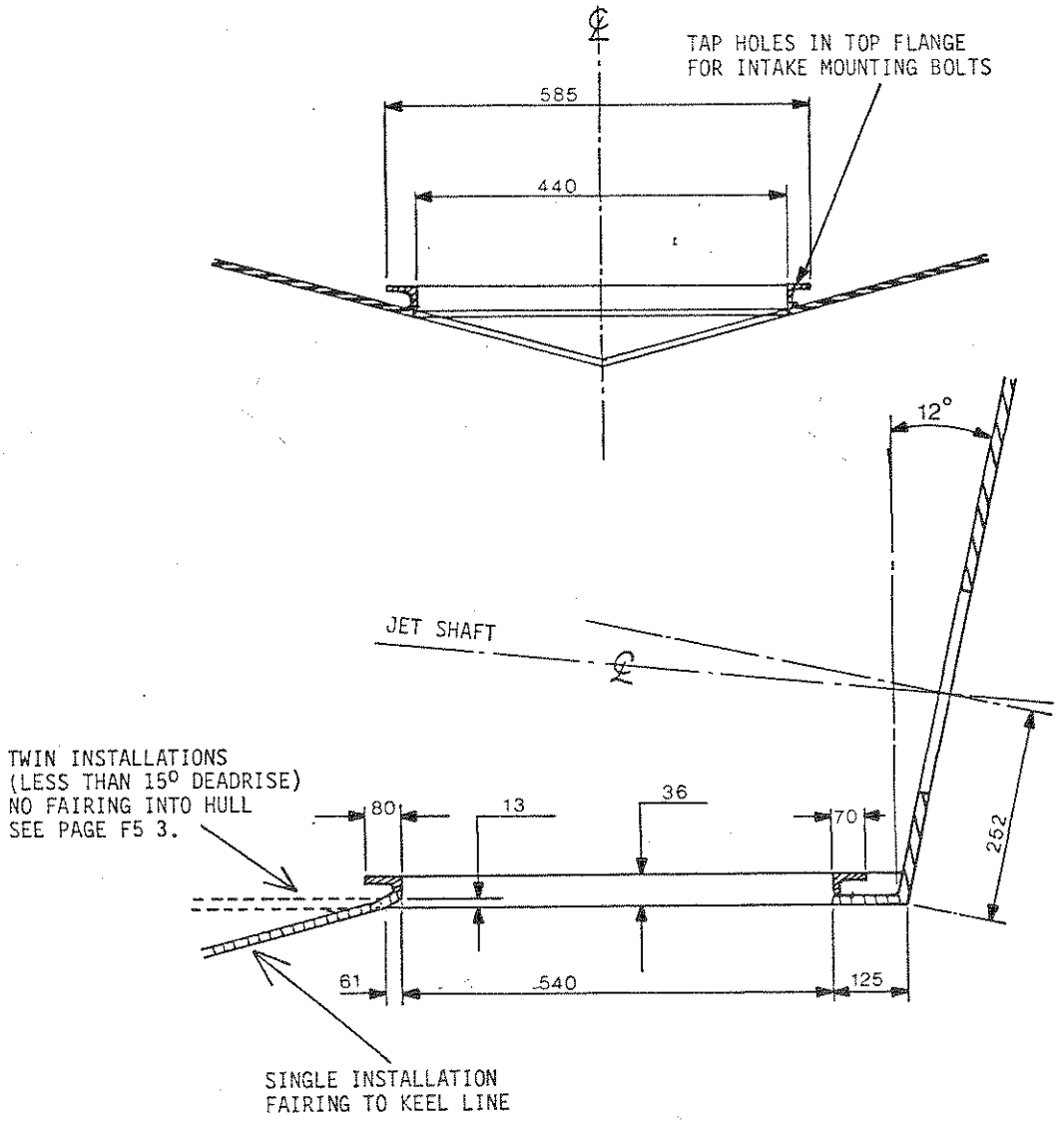


DEEP VEE HULLS



2. CONSTRUCTING A NEW HULL OF METAL

The jet mounting block for metal hulls need not be the solid 36mm (1½") thickness shown on Page F2, but may be made of angle section as shown in sketches below. For single jet installation fabricate mounting block by method shown but to dimensions on Page F2. (The jet mounting block for a single jet will of course be on the boat centre-line). For multiple jet installations refer also to Page F5.



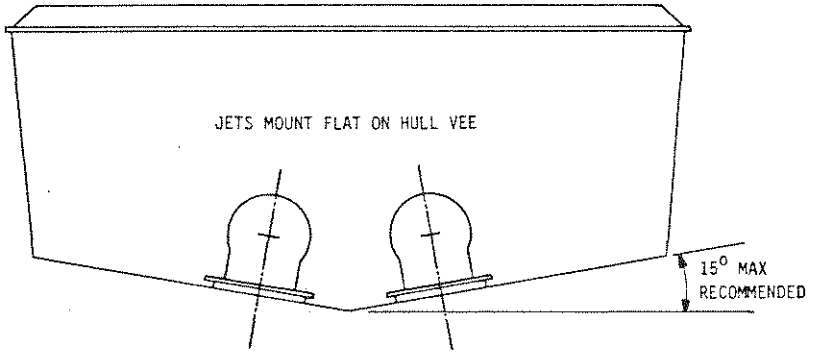
3.

MULTIPLE JET INSTALLATIONS

Keep the jet unit and engine centres as close together as possible to minimise the chance of air from the bow wave entering the jet and causing it to slip. (Refer also to Design Guide section Page E9).

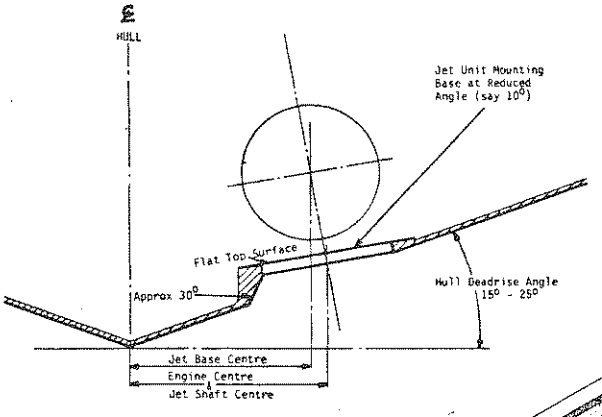
FOR HULL DEADRISE ANGLES UP TO 15° - the jet unit mounting bases are made flush with the vee of the hull. No fairing forward of the jet unit mounting base is required when this is done.

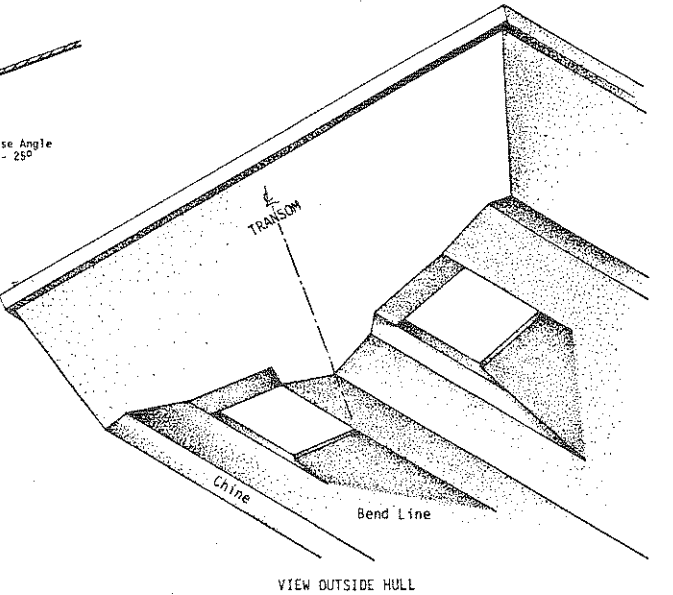
FOR DEADRISE ANGLES UP TO 15°



FOR HULL DEADRISE ANGLES OVER 15° - it is recommended the jet unit mounting bases are inclined to the vee of the hull to bring them nearer to horizontal across the boat. This improves the steering efficiency of the twin jet installation.

FOR DEADRISE ANGLES OVER 15°





VIEW OUTSIDE HULL

FOR WOOD AND FIBREGLASS HULLS - make the jet unit mounting bases solid as page F2.

FOR METAL HULLS - the jet unit mounting bases can be made of angle section and not solid as Page F4.

FOR TRIPLE JET UNIT INSTALLATIONS - follow the notes above covering outer two jet units and treat the centre jet unit as a single installation on the keel line.

4. PREPARING AN EXISTING HULL

Remove any existing propulsion equipment and engine(s). Remove any floor and possibly the fuel tank from the centre keel area to clear the new engine position.

The boat must have engine bearers strong enough to carry the weight of the petrol or diesel engine(s) (Page F3). If bearers are not already fitted, remove the floor to allow room for the bearers to be fitted.

FOR A SINGLE JET INSTALLATION :

Mark the hull to cut out the keel area for the jet unit mounting base as shown in the diagrams below. Remove any keelson or planing strakes for 2 metres in front of the cut-out. If transom angle not 12^{o} - remake small 12^{o} transom area as instructed on Page F1.

Build up to shape shown on Page F2. The hull must be built up to at least existing strength and thickness. Grind even. Fill any hole in transom left by old machinery and recut transom hole for 1031 jet unit as instructed on Page F1.

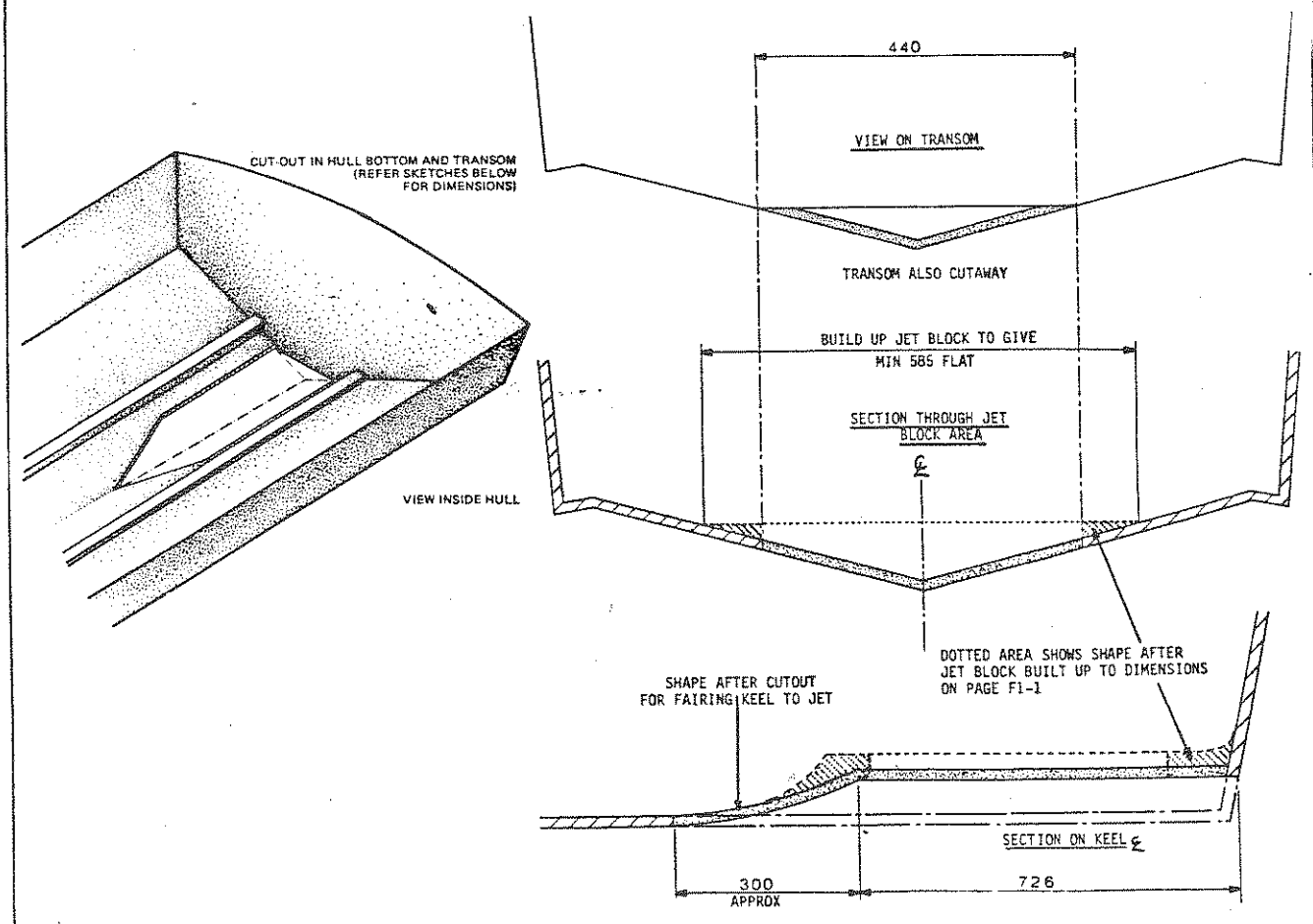
Fix in heavy engine bearers and make a transverse bulkhead in front of the new engine position. The bearers should continue beyond the bulkhead to as far forward as possible.

Refit floors outside engine bearers as appropriate. Apply finish coating to all new surfaces both inside and outside hull as appropriate.

Drill new holes as necessary for new mounting of 1031 jet unit and engine.

FOR A METAL HULL : Follow the method above but the jet unit mounting base may be made of angle section as Page F4.

FOR A MULTIPLE INSTALLATION : Follow the same method above but refer also to Page F5.



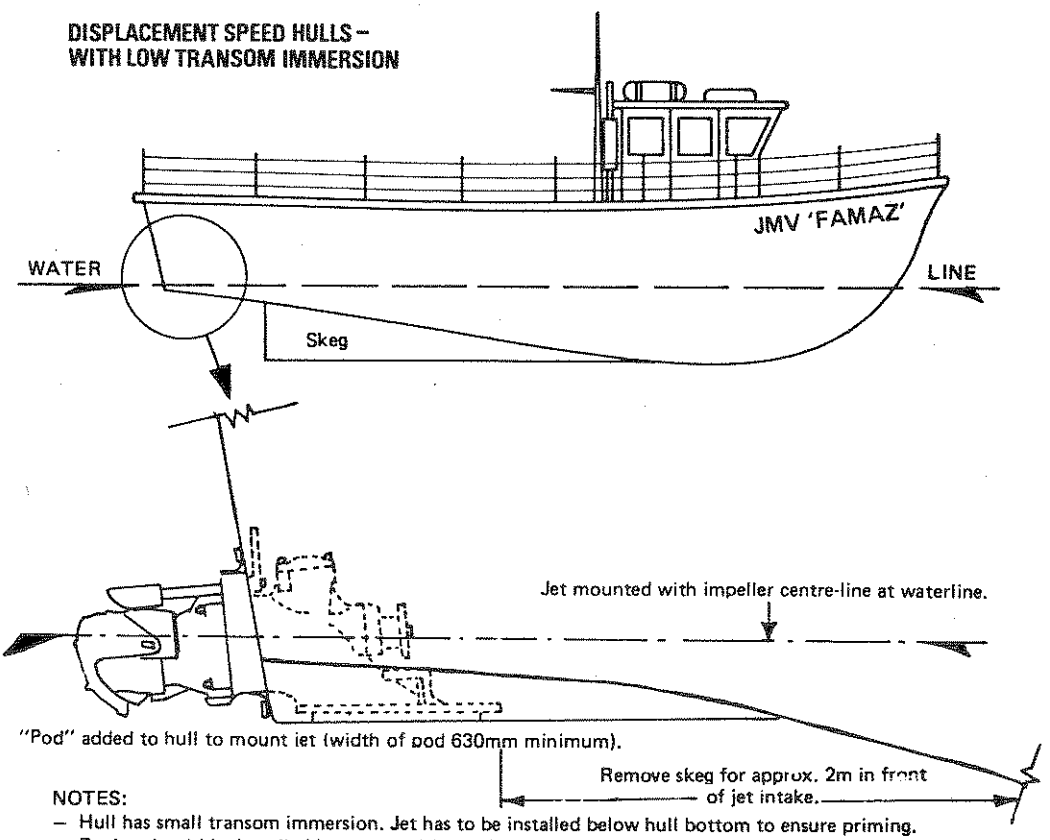
5.

SLOW SPEED (DISPLACEMENT) CRAFT

The jet unit is installed generally as in the previous pages.

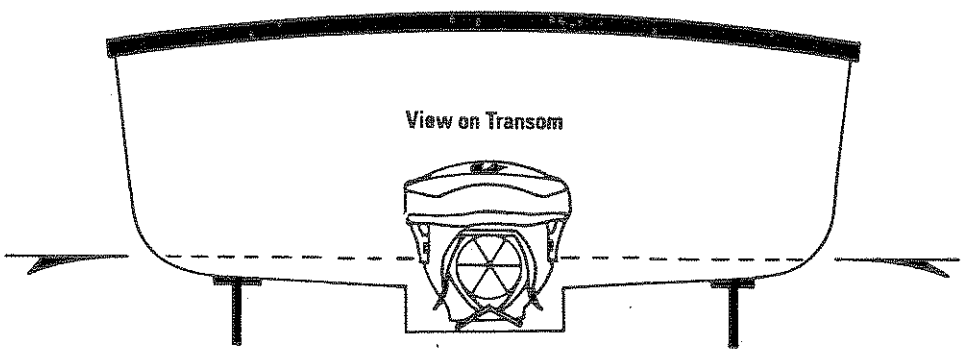
For hulls with low transom immersion hull modification may be necessary so that the jet can be immersed sufficiently to prime. Refer sketches below.

DISPLACEMENT SPEED HULLS – WITH LOW TRANSOM IMMERSION



NOTES:

- Hull has small transom immersion. Jet has to be installed below hull bottom to ensure priming.
- Engine should be installed in same position as it would be for a propeller installation or slightly aft of that position, which will improve priming of the jet.
- If more keeling is desired twin keels abeam of the intake is acceptable. (See sketch below).



TWIN ABEAM KEELS (Optional)

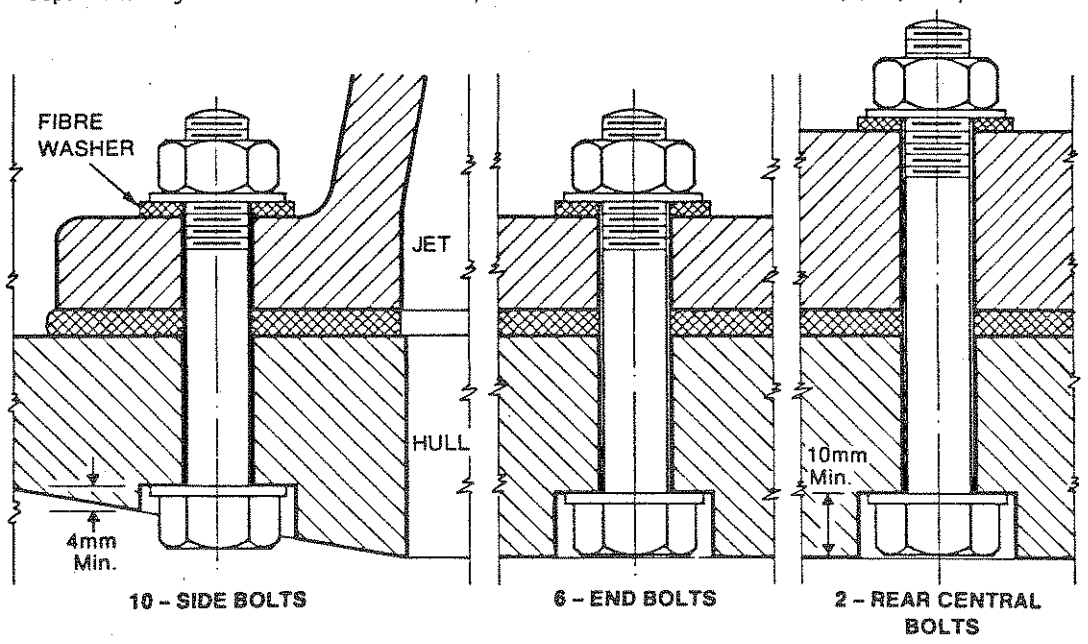
JET MOUNTING BASE

After preparing the intake mounting block and transom hole in the hull (Page F1), prepare the jet unit for installation by removing the reverse bucket. Then fit the jet unit complete with the intake screen but without the base gasket, in position in the hull. Fit the jet unit from inside the hull passing the tailpipe section out through the transom hole. Ensure that the screen is central in the rectangular hole in the intake block, and that the jet looks to be in the correct position in relation to the transom. (See Page C1).

FOR FIBREGLASS OR WOODEN HULLS

Using the jet flange as a template, drill fourteen 10.5mm (13/32") dia holes through the intake block.

There are four holes at the rear of the unit that are masked by the jet unit. Scribe through these holes to mark the block (two of these holes can be reached through the inspection cover). Remove the jet unit. Drill the four 10.5mm dia holes through the marks ensuring that the drill is held at 90° to the top face of the block. From underneath the boat spot face the 10 side holes 25mm (1") dia and a minimum of 4mm (3/16") deep. The eight end holes should be spotfaced to a minimum of 10mm (3/8") deep.



FOR METAL HULLS

Follow the same initial steps above but if using an angle section jet unit base as shown on Page F4 the holes in the top flange can be drilled 10.5mm to bolt the jet unit down or they can be drilled to tapping size to tap 10mm thread so the mounting bolts can then thread into the flange. Method of bolting jet unit down as shown.

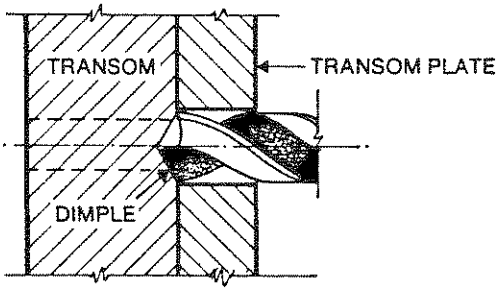
CAUTION - For steel hulls THE JET UNIT MUST BE TOTALLY INSULATED FROM THE HULL by insulating bushes and washers fitted to the intake base mounting bolts.

BOLTING DOWN

Liberally apply Adoseal, Sealastic, or similar good sealant to the top of the intake block, both sides of the gasket, the underside of the jet flange and the bolt heads. Place the gasket and jet unit in place and bolt down as shown in the sketches. Work continually round the 18 nuts until all are torqued down to 15 lb ft. Remove excess sealant.

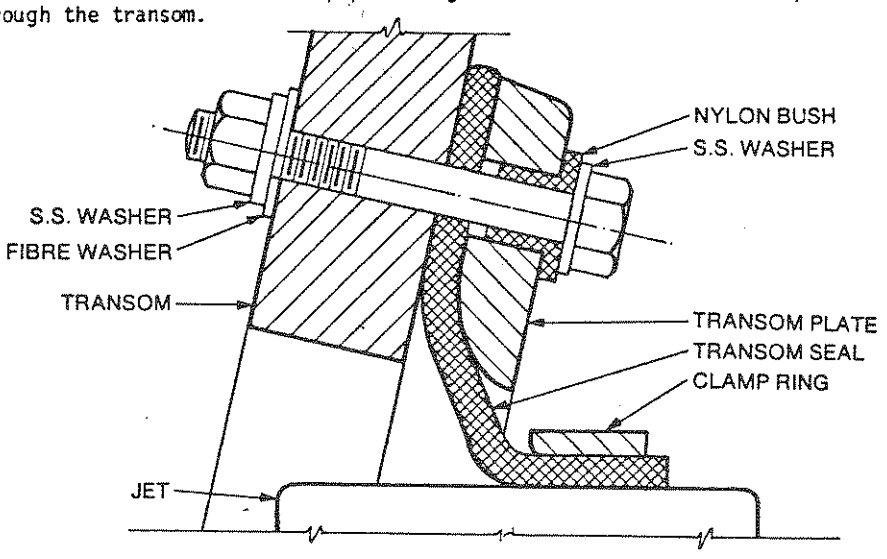
TRANSOM SEAL

Place the transom plate over the tailpipe and against the transom and centralise it in relation to the intake. Select a drill that just passes easily through the holes in the transom plate and drill through the holes to just dimple the transom.



Remove the transom plate and drill 8.5mm (45/64")dia holes through the dimples in the transom.

Place the transom seal over the tailpipe and against the transom and line up the holes in the seal with those through the transom.



Replace the transom plate, and bolt up as shown in the sketch.

It should not be necessary to apply a sealant, however, if the surface of the transom is rough, a liberal coating of sealant on the transom would be advisable.

Place the clamp ring over the seal and bolt up.

Refit the reverse bucket.

GENERAL

The engine should be installed in a position that will give the boat a proper fore and aft balance. For moderate semi-planing craft, it is often necessary to mount the engine further forward, near amidship for proper trim at medium speeds.

For high speed planing craft, the engine can be directly short coupled to the jet unit providing the hull has sufficient bottom area to carry the weight of the engine.

MOUNTING

The engine is mounted using engine mounting feet fixed to the engine bearers. Align with the jet unit as covered elsewhere (H2-3-82). Flexible engine mounts are preferred to reduce vibration and noise.

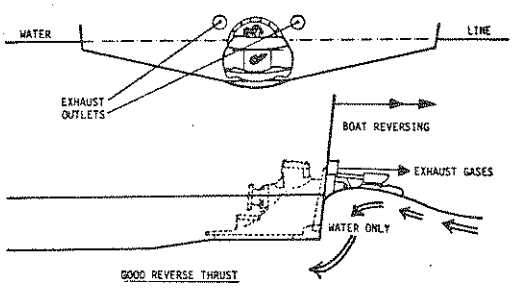
COOLING

The majority of engines have an integral raw water cooling pump. The suction side of this pump can be connected to a conventional skin fitting in the hull bottom, or to the jet unit offtake. The 1031 jet unit has a water offtake for 25.4mm (1") hose and provides 1 kg per sq.cm., (10.3 kN per sq.m., 1½ p.s.i.) at 600 r.p.m. idle and approximately 1.9 kg per sq.cm., (186 kN per sq.m., 27 p.s.i.) at full r.p.m. This can be used without a raw water pump providing the engine cooling system will operate efficiently at the low pressure when idling. If raw water pump fitted to engine, feed water from jet offtake to sandtrap (if used) and then to raw water pump. If a clutch or gearbox is used a conventional hull water pick up may be necessary if the jet water offtake is not immersed below waterline.

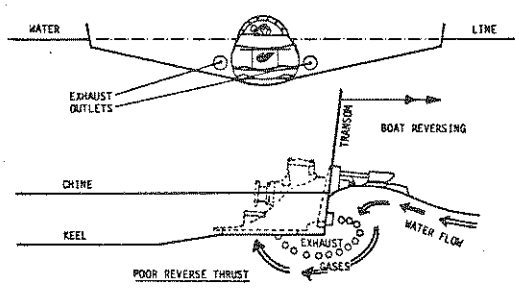
EXHAUST

The exhaust system is led through a transom skin fitting in the normal way, either with or without high riser and silencer as necessary, and the waste water fed into this line. Exhaust outlets should be above the waterline.

HIGH EXHAUST POSITION



LOW EXHAUST POSITION



ENGINE SYSTEMS

Wiring, instruments, throttle systems etc are all conventional; follow the manufacturers recommendations.

GOVERNOR SETTINGS

The "no-load" governor setting (or "high idle") on diesel engines should be set at least 200 r.p.m. higher than full throttle r.p.m. achieved when driving the jet unit.

EXAMPLE

Full throttle driving jet	2,760 r.p.m.
Governor begins to reduce power	2,960 r.p.m.

Settings finer than this may result in reduced engine power to the jet unit.

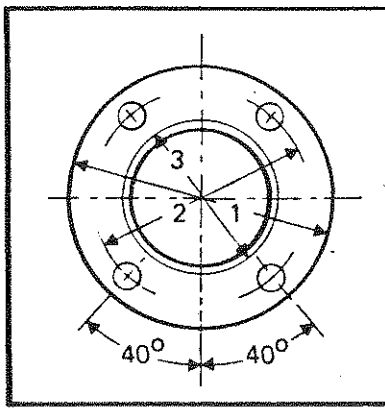
COUPLING SYSTEMS

1. UNIVERSAL DRIVE SHAFT

The usual method of coupling the engine to the jet unit is using a splined universal drive shaft (cardan shaft). All 1031 jet units include the 1510 series "Hardy Spicer" flange as standard equipment. A 1410 series flange is available to order for gasoline engines as a no charge option. The following shafts are available as optional extras :

Short series 1550 242mm (9.5") overall length
Long series 1510 460mm (18") to 1525mm (60") overall length

An adapter plate is necessary to bolt the drive shaft to the engine flywheel and is available as an optional extra.



No.	1510
1	146mm 5¾"
2	120.6mm 4¾"
3	95.250mm 3.750" 95.199mm 3.748"
	4 holes 12.7mm (½" Dia.)

Coupling Flange detail.

A tortionally resilient member between the engine and the jet unit is desirable to relieve the impeller of engine induced vibrations, and can also provide the insulation necessary on steel hull installations. The tortionally resilient member must be supported between carrier bearings - the normal arrangement is for the member to be attached to the engine flywheel and one carrier bearing mounted in a housing bolted to the engine flywheel housing. This is most often supplied by the engine manufacturer.

UNIVERSAL ANGLES

The angles on the universal joints should be equal and in the range of 1^{o}-5^{o}. Angles less than 1^{o} or greater than 5^{o} will cause vibration and undue wear. These angles are the maximum resultant angles allowable in any plane. Figs 1 and 2 assume no offset in any other plane. Make sure the two centre yokes are in the same plane to avoid tortional vibrations; when assembled the spline should be approximately in the mid travel position.

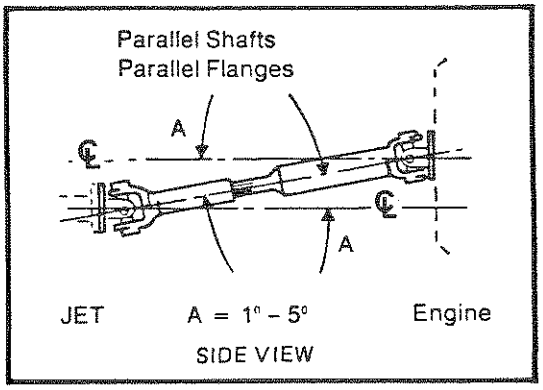


Fig 1.

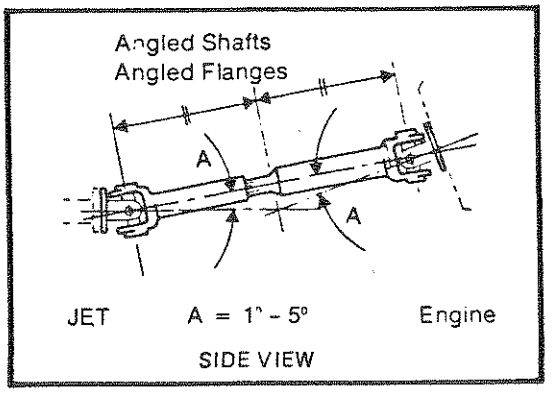


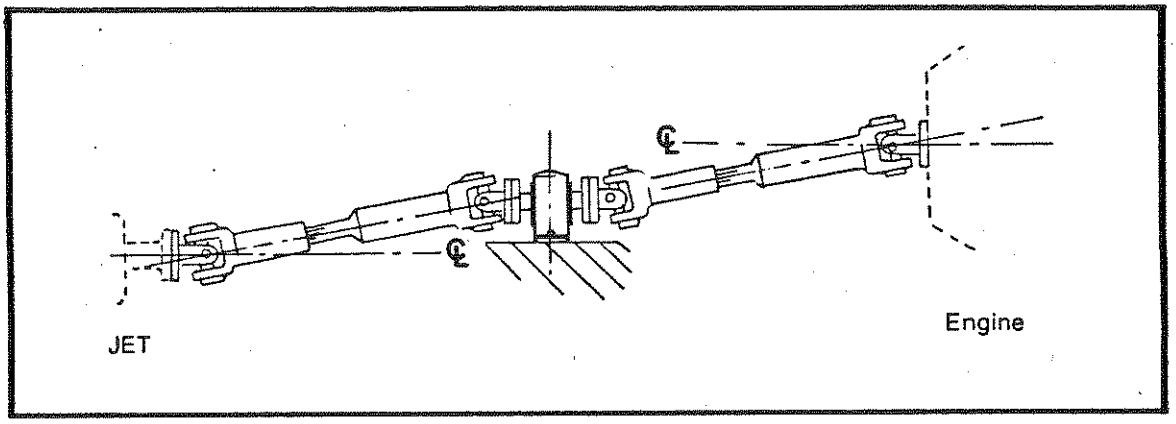
Fig 2.

LENGTH OF SHAFT

The 1510 series "Hardy Spicer" shaft centre can be safely run with a flange to flange length of up to 525mm (60") using 76.2mm (3" Ø dia x 2.41mm (.095") wall tube.

If the shaft needs to be longer than 525mm (60") use a two piece divided shaft with an intermediate fixed support bearing. This is available as an optional extra. Universal angle arrangements should be as for a single piece shaft as Figs 1 and 2.

It is wise if the drive shaft/s are as short as possible.



2. FLEXIBLE COUPLINGS

Flexible couplings such as Koppers or Centaflex types can be used but the engine must be very accurately aligned and rigidly mounted. Flexible engine mounts are not suitable with this type of coupling. A flexible coupling should always be mounted next to the jet unit coupling flange and any extension to driveline should be next to the engine flywheel. The jet unit thrust bearing must not be subjected to radial loads.

CAUTION : It is advisable to check for tortional vibrations especially if a universal drive shaft is used without a tortionally resilient member in the driveline. Moments of inertia data for tortional vibration calculations are listed on page B1,B2. These calculations are normally undertaken by the engine supplier.

STEERING CONTROL SYSTEMS

GENERAL

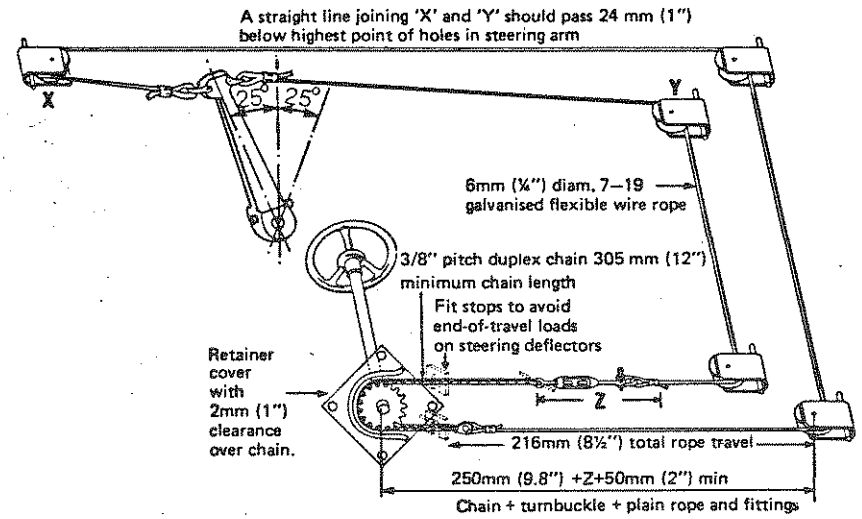
Both the steering and reverse mechanisms on the 1031 jet unit are balanced, so that the controls will be finger light and positive no matter what the size of vessel. Power assisted steering controls are not necessary, even for multiple jet units. However, the controls can be ruined by badly designed, high friction control lines between the jet unit and the helm.

A 406mm (16") diameter steering wheel is suitable with between 1¼-1½ turns from hard to Port to hard to Starboard. A greater number of turns reduces the sensitivity of the steering during slow speed manoeuvring .

1. WIRE ROPE AND PULLEY SYSTEM

This system is easy to inspect and maintain and is recommended for markets where the more sophisticated steering systems are difficult to obtain. It is available as an optional extra. The wire rope should be a truly flexible type capable of forming easily to the pulley diameter. The pulleys should be at least 130mm (5") effective diameter so that the flexible wire is not severely bent at the pulley. Pulleys should have good quality small diameter bearings.

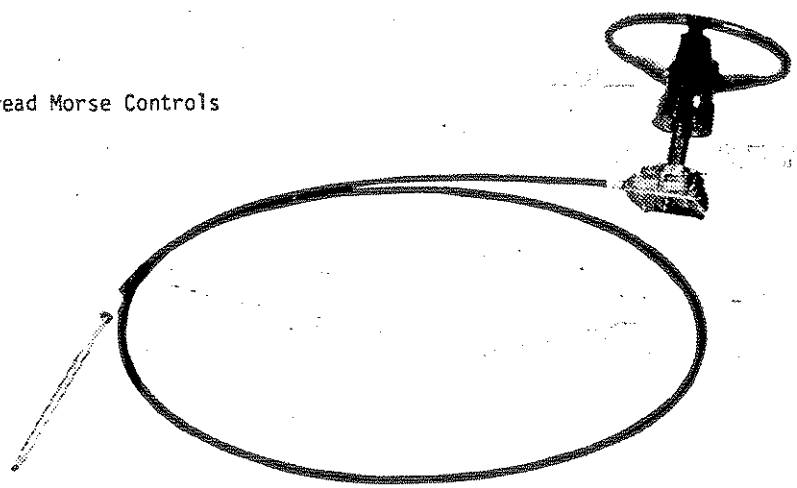
WARNING : Small diameter pulleys rapidly damage the wire, and have high friction.



2. PUSH PULL CABLE SYSTEM

A *Teleflex-Morse rotary type D260 or Morse Command 2 or similar system is recommended. Any are available as an optional extra.

* in U.S.A. read Morse Controls



STEERING CONTROL SYSTEMS Continued

Superior systems such as twin tension cable and/or rack and pinion may also be used. When connected to the existing holes in the steering arm these systems will give approximately two turns of the wheel from hard to Port to hard to Starboard. We recommend more direct steering. The steering arm can be drilled nearer to its pivot to give a shorter cable travel. For example, an attachment hole drilled 185mm from the pivot, would give a total of 1½ turns on the steering wheel. (1¼-1½ turns recommended). The steering kit is available at your nearest *Teleflex-Morse stockist, or your Hamilton agent will obtain it for you.

You will need :

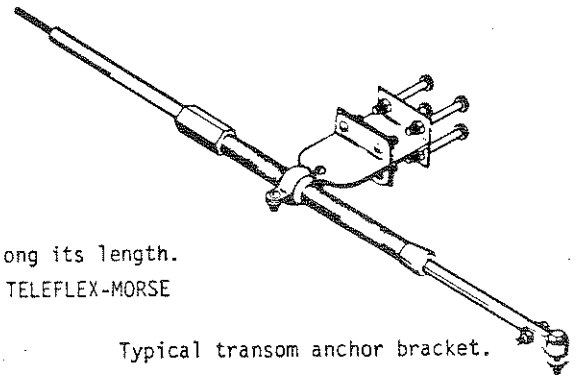
A helm assembly, consisting of steering wheel, bezel kit, helm assembly and drive mechanism.

A cable assembly, specifying the length required i.e. measure along the actual cable path from the centre of the steering wheel to the attachment point of the steering arm on the jet unit, with the steering arm vertical.

KEEP THE NUMBER OF BENDS TO A MINIMUM, AND ENSURE THAT THE BEND RADIUS IS AS LARGE AS POSSIBLE.

A ball joint attachment to fit in the jet steering arm for inner cable connection.

An inboard transom anchor bracket to hold the outer cable end to the transom near the jet unit.



Typical transom anchor bracket.

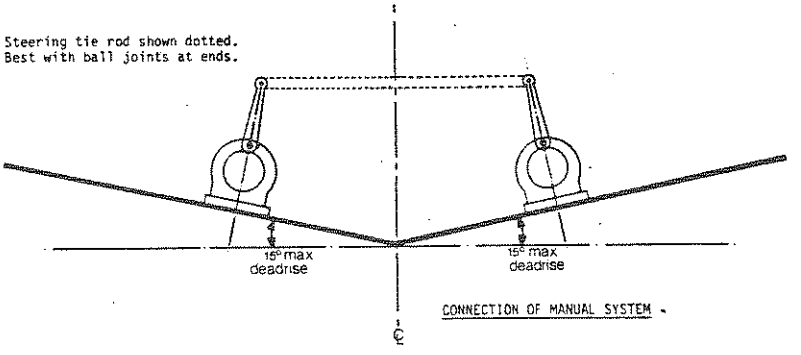
Use sufficient brackets to hold the cable in position along its length.

* IN U.S.A. READ MORSE CONTROLS FOR TELEFLEX-MORSE

3. MANUAL HYDRAULIC SYSTEMS

Manual hydraulic systems are suitable such as Hynautic, Charlynn etc. A stroke of 216mm (8½") is required to obtain full lock each way when connecting to one of the two holes in the top of the jet steering arm. If, however, this results in more than 1½ turns of the wheel full lock to full lock, we recommend a new connection hole is drilled in the jet steering arm nearer to its pivot to reduce the number of turns of the wheel to between 1¼ and 1½ full lock to full lock.

4. STEERING LINKAGE WITH TWIN 1031 UNITS.



CONNECTION OF MANUAL SYSTEM

Jet unit steering arms can be connected as shown at angles up to 15°. (Lost motion through imperfect geometry is minimal).

REVERSE CONTROL SYSTEMS

REVERSE CONTROL - TWIN JETS

A Teleflex-Morse cable is required to complete the reverse control system as the 1031 jet unit is supplied complete with a through transom connection kit and a control handle operator.

Order the cable from your Hamilton Jet dealer or nearest Teleflex-Morse stockist. Specify the length required i.e. measure along the actual cable path from the centre of the control box to the reverse bucket attachment point with the reverse bucket in the mid stroke position.

Details :- (note - this cable is normally used as a steering cable).

COUNTRY	EX CATALOGUE	TILLER END	PART NUMBER
Australia & New Zealand	Teleflex-Morse Ltd, Artarmon, NSW, Australia.	3/8" Diameter cross-hole	D345
U.S.A.	Morse Controls, (Catalogue 780 or 820) Marine Products Plant, CA 93257, U.S.A.	3/8" Diameter cross-hole	E300962
U.K.	Teleflex-Morse Ltd, Basildon, England.	3/8" Diameter cross-hole	9206568
Sweden		3/8" Diameter cross-hole	D335

Teleflex-Morse (Incom) have additional offices in Japan, Singapore, France and West Germany.

A detailed drawing of the reverse control system appears with the parts list at rear. See page N4-7-83

Alternative Cable : The Flextrol SC72 cable can be used provided Hamilton Adaptor, part number 104276, is ordered with the jet. This cable is also supplied by Volvo Marine dealers as the 'Safe T' and 'Big T' steering cable.

ELECTRICAL CORROSION PRECAUTIONS

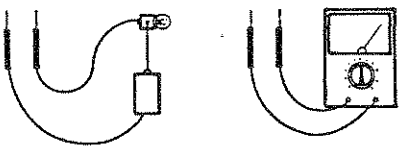
ELECTRICAL INSULATION

Apart from the need to check the jet unit insulation, normal marine practice should be followed when installing the electrical system in a jet boat.

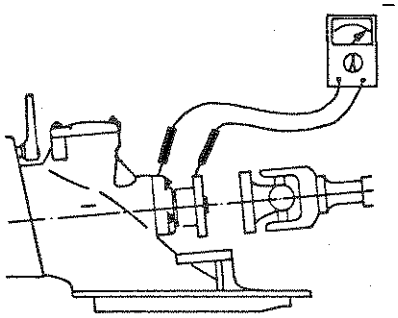
INSULATION

The rotating parts of the jet unit are electrically insulated from the aluminium casing to prevent electrolytic corrosion in sea water. Insulation is by tufnol washers and rubber in the rear bearing.

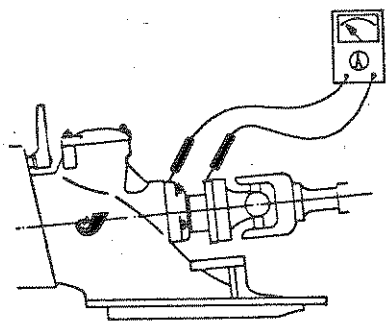
When a well insulated jet unit is immersed in sea water, a small electrolytic voltage is generated between the shaft and the housing. However, no corroding current flows as there is no external metallic circuit.



1. To check the insulation use an ohm-meter or bulb and battery (3-12 volt).



2. Remove the coupling shaft and, revolving the shaft slowly by hand, (with the engine stationary and jet unit out of water), check the insulation between the casing and shaft. The resistance should not be less than 1000 ohms. (If you are using a bulb it should not light). A rear bearing, damp with sea water, may give a slightly lower resistance, but a metallic short circuit, which is dangerous, usually shows a very low resistance (under 10 ohms) and a test light will glow.



3. With coupling shaft connnected resistance should be almost zero (bulb should light). (This because of Negative Earth Bonding System - see page J2-8-82)

ELECTRICAL CORROSION PRECAUTIONS

PRECAUTIONS AGAINST CORROSION

C.W.F. Hamilton & Co Ltd have taken all possible precautions during manufacture and assembly of the jet unit, by using materials that are resistant to salt water corrosion and by placing anodes in the most effective places on the jet. The unit however, is still vulnerable to the actions of the person who fits the entire power pack into the hull and to the actions of his electrician.

One of the major causes of corrosion to metal parts in salt water, particularly impellers, is stray currents emanating from the boat's electrics. These currents can be very small, and defy detection, but acting over a considerable period they can cause heavy corrosion. The solution to this problem, is to formally bond all major metallic parts to a negative earth. Therefore, boats using Hamilton jet units at sea should be bonded and wired as follows :-

1. Negative Earth Bonding (See page J3-8-82

The bond strip and connecting wires shall be copper of at least 14.5 sq.mm. cross section area to give very low electrical resistance. All junctions should preferably be welded, but if bolted, should be clean, a good contact, and regularly inspected. The bond wire or strip runs fore and aft down the hull and is connected to :

(a) The negative pole of the battery.

(b) The engine frame. (The engine must have a negative earth).

(c) The jet unit casing.

(d) All anodes whether in the jet, or attached to the hull.

(e) The fuel tanks and any other major metal item.

(f) Casings of all major items of electrical equipment.

(g) In the case of a wood or fibreglass hull, to an external earth plate in an area of the hull bottom which is always under water.

(h) In the case of an aluminium hull, to a connection welded to the hull in an area where the hull is always touching water.

2. Electrical Wiring System

Every part of the electrical system should use two wires, positive and negative i.e. the negative must not run through the frame of any major unit, through the hull of the boat, or through the bonding system.

For example, the negative to the starter motor should be a seperate large section wire from the negative pole of the battery, to the holding bolt of the starter motor, and NOT to an engine bolt somewhere near the starter.

3. Radio Transceivers, Depth Sounders and Other Electrical Auxiliaries

Batteries, radio transmitter or other electrical equipment should NOT be earthed to the jet unit.

Be guided by your radio technician, but in general these systems should either be entirelyinsulated, i.e. seperate insulated alternator, seperate batteries etc, or, the system should be incorporated in the bonding system, but with a seperate earth plate well removed from the bonding earth plate and from the jet.

4. In Service Checks

In service, two items should be inspected regularly :

(a) The bonding system for loose or corroded connections and test to ensure that electrical resistance is still low.

(b) All anodes, if half eaten away, replace with a new anode.

5. Zinc Anodes

Regular maintenance of the sacrificial zinc anodes is recommended. There are 2 anodes on the 1031 jet, one under the exterior of the tailpipe and the other on the interior of the jet intake below

ELECTRICAL CORROSION PRECAUTIONS

the water line. Both are electrically connected to the casing of the jet unit. If corrosion is taking place the zinc anodes will be eaten away in preference to the aluminium jet unit casing, so the anodes should be inspected and replaced when badly corroded. Further anodes may be fitted on the hull if desired. A wire must be run from the anode to the aluminium casing of the jet unit.

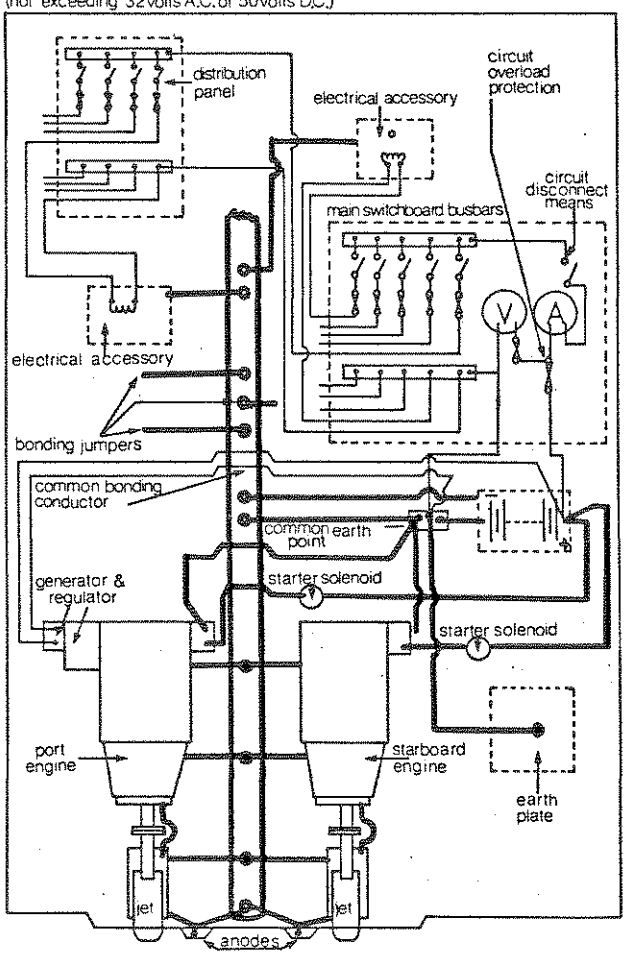
6. Anti Foul Paint

Keep stainless steel clean and polished. DO NOT PAINT OR ANTIFOUL ANODES - leave bare. Use chlorinated rubber, or non metallic based anti-fouling on the aluminium parts of the jet. (Do not use zinc, or particularly copper paints as these would cause rapid corrosion of the jet unit).

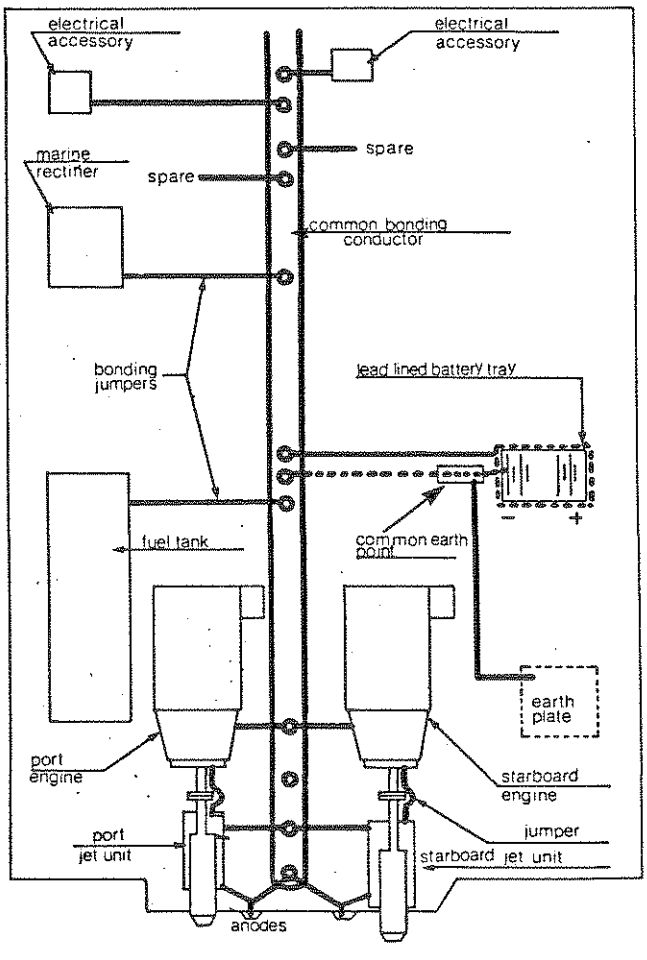
7. Impressed Current Protection

Impressed current protection e.g. Mercathode is also recommended.

A TYPICAL EXTRA LOW VOLTAGE NEGATIVE EARTH SYSTEM
(not exceeding 32volts A.C. or 50volts D.C.)



EXAMPLE OF A BONDING LAYOUT



STEERING

The nozzle deflects the water jet to port or starboard causing the boat to steer to port or starboard respectively.

The following points should be remembered when operating a jet craft :-

(a) If the engine is stopped there is no water jet for the nozzle to deflect and thus the craft cannot be steered.

Never stop the engine when approaching a mooring or at any time when steering will be required.

(b) The wider the throttle is opened the greater the steering effect - i.e. the sharper the turn.

(c) Steering is available in "neutral" and reverse as well as in forward control - a feature which gives the Hamilton Jet unrivalled manoeuvrability.

Remember though that whether going forwards, in "neutral", or in reverse the bow of the boat will always turn the way the steering wheel is turned, i.e. turn wheel to port, bow of boat will move to port and vice versa.

This means that in reverse the boat has the opposite steering to a motor car, a feature which can be used to advantage when manoeuvring.

FORWARD/NEUTRAL/REVERSE CONTROL

Reverse and "neutral" are achieved by redirecting the jetstream. If the reverse bucket (57) is lowered fully all of the jetstream is redirected back under the boat giving full reverse thrust. If the reverse bucket is lowered partially the jetstream is split giving some forward and some reverse thrust. At one reverse bucket position the forward and reverse thrusts will be equal so the boat will not move ahead or astern regardless of the throttle opening.

This position is referred to by Hamiltons as "NEUTRAL". (It should not be confused with the neutral position of a gearbox when the driveline stops rotating).

When operating the Hamilton reverse control the jet unit is always rotating regardless of the position of the reverse bucket. Any intermediate position between forward and reverse can be selected to give infinitely variable ahead and astern speeds when manoeuvring.

CAUTION

If in lightweight planing craft the reverse or neutral positions are selected with the throttle left open and the boat moving forward at speed, the resultant "braking effect" is very severe - even more so than full braking with a motor car.

The above procedure should therefore be used only in emergency.

For normal operation to "brake" the boat's forward motion :-

(i) Close the throttle.

(ii) Select reverse or neutral.

(iii) Open the throttle, gently at first.

MANOEUVRING AND DOCKING

It has been found that the boat is best manoeuvred as follows :

(i) Move the lever control to the "neutral" position.

(ii) Set the throttle up to 1/3 open (say approx. 1,200 r.p.m. with direct engines). In strong tide or wind conditions increase the throttle opening to obtain greater response as necessary.

(iii) A slight movement either way from the "neutral" position will be sufficient to move the boat forwards or backwards until the manoeuvre is complete.

(iv) Steering will be excellent also at this throttle opening.

GENERAL

This unit has been designed to require the absolute miniumum of maintenance. However, it is recommended that the unit be dismantled and inspected for wear on bearings, seals, etc and corrosion annually as a minimum requirement.

Day to day maintenance should be negligible, but the following points and checks should be noted :-

THRUST BEARING

Grease with a good quality Lithium-based ball bearing grease every 30 hours' operation. Do not overgrease.

REAR BEARING

This is a dry run bearing, refer to page L8 for service and dismantle procedure.

GLAND SEAL

This is a carbon face seal type with ceramic counterface and should require no attention. Should this seal be faulty water will leak from under the bearing housing.

To inspect seals see dismantling procedure page L3. A. Inspect at least every 500 hours.

DRIVE SHAFT UNIVERSALS

Every thirty hours sparingly grease the universal joints and sliding splines if Hardy Spicer type employed. Do not over grease.

SACRIFICIAL ANODES

The unit is fitted with an anode on the tailpipe which will waste away in sea or contaminated water. Regularly inspect this anode and replace immediately it is reduced in size to a serious degree. If allowed to disappear, corrosion will start on the Aluminium parts which could eventually damage the unit.

DEBRIS IN UNIT

Any debris such as wood, water weed, etc. caught in the intake screen, impeller or tailpipe stator vanes will affect the jet unit's performance. The jet is provided with an inspection cover lip and the cover can be removed provided the engine is stopped and the craft is stationary.

On most installations the static lever of water inside the jet unit will be below the intake inspection cover lip and the cover can be removed provided the engine is stopped and the craft is stationary.

If the static water line is too high then often by moving the load to the bow of the boat or placing a heavy load on the bow end the stern is raised enough to allow the cover to be removed.

To remove the cover :-

Remove the two nuts and washers and draw the cover off.

Blockages of the unit are usually noticey by (a) the engine "racing" and or (b) lack of jet thrust or boat speed.

Great care should be taken to avoid ropes or vines as these, if caught around the impeller shaft, will be wound into the jet unit.

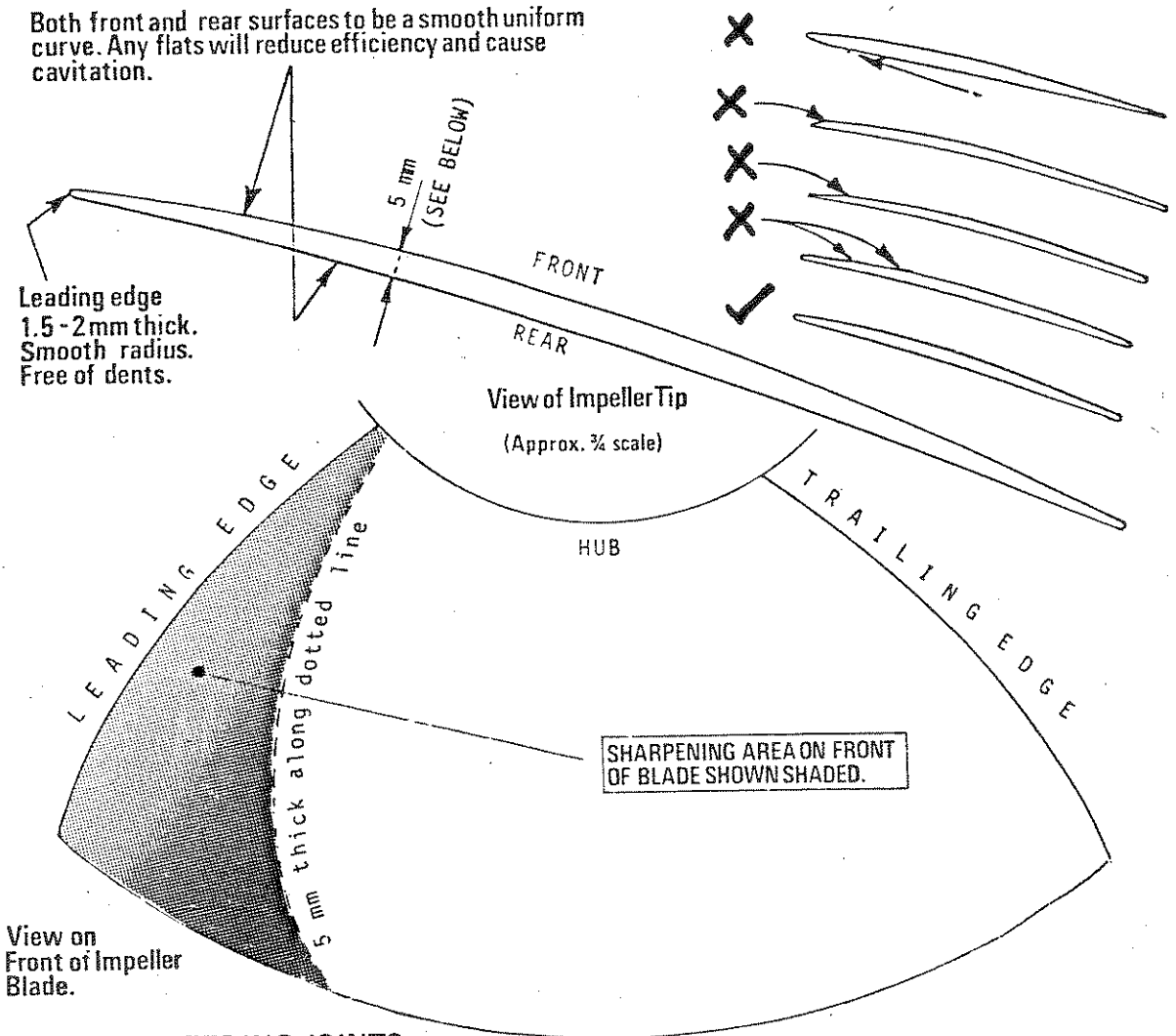
Recommended practice is to close the throttle or even stop the engine and coast over such bad debris if the boat cannot steer round it.

Smaller pieces of debris, water weed etc, will not normally foul the unit.

IMPELLER

The leading edges of the impeller may tend to become "blunt" after a period of time with the action of small solid particles in the water. The performance of the impeller will drop with the blades blunt.

Anytime the inspection cover is removed (as above) the leading edge of the blades should be inspected for wear. If badly worn, remove impeller (see section on dismantling unit) and sharpen as shown below.



REVERSE & STEERING JOINTS

The reverse bucket and steering joints are outside the hull.

These joints should be oiled and checked to see they are operating freely. Once in the water these joints will be water lubricated and will not normally require attention.

CARE OF JET UNIT

The main body of the unit is constructed from Silicon-Aluminium alloy (LM6) which best resists corrosion from salt water. These castings are finished in a Poly-urethane paint finish. Periodic cleaning down, wire-brushing, and repainting may be necessary depending on water conditions prevailing, and extent of use.

Periodically when the craft is on the slip, or at least an annual survey, the complete unit should be removed from the boat, and inspected internally and externally for faults, corrosions, or breakages. Clean down and repaint the casting. DO NOT use copper-based paints. Non metallic paints are suitable. Leave all stainless steel parts polished and unpainted.

A THRUST BEARING, GREASE SEALS AND WATER SEALS

1 Uncouple the drive shaft from the jet unit.

2 Prevent the coupling 99 from turning, and unscrew set screw 97 and nut 87, two turns only. If the nut appears very tight, heat until it is just not possible to hold the hand on it, this will destroy the LOCTITE and free the nut.
(DO NOT OVERHEAT).

3 Use puller to free coupling 99 of the main shaft. Unscrew nut 87, remove coupling 99 and key 69.

4 Remove nuts and washers from the three bearing housing studs 16.

5 Slide bearing housing 78 off the main shaft (the housing will still contain bearing 74, sleeve 76, bearing carrier 73 and one oil seal 81).

6 Withdraw seal housing 77, sleeve 76 and check "O" ring 82 is in the housing.

7 Remove nuts and washers from studs 9 and take off inspection cover 4.

8 Take out split pin 84 from shaft and slide carbon seal kit 80 forward and remove from shaft.

CHECK THE FOLLOWING PARTS FOR WEAR AND REPLACE WHERE NECESSARY

9 Two seals 81 and their sleeves 76 and bearing 74. Replace seals if worn and also the sleeves if they are grooved.

10 Carbon face 80 and face on stationary housing. Check to see if they are scored or chipped.

11 "O" rings 83 and 82. Check for nicks for deformation.

12 Thoroughly clean all parts.

ASSEMBLY (SEE DRAWING PAGE L6)

13 Replace the carbon seal assembly in the shaft in the following order. Cup washer, spring, rubber drive ring (well oiled), carbon face (well oiled). Treat the carbon face as fragile. Push the whole assembly well back on the shaft.

14 Push oil seal 81 into seal housing 77 so that the side with the spring visible faces coupling.

15 Coat "O" ring 83 with lanoline (if not available use grease) and place around ceramic seal face in seal housing 77.

16 Feed seal housing 77 over the shaft and push home.

17 Feed sleeve 76 onto the shaft with the radius on the inside diameter leading. (This radius mates with the radius on the shoulder of the drive shaft). Later units have radius on both ends of bore. Grease the outside diameter and push through the seal until it is firmly against the shoulder of the shaft.

18 Push bearing 74 into bearing housing 78.

19 Push seal 81 into bearing housing 78 with spring side facing out.

20 Grease "O" ring 82 and place in bore of housing 78 next to bearing.

21 Feed housing onto shaft and tighten nuts and washers on the three studs 16 to 75 lb ft.

22 Grease tufnol sleeve 73 and push between shaft and bearing, gently tap bush in all round until it is flush with the face of the bearing

23 Grease outside diameter of sleeve 76 and slide it along the shaft and through seal 81 until it is against the bearing.In this case the portion of the radius on the inside is unimportant.

24 Fit key 69 and slide coupling 99 onto shaft.

25 Coat threads of shaft and coupling nut with "LOCTITE" (thread locking liquid) and torque to 295 lbft.

26 Slide carbon face forward to seal face and carefully push the rubber drive ring into the carbon face, compress the spring against carbon face. Replace the split pin 84 and bend it over snug with shaft.

27 Replace the inspection cover and seal.

28 Turn the shaft by hand, to insure it is free before coupling to the drive shaft.

(Alternative access to the carbon seal is from the stern, ie: remove the tailpipe, impeller, etc as below.)

B <u>IMPELLER, WEAR RING ETC.</u>

Before dismantling the tailpipe end of the jet, remove the inspection cover 4, intake screen 14 and carry out the folling checks.

1 Using a feeler gauge, check clearance between the tips of the impeller blades and wear ring 6 at each side of the unite (ie: not top and bottom). Maximum recommended (worn) clearance is 1.27mm (.050") per side.

2 Disconnect the reverse control from the lug on the top of the reverse bucket 57. Move bucket through full arc to check either stiffness or slack bushes.

3 Remove lock bolts 28, bucket hinge pivots 58 and reverse bucket 57.

4 Push rubber splash guard 101 upwards and turn inside out to expose steering crank.

5 Disconnect steering arm 62 from the cable control. check steering shaft for :-
(a) freedom of movement.
(b) undue wear in bushes 42 and 11.
(c) undue wear on ball end of crank 63.

6 Remove cotter 64 from steer crank 63 and ensure that crank rotates freely on shaft.

7 Rotate steering deflector 46 through full arc, to check either stiffness or slack bushes. If these seem to be in good condition the deflector can stay on the tailpipe.

8 Remove the 4 nuts 27 holding the tailpipe and spring washers 31. Hit the tailpipe sideways with a rubber mallet or heel of hand to free the joint, remove tailpipe from the remainder of the jet unit, the steering crank 63 should be slid off the shaft at the same time.

9 Lock coupling 99 so that it can not rotate, unscrew nut 70 at the tailpipe end. If stiff, gentle heat the nut to destroy the "LOCTITE".

10 Slide off bearing sleeve D1 complete with V ring seal D3 and 'O' ring D2. (See page L 9)

11 Slide off impeller 92 and remove key 68.

12 Examine wear ring 6. In the unlikely event of being very badly scored, or if it has swollen inwards, it should be replaced. If possible , request your local agent to carry out the replacement.

Replacement procedure is as follows :-

(a) Find the joint in the wear sleeve and force a fine screw driver between the sleeve and the intake casting adjacent to the joint until the end of the sleeve is free (Fig. 1 and 2). Pull end of the sleeve inwards and remove it from intake.

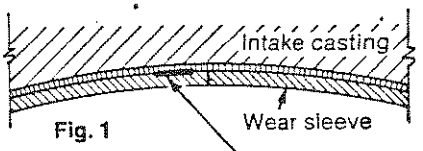


Fig. 1

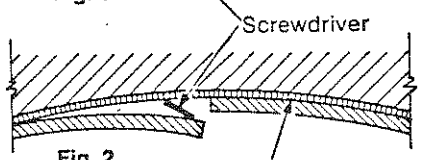


Fig. 2

(b) Remove the insulating strip and throughly clean intake bore

(c) Paint the intake bore with a thin layer of bitumious paint.

(d) Put in a new insulating strip and then grease its inside diameter.

(e) Take a new wear strip and with chamfer end leading, butt the strip at the chamfers by twisting slightly, Fig. 3, (this reduces the lead in diameter) and feed it inside the insulating strip, as it goes in straighten the strip gradually until it butts normally, Fig. 4. Slide in as far as possible and complete assembly by tapping gently with a wood block round and round the outside edge. The wear strip is in the correct position when it is flush with the face of the bore, see Fig. 5. The .031" gap must be maintained to prevent electrical contact between the wear ring and the intake casting.

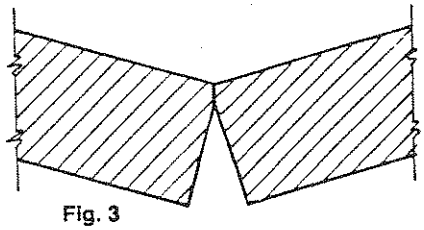


Fig. 3

13 (a) Check the impeller leading edge, if blunt or dented file out the dents following the profile of the blade, and then sharpen in line with instruction 7 on page L2.

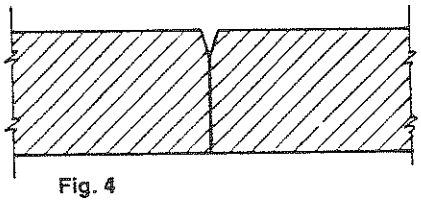


Fig. 4

(b) If you decided in B1 that the outside diameter of the impeller was badly worn, check it again in the new wear ring, if the clearance is still too great proceed as follows:-

(i) Build the tips up by welding with ASI316L stainless steel rods. E.g. Philips RS316L.

(ii) Turn the outside diameter to 10.598"/10.590" making sure that it is concentric with the bore.

(iii) File and polish.

(iv) Balance the impeller statically, preferably on its main shaft 67 with the coupling 99 and all keys in place.

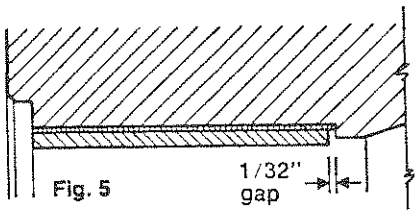


Fig. 5

14 Check the DU bearing D4 for wear and the sleeve D1 for wear or bad scoring and if necessary replace. Replace automatically if the impeller has just been built up and the wear sleeve replaced. Use an internal extractor to pull bush D4 complete with housing D5 from the tailpipe 41, (see page L9 for assembly).

When pressing the housing D5 in, remove capped nipple D8, use a block under the nose of the tailpipe fairing to take the load.

15 Replace all worn bushes in the steering system.

16 Clean all parts thoroughly.

ASSEMBLY

17 Grease shaft and insert key 68 with its chamfers down into shaft keyway.

18 Slide on impeller, check that it is the right way round, i.e. fairing on shaft first.

19 Slide on sleeve D1 complete with 'O' ring D2.

20 Apply "LOCTITE" to shaft thread and thread of nut 70, torque nut to 295 lb ft.

21 Greese sleeve D1, Slide 'V' ring D3 2/3 the way along the sleeves.

22 Replace tailpipe complete with dryrun kit (refer to pages L8 and L9) and at the same time feed steering crank 63 onto shaft 61. Fully torque four nuts and washers 27 and 31 to 75 lb ft. A rubberised sealing compound may be used between tailpipe and intake should an unacceptable leak occur on reassembly.

23 Turn coupling 99 to ensure that shaft 67 is free.

24 Replace and tighten cotter 64 in steering crank 63 and push down rubber splash guard.

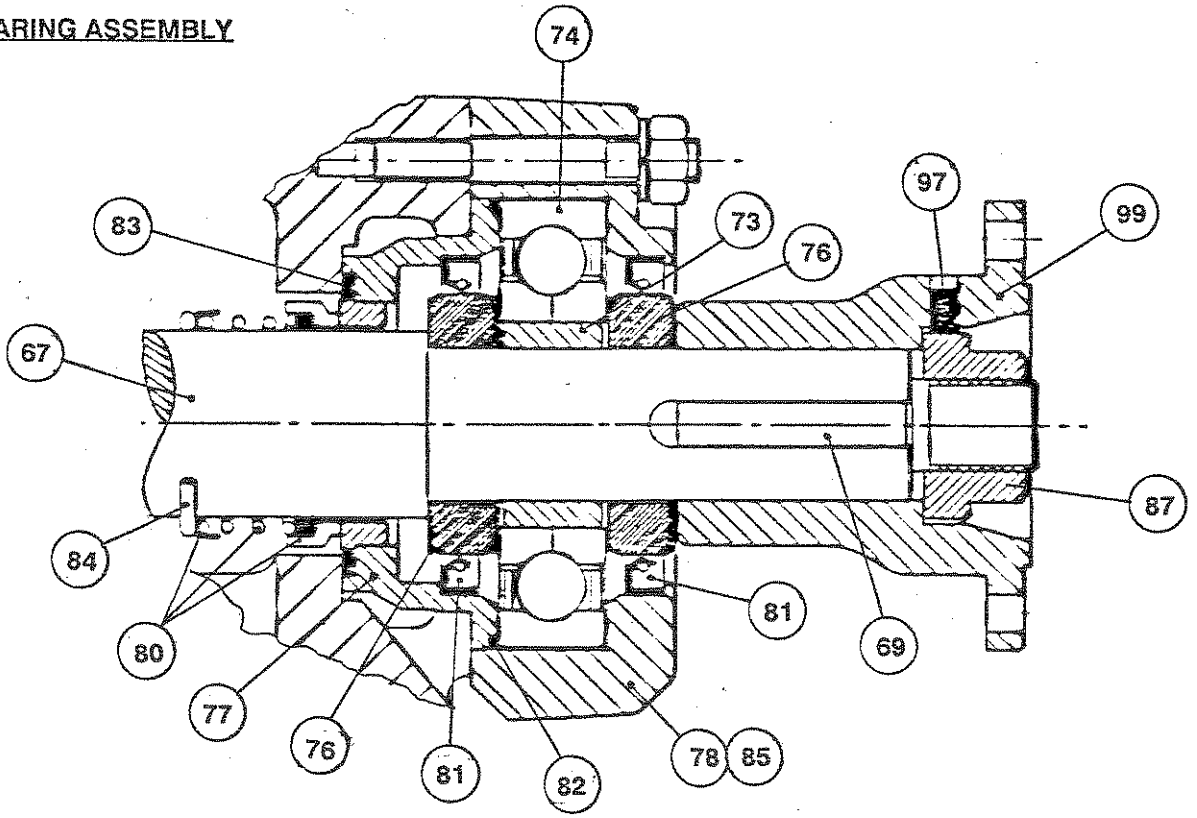
25 Replace reverse bucket 57 hinge pivots 58 and lock bolts 28.

26 Check that reverse control from helm to reverse bucket is free and then reconnect to bucket.

27 Check that steering control from helm to steering arm is free and then reconnect to the arm.

28 Fit capped nipple D8 and grease rear bearing using a manual grease gun.

BEARING ASSEMBLY



Note:-

When releasing coupling (99) a "puller" is required. Leave nut (87) 3/4 engaged to prevent the coupling flying loose when it frees which can be dangerous.

JET UNIT FAULT FINDING

1.	Water leaking from under front bearing housing	- Faulty carbon seal or thrust face.
2.	Excessive high pitched rattling whine.	- Faulty thrust bearing.
3.	Bad vibrations.	- Worn dry run bearings. - Worn drive shaft universal joints.
4.	Engine revolutions gradually increasing over a period of time. Take off performance poor.	- Worn or blunt impellers. Excessive impeller impeller tip clearance.
5.	Sudden increase in engine revolutions, no noticeable decrease in jet thrust.	- Faulty tachometer.
6.	Excessive engine revolutions, noisy jet unit with aerated water from nozzle.	- Screen blocked with weed, debris or rope through grill and wrapped around unit shaft or object jammed in stators.

NOTE : All the symptons described in items 2, 3 and 4 may be caused by the same fault as in item 6.

ASSEMBLY INSTRUCTIONS - DRY RUNNING KIT

(REPLACEMENT FOR MARINE BEARING)

1 Refer to page L3 to dismantle the coupling end of the jet and replace the Water Seal assembly 80 with the Special Dry Run Seal assembly item D10. Reassemble as instructions on pages L3 and L4, ensuring that both rotating seal and stationary counterface are replaced. If one or the other is showing any wear.

2 Refer to page L4 to dismantle the rear end of the jet.

3 Inspect all parts for wear, replace worn items.

4 Assemble items D1 and D2 onto the mainshaft and assemble item 70 as steps shown on page L6.

5 Assemble items D4, D6, D7 into housing D5 as shown, item D7 to be loctited in place using 601LOCTITE

6 Take the V-Ring Seal (D3) and place it about 2/3 the way along the shaft sleeve (D1).

7 Press housing D5 into tailpipe using a block of wood under the nose of tailpipe to take the load, before fitting item D8.

8 Reassemble the tailpipe assembly to the intake following steps on page L6, fit item D8.

9 Using a manually operated grease gun, grease the rear bearing via the capped nipple (D8). The correct amount of grease will have been applied when an appreciable increase in pressure is detected.

DO NOT USE A POWER OPERATED GREASE GUN.

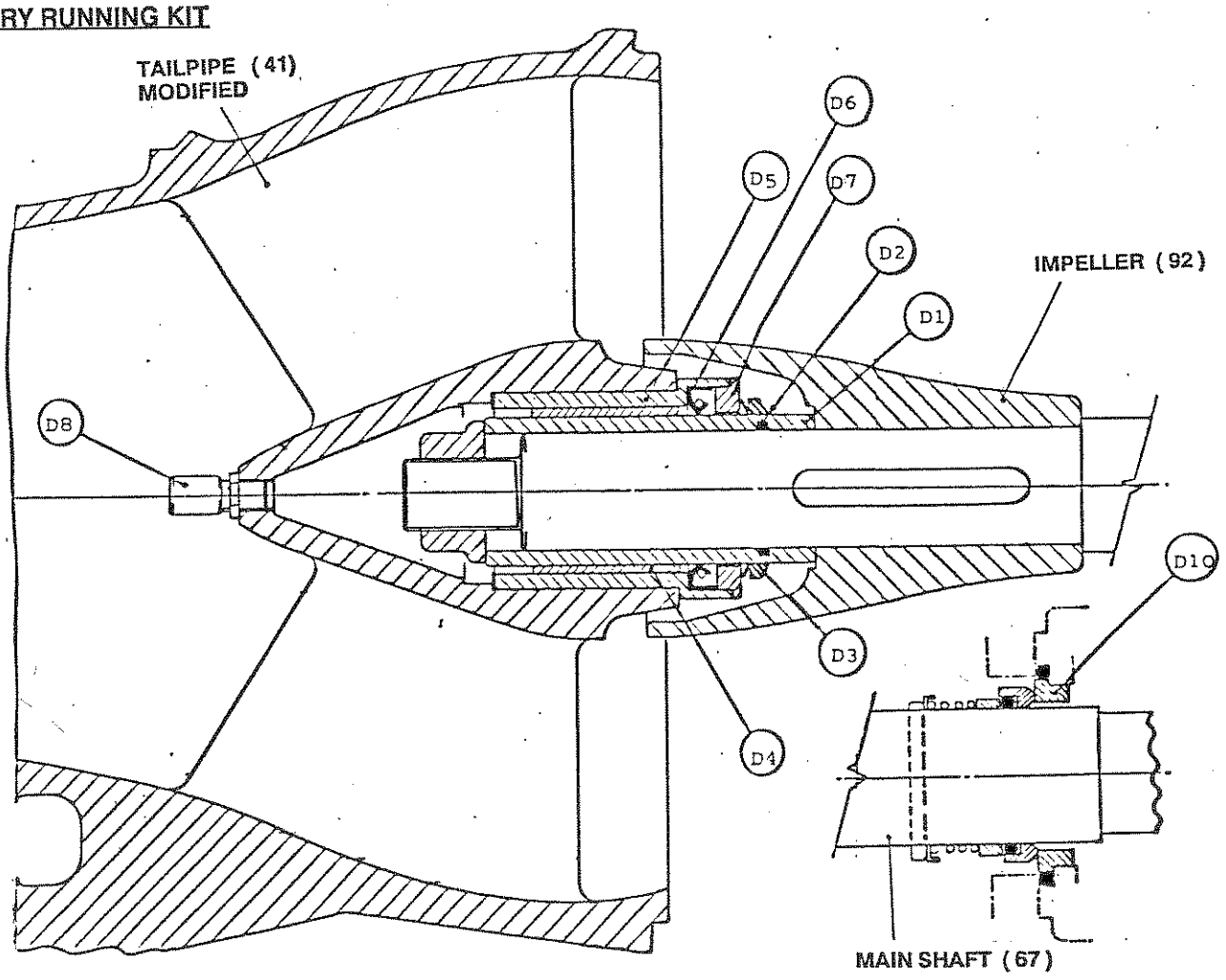
RUNNING IN

DO NOT EXCEED 1000 RPM FOR THE FIRST 5 MINUTES RUNNING (whether the jet is in or out of the water).

MAINTENANCE

The system is essentially a dry run system and does not require frequent lubrication. Grease as in instruction 10 above only every 1000 hours or every 6 months whichever occurs first.

DRY RUNNING KIT



Item	Part No.	Req'd	Description	Replaces Std Item No.
D1	105958	1	Shaft Sleeve	46
D2	HMHO AEL	1	"O" Ring Special	-
D3	JWKZ AEA	1	V-Ring Seal	-
D4	KHOB ABF	1	DU Bush	65
D5	105960	1	Bush & Seal Housing	65
D6	61316	1	Seal - GACO MIS.20	-
D7	105984	1	Seal Face	-
D8	HEID AAY	1	Capped Hydraulic Nipple-1/8BSP	-
D10	105962	1	Seal Assembly - Special	7

For assembly instructions see page L8.

LOCTITE CHART

Studs	-	262
Bushes and Sleeves	-	601
Special Nuts and Bolts	-	See below
Grub Screws	-	222

TIGHTENING TORQUES

General applications:

Thread Diameter mm	Tightening Torque Nm	lbf. ft
6	5	4
8	12	9
10	24	18
12	40	30
16	100	75
20	200	145

NOTE:

Threads to be plain dry or lightly lubricated. Recommended lubricant - BP Energrease MM-EP2 (marine multipurpose extreame pressure grease) or equivalent.

Where loctite is to be used, threads to be degreased, clean & dry.

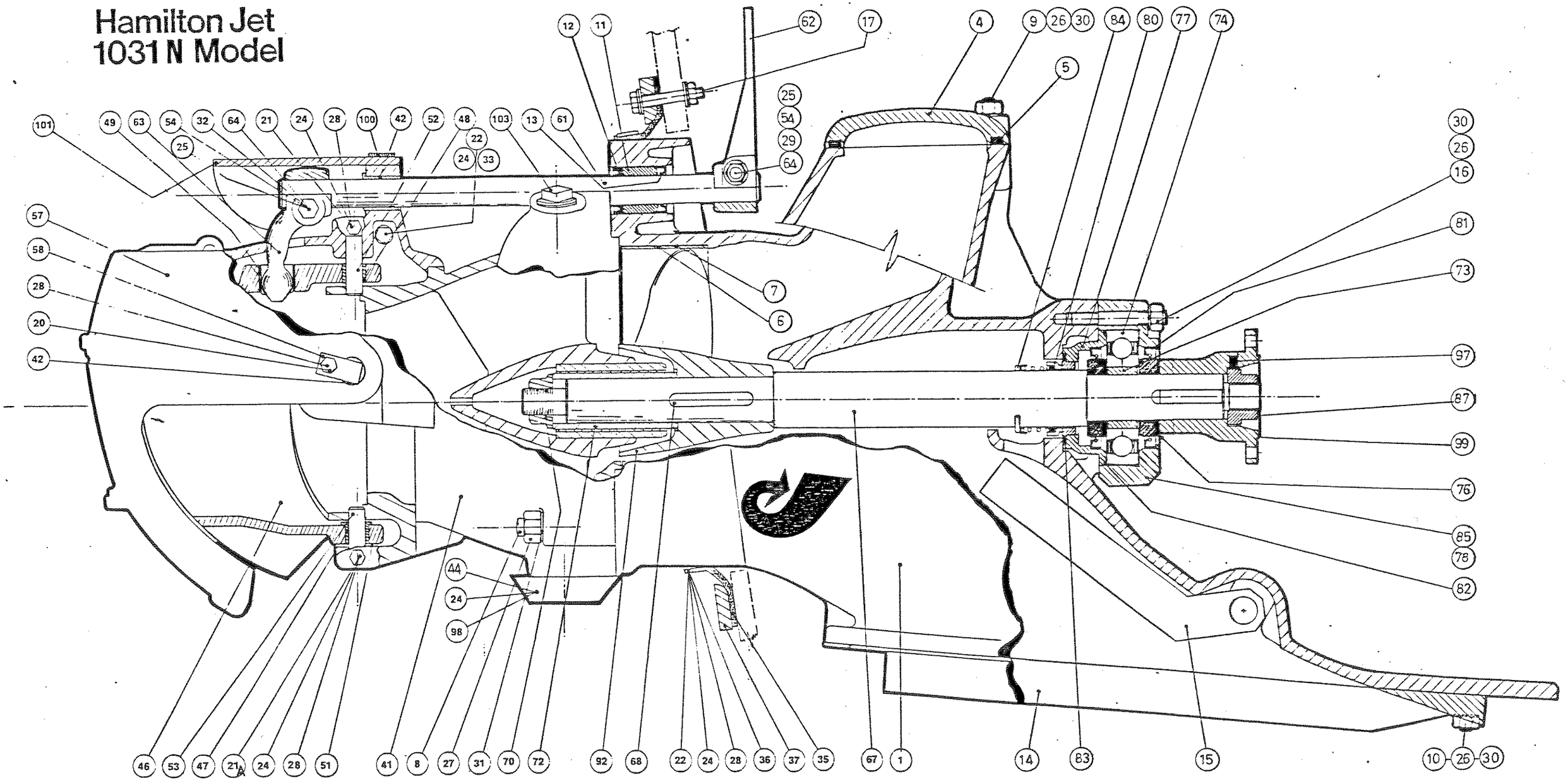
Special applications :

Description	Part No	Tightening Torque Nm	lbf. ft	Loctite
Coupling Nut	102852	400	295	242
Impeller Nut	105286	400	295	242

GENERAL ASSEMBLY

N1 - 5 - 90

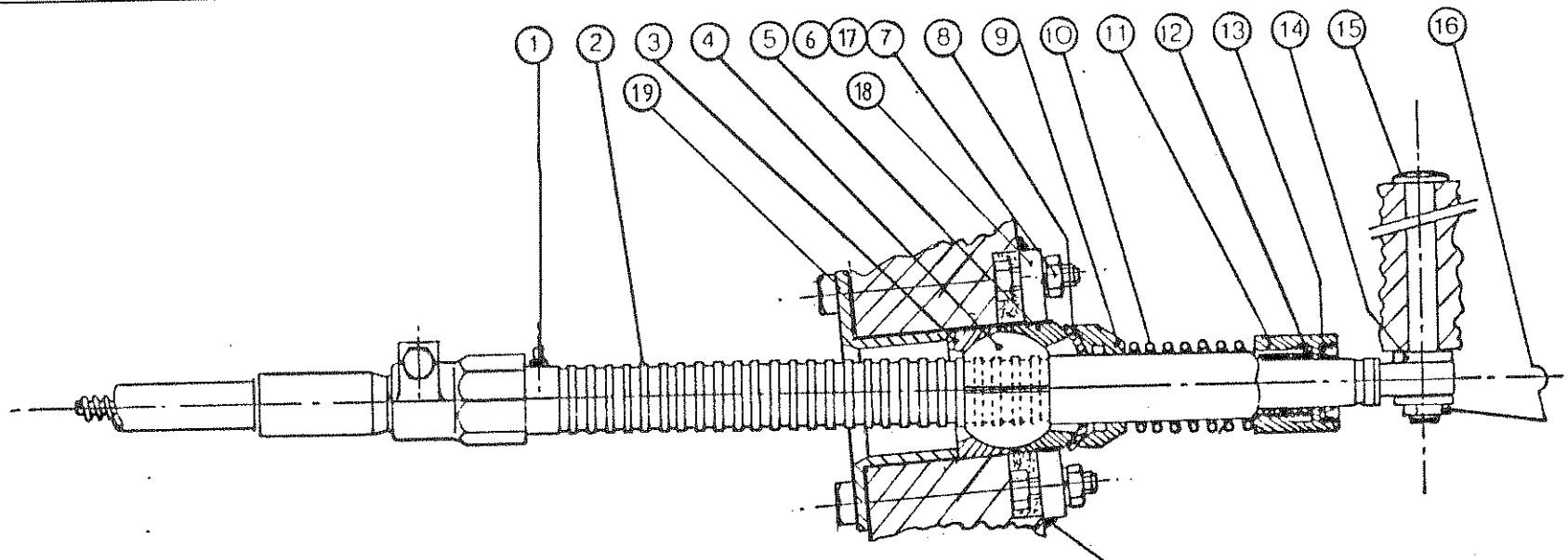
Hamilton Jet
1031 N Model



Item	Part No.	Description	Qty
1	105272	Intake	1
2	-	-	-
3	-	-	-
4	102659	Inspection Cover	1
5	102280	Inspection Cover Seal	1
6	103362	Wear Ring	1
7	103363	Insulator	1
8	102286	Stud M16	4
9	103916	Stud M12	2
10	JCQH XAU	Stud M12	4
11	102728	Steering Shaft Bush	1
12	61353	Scraper	1
13	61362	Seal	1
14	105276	Intake Screen (Aluminium bar)	1
15	105922	Screen Rake Kit	1
16	102769	Stud M12	3
17	105743	Installation Information	1
18	HYQH XEE	Bolt M10 x 80	2
19			
20	XZQH XAY	Bolt M8 x 20	2
21	HYQH XCA	Bolt M8 x 40	1
21A	HYQH XCC	Bolt M8 x 50	1
22	HYQH XCL	Bolt M8 x 90	1
23			
24	JDQH XAC	Nut M8	24
25	JDQH XAE	Nut M10	2
26	JDQH XAH	Nut M12	13
27	JDQH XAL	Nut M16	4
28	JEQK XAC	Lock Washer M8	7
29	JEQK XAE	Lock Washer M10	2
30	JEQK XAH	Lock Washer M12	13
31	JEQK XAJ	Lock Washer M16	4
32	JEOZ XAI	Flat Washer M10	36
33	JEOZ XAF	Flat Washer M8	35
34			
35	102939	Transom Seal	1
36	103237	Clamp Assembly	1
37	102940	Transom Plate	1
38			
39			
40			
41	106061Y	*Tailpipe (160mm nozzle dia)	1
42	102952	Bush	3
43			
44	HYQH XCB	Bolt M8 x 45	1
45			
46	103414Y	Deflector (to match 160mm nozzle)	1
47	102734	Bush (bottom)	1
48	102838	Bush (upper)	1
49	102961	Bush (crank)	1
50			

* Before ordering replacement Tailpipe or Deflector measure the actual bore size in mm to ensure correct size ordered.

Item	Part No.	Description	Qty
51	102154	Washer	1
52	102848	Deflector Pin (top)	1
53	102737	Deflector Pin (bottom)	1
54	102993	Thick Washer (cotter)	2
55	-	-	-
56	-	-	-
57	102815	Reverse Bucket	1
58	102953	Pivot	2
60	-	-	-
61	102832	Shaft Steering	1
62	102831	Arm	1
63	102833	Crank	1
64	102834	Cotter	2
65	-	-	-
66	-	-	-
67	102739	Mainshaft	1
68	102823	Key - stainless steel	1
69	102822	Key (coupling)	1
70	102852	Nut - main shaft (Impeller)	1
71			
72	105961	Dry Run Kit	1
73	102122	Bearing Carrier	1
74	JNOD ABX	Bearing	1
75			
76	102747	Sleeve Seal	2
77	106082	Seal Housing (Stationary Face)	1
78	102668	Bearing Housing	1
79			
80	61351	Romet Seal Sub Assy.	1
81	61380	Seal	2
82	HMHO BDB	"O" Ring 3 3/4 x 4 x 1/8, 70S	1
83	HMHR ABI	"O" Ring 2 7/8 x 3 1/8 x 1/8 G.S.	1
84	HUIL ABD	Split Pin 3/16 x 2 1/2 SS	1
85	HEID AAA	Grease Nipple 1/8 BSP Straight	1
86	-	-	-
87	105286	Nut (coupling)	1
88	-	-	-
89	-	-	-
90	-	-	-
91	-	-	-
92	106083	205 Impeller - 5 bladed Trimmed	1
93			
94			
95			
96			
97	JAJM YBL	Socket Set Screw M6 x 40mm plated	1
98	102185-4	Anode	1
99	102757	Coupling (to suit 1410 Hardy Spicer)	1
100	103014	Clamp (splashguard)	1
101	103015	Splash Guard	1
103	103043	Plug	1



NOTE :- Seal item (18) to intake face with R.T.V. sealent all round.

TRANSOM ASSEMBLY

Item	Qty	Part No.	Description
1	1	HEID AAS	Grease Nipple 1/4 UNF
2	1	103389	Guide Tube
3	1	106066	Bush
4	2	63390	Ball Half
5	1	106065	Cap
6	4	JELK AAC	M6 Spring Washer
7	4	HYQHXAR	M6 x 100 LG Bolt ST ST
8	1	103387	Rubber Washer
9	1	103384	Seal Cap
10	1	103386	Spring
11	1	103388	Seal Housing
12	1	63391	Nylon Bush
13	1	61398	Scraper Seal
14	2	103385	Washer
15	1	102982	Cleves Pin
16	1	HUILAAF	Split Pin 1/8 X 3/4 S.S.
17	8	JDQHXAA	M6 Nut S.S
18	1	106064	Cap Plate
33	1	106067	Bush Retainer

REVERSE CONTROL ASSEMBLY

TRANSOM ASSEMBLY

(106063SY)

REVERSE CONTROL ASSEMBLY

CONTROL HANDLE ASSEMBLY

(103006)

CONTROL HANDLE ASSEMBLY

Item	Qty	Part No.	Description
19	1	103013	Spring
20	1	103117	Control Lever
21	1	103012	Pin
22	2	HUILABF	3/32 x 1/2 S.S. Split Pin
23	1	JAJY AAI	5/16 UNC x 3/8 Screw SS
24	1	1030101	Lock Gate
25	1	63388	Cable Operator D2
26	5	JEQKXAA	M6 S.S. Spring Washer
27	5	JDQHXAA	M6 S.S. Nut
28	4	HYQHXAI	M6 x 60 S.S. Bolt
29	1	103011-1	Control Cover
30	1	HYQHXAB	M6 x 30 Bolt S.S.
31	1	103366	Adaptor
		E300962	Cable - Ex U. S. A.
32	1	D345	Cable - Ex Australia Teleflex
		9206568	Cable - Ex U. K. Morse
	or	SC72	Cable - Flexatrol.
31A	-	104276	Adaptor (Optional) Flexatrol