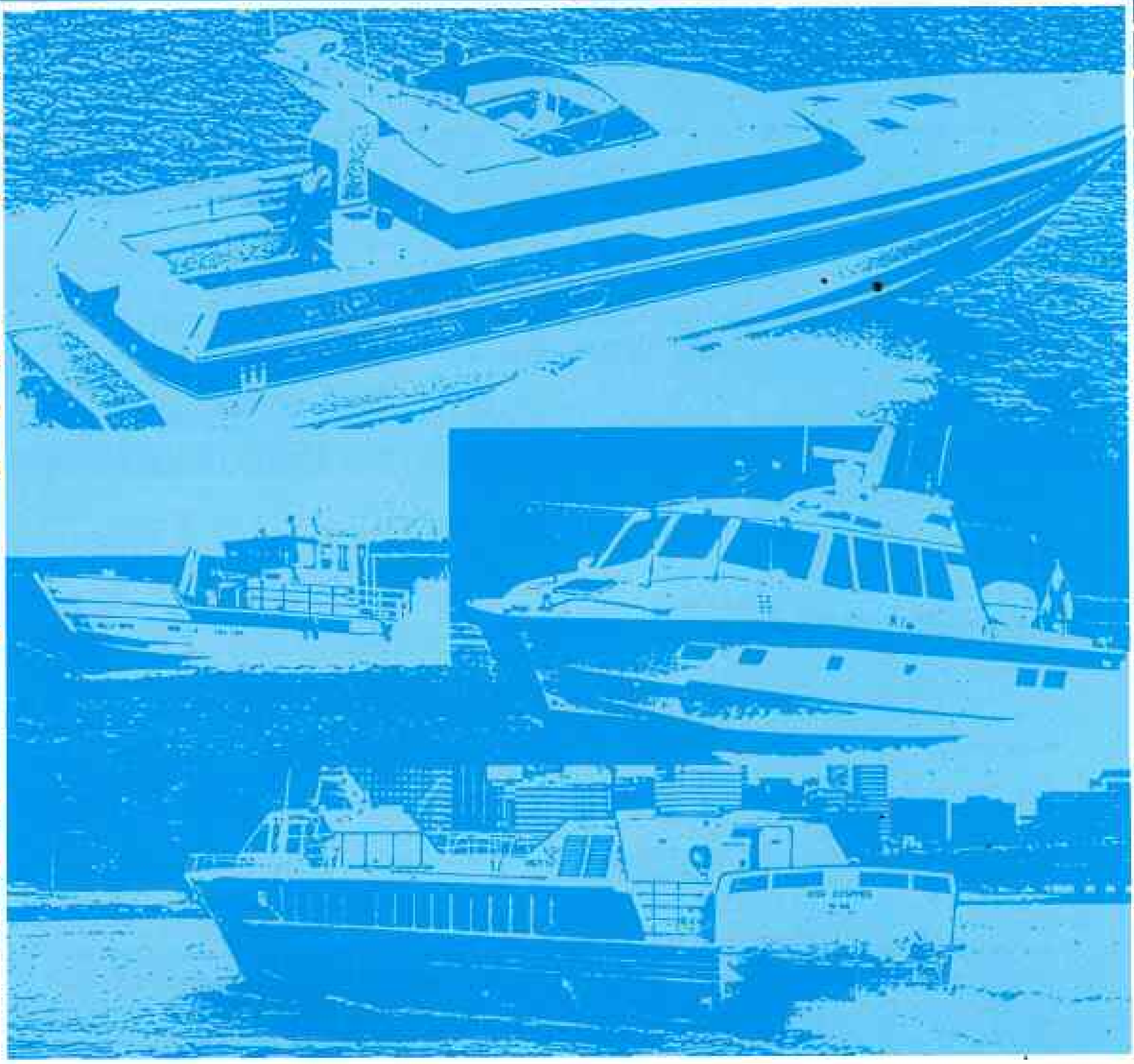
HamiltonJet

Application Guide



Guide to suitable hull shapes and appropriate Hamilton Jet model.
For detailed information on each model refer to Designer's Manual.

THE POWERFUL ALTERNATIVE

C.W.F.HAMILTON

GROUP OF COMPANIES

ON REFLECTION

If ever there was a dream come true, a fine example would have to be the story of Charles William Fielden (Bill) Hamilton OBE - New Zealand farmer, inventor, engineer and jet boat pioneer.

No better precis of the life of the founder of C.W.F. Hamilton Limited could be found than in the introduction to the story of his life, "Wild Irishman", which says:

"Bill (C.W.F.) Hamilton OBE was born in 1899 at Ashwick Station, near Fairlie in South Canterbury. His talent for invention and love of boats developed from an early age and he grew up to be a high country farmer, racing driver, engineer, and - almost by accident - the first man to make the jet propulsion of watercraft a practicality. Where in the world there are shallow and dangerous rivers and floods, there you will find Hamilton-patent jet units operating. His gift for making things work and for designing revolutionary equipment is self-taught, for he had no formal engineering training whatsoever. This may account for his success, during the Second World War, in personally training unskilled men to do high-precision work in the little back-country factory at his Irishman Creek Station in the Mackenzie Country - a really extraordinary enterprise ...".

Thus began the development of a great New Zealand engineering firm.

The dream of the young Bill Hamilton to build a boat which could travel up-stream against the current was nearly 50 years in the realising, but he lived to see his dream become a practical reality for real significance to the economy of his country.

The jet boat was his dream: and today the Hamilton jet unit is recognised as being ideal for a wide range of heavy duty operations throughout the world - in places as far apart as Scandinavia and Southeast Asia.

Building on Bill Hamilton's success, son Jon taught himself computer technology to refine the early jet units built by his father; and representing the next generation still, Mike takes the family saga the full step forward into the use of the latest technology.

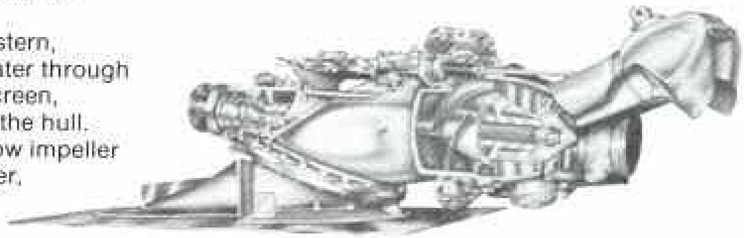
For his contribution to manufacturing Charles William Fielden Hamilton was awarded the OBE, and then knighted for his services. Looking back over the years Sir William Hamilton is quoted as feeling deep gratitude to the many fine people who came along with him, in one way or another, from the first days at Irishman to his triumph in engineering, adding "Well, I had such a great team of chaps with me".

Hamilton Group

— Background

C.W.F. Hamilton & Co. Ltd. Founder, the late Sir William Hamilton, experimented with jet propulsion during the early 1950's. He sought a propulsion system to power a small river boat up the fast flowing mountain fed rivers of his home country, New Zealand. By the mid 1950's he had developed the world's first successful water jet, establishing the well earned reputation as being the pioneer of marine jet propulsion.

Today, the combined expertise gained from over 30 years in the field keeps C.W.F. Hamilton to the fore in water jet propulsion. New generation Hamilton water jets reflect the latest technological advances. Computer aided impeller designs, tested to perfection using a closely monitored closed circuit water tunnel, give high propulsive efficiencies — better than the best propeller systems at medium to high planing speeds.



Inboard mounted, near the stern, Hamilton water jets draw water through an intake duct and debris screen, fitted flush to the bottom of the hull. A high performance axial flow impeller pumps high volumes of water, discharging via a nozzle projecting through a sealed transom opening. This results in powerful forward thrust. The force of the generated thrust is fully transmitted through the intake base to the hull with no thrust being transmitted to the engine via the driveshaft. A single piece steering deflector is mounted on the tailpipe. Controlled by an inboard tiller arm it directs the jet of water to port or starboard, providing powerful, sensitive self-centring steering.

Hamilton's electronic reverse control system (HERC) links the hydraulically actuated thrust reversing deflector to the control lever, affording finger tip reverse control. With the deflector fully lowered up to 55% of full forward thrust is available as reverse thrust. In the mid-way "zero-speed" position there is no resultant forward or reverse thrust, but full steering is always available for precise manoeuvring.

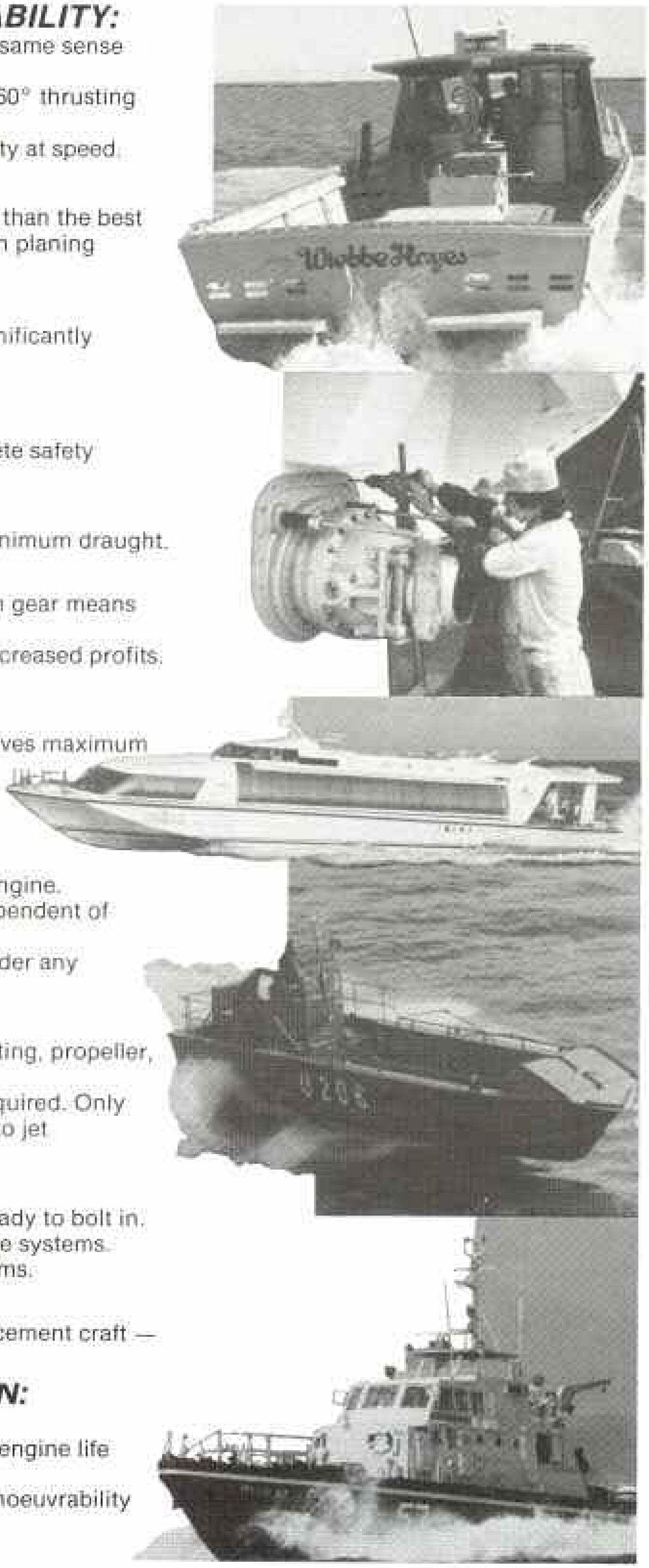
Infinitely variable forward or reverse speeds can be selected by raising or lowering the reverse deflector from the "zero-speed" position, and even at full speed, can be instantly lowered, acting as a powerful emergency brake.

Normally directly driven via a short slip-jointed universal driveshaft coupled to the engine flywheel adaptor, Hamilton water jets are available in models compatible to most popular high speed marine diesel engines up to 1400 hp.

All units are supplied factory tested, assembled as a complete package including integral steering and reverse systems, reflecting simple low cost installation.

HamiltonJet

— Advantages



EXCELLENT MANOEUVRABILITY:
- Precise fingertip steering maintains same sense at all speeds.
- Hamilton "zero-speed" steering — 360° thrusting for docking and holding station.
- Reverse thrust "power braking" ability at speed.

HIGH EFFICIENCY:
- Propulsive and fuel efficiency better than the best propeller systems, at medium to high planing speeds.

LOW DRAG:
- Lack of underwater appendages significantly reduces hull drag.
- 8-12% less hull resistance common.

TOTAL SAFETY:
- No exposed propeller allows complete safety around people in the water.

SHALLOW DRAUGHT:
- Smooth hull bottom lines affords minimum draught.

LOW MAINTENANCE:
- Elimination of protruding propulsion gear means no impact damage and snags.
- Minimum downtime for repairs — increased profits.
- Simple maintenance routines.

SMOOTH AND QUIET:
- No hull vibration or torque effects gives maximum comfort.
- Eliminates high speed cavitation.
- Low underwater acoustic signature.

MAXIMUM ENGINE LIFE:
- Jet unit impeller finely matched to engine.
- Power requirement completely independent of boat speed.
- No possibility of engine overload under any conditions.

SIMPLICITY:
- Single module replaces rudder, shafting, propeller, strut, gland, bearings etc.
- No heavy and expensive gearbox required. Only simple direct drive line from engine to jet coupling.

EASY TO INSTALL:
- Complete factory tested package, ready to bolt in.
- Includes integral steering and reverse systems.
- No difficult engine alignment problems.

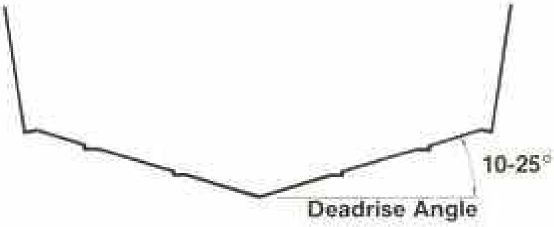
FLEXIBILITY:
- Suitable for both planing and displacement craft — single or multiple jet installations.

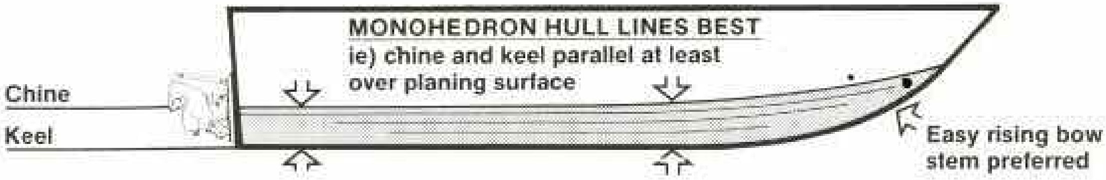
SECONDARY PROPULSION:
- No drag at speed.
- Unloads main propellers, increasing engine life and reducing maintenance.
- Excellent slow and "zero-speed" manoeuvrability
- Boosts top speed.
- Increases acceleration.

PLANING CRAFT  — Hull Shapes

RECOMMENDED

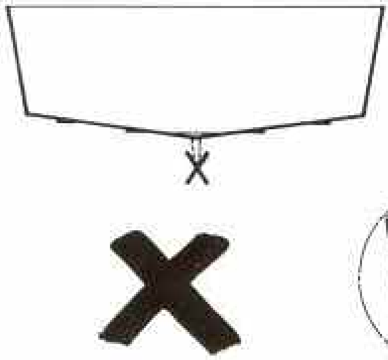
Some deadrise angle in planing craft is desirable to ensure that aerated water from the bow wave does not enter the jet, causing slip and power loss. A deadrise angle between 10° and 25° is generally acceptable.

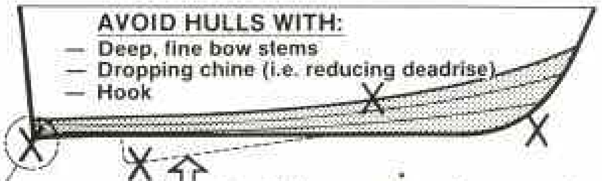


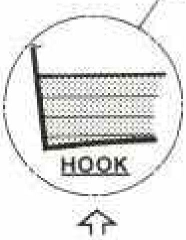


A hull with monohedron lines (ie chine and keel parallel, at least over the planing area) is recommended and gives best handling and performance. An easy rising bow stem is preferable — avoid deep, fine stems, these can cause "bow steer" and ultimately result in poor handling.

NOT RECOMMENDED







There should be no appendages, such as: keels, rudders and planing strakes for at least 2m in front of the waterjet intake. Any such protrusions can greatly affect performance. Strakes or keels outside the intake area are acceptable.

A hooked bottom over the aft planing surface is a common cause of poor handling and high speed broach. It should therefore be avoided.

Should there be any doubt in the selection of a hull, or suitability of an existing hull, submit all relevant details to C.W.F. Hamilton & Co Ltd for a detailed appraisal.

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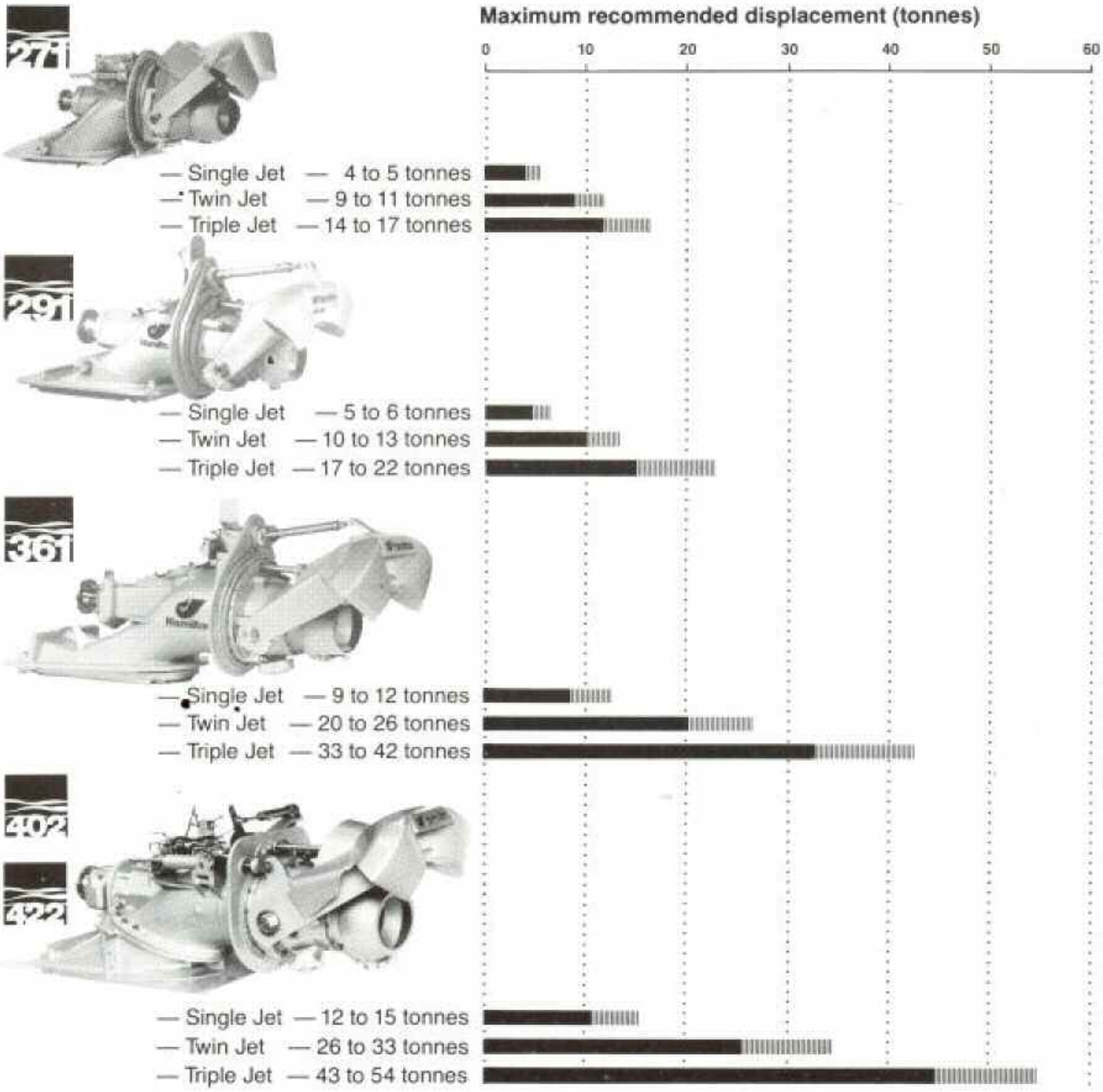
PLANING CRAFT  — **Jet Selection**

Having determined the hull shape is suitable, estimate the likely all-up-weight (AUW) of the craft. Include fuel, passengers and payload.

Using the estimated AUW of the craft as a guide select an appropriate model (or multiple of jets) from the "Jet Selection Table" below.

Best efficiency is achieved by selecting a jet (or multiple of jets) below the recommended maximum displacements.
Operating at maximum recommended displacement assumes the hull size and shape is suitable for that displacement.



Should the application fall in the shaded region or outside these limits contact C.W.F. Hamilton & Co Ltd with all relevant data for a detailed appraisal.

HamiltonJet

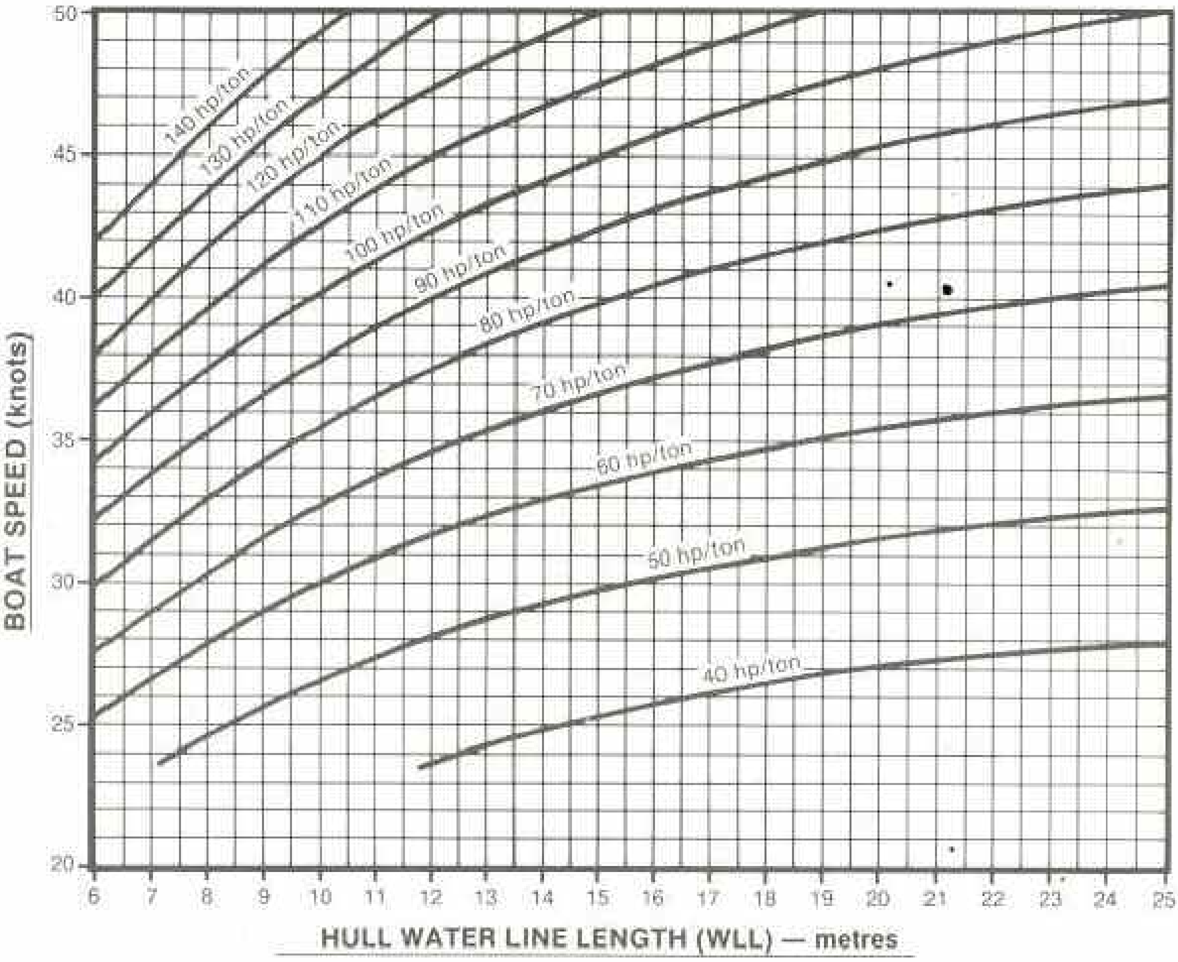
PLANING CRAFT — Performance

Using the "Speed Guide Table" plot a vertical line corresponding to the waterline length of the craft (m).

For best propulsive efficiency, plan for a minimum speed of 25 knots.

At the point where the vertical line intersects the nominated boat speed on the horizontal axis read off the required power/weight ratio (hp/tonne).

SPEED GUIDE TABLE



Speeds predicted from this table are approximate only, e.g. deep vee hulls may be 2-3 knots slower. Should an accurate speed estimate be required, hull resistance data can be superimposed over the jet dynamic thrust curves — refer to selected model jet "Designer's Manual".

If hull resistance data is not available, submit the following information to C.W.F. Hamilton & Co Ltd for an accurate assessment.

- ***All up weight (AUW)***
- ***Waterline length (WLL)***
- ***Max. Chine Beam***
- ***Deadrise Amidships***
- ***Deadrise at Transom***

HamiltonJet

PLANING CRAFT —Engine Selection

Having determined the required power/weight ratio (hp/tonne) from the planing craft "Speed Guide Table" and estimated the approximate all up weight (AUW) in tonnes; multiply the two figures to obtain the total power input (hp) required at the jet.

Power/Weight Ratio — hp/tonne **X** **All Up Weight (AUW) — Tonnes**

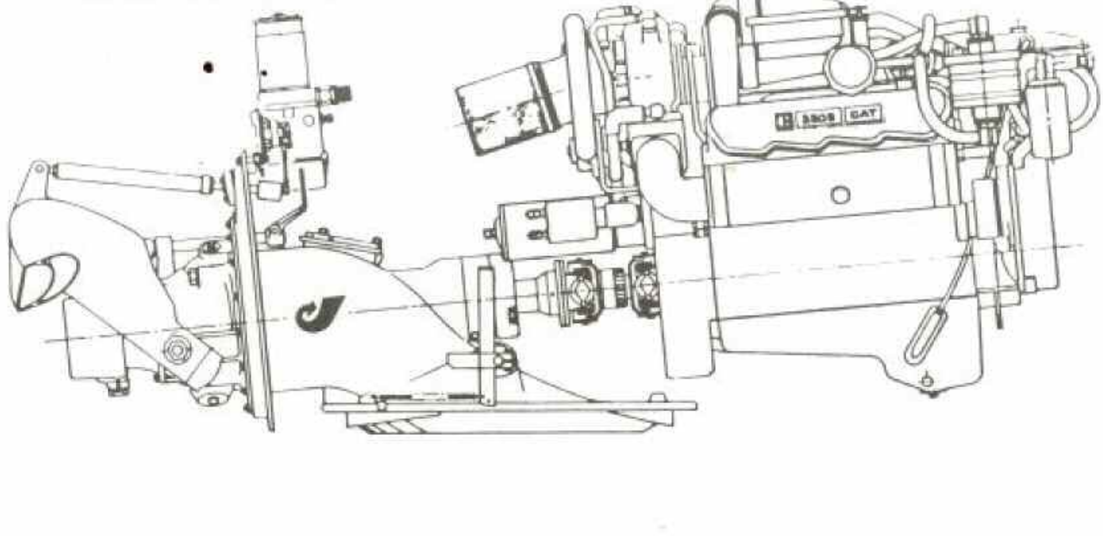
= **Required Total Power (hp)**

For multiple jet installations, divide the "required total power" by the number of jets to give the power output required for each engine.

Select an engine of power equal to, or greater than required, within the R.P.M. range of the selected model jet — refer to power/rpm curves in selected model "Designer's Manual".

Common direct drive engine matchings for planing craft are listed in Engine Matching Tables in the selected model jet "Designer's Manual".

Maximum power inputs to each jet are:
271: 225kW (300hp)/2800rpm.
291: 300kW (400hp)/2800rpm.
361: 580kW (780hp)/2300rpm.
402: 790kW (1060hp)/2300rpm.
422: 1180kW (1580hp)/2300rpm.



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DISPLACEMENT CRAFT

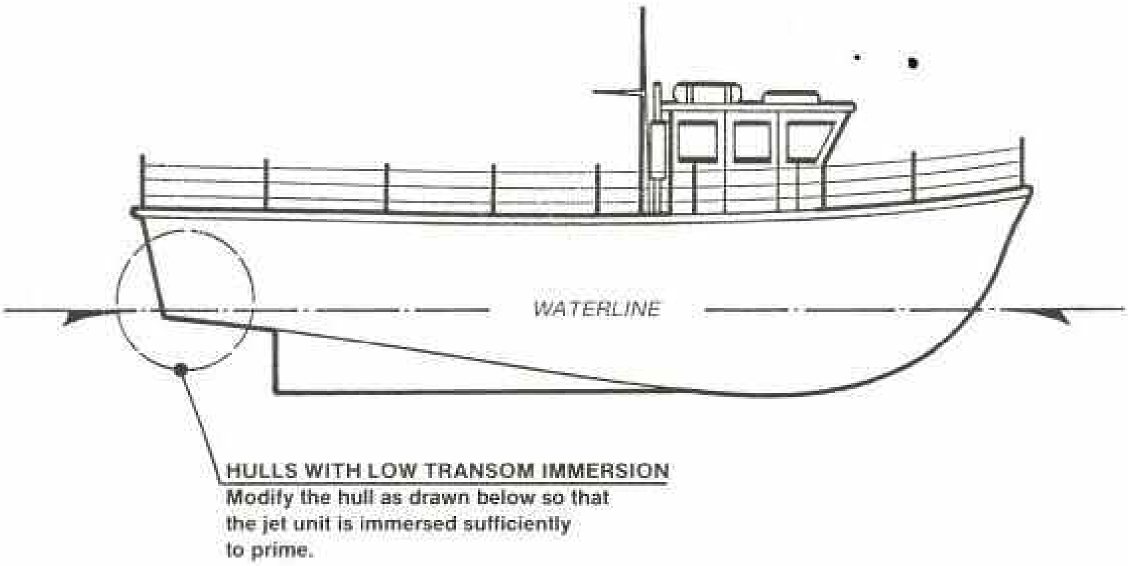
— Hull Shapes

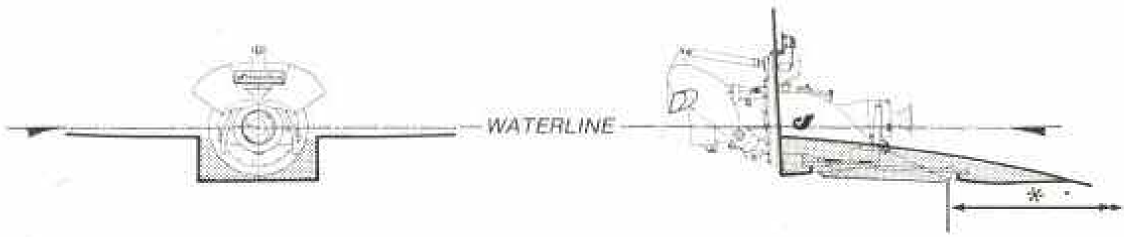
Hamilton water jets are suitable for propulsion of displacement craft up to their natural displacement speed (limited by the length and efficiency of the hull, rather than power input).

Long, narrow easily driven craft are the most suitable and tend to be faster. A conventional vee'd stem bow with a minimum of 10° deadrise is recommended to avoid air entry to the jet.

There should be no appendages such as: keels, rudders, or lap strakes for at least 2m in front of the jet intake. Any such protrusions can cause air to enter the waterjet, resulting in slip and power loss. Strakes or keels outside the intake area are acceptable.

Minimum immersion of the water jet is with the water level at least up to the mainshaft when the craft is at rest. For craft with low transom immersion a hull modification may be necessary to ensure the water jet is immersed sufficiently to prime.





** Remove all appendages within 2m in front of jet intake area*

HamiltonJet

DISPLACEMENT CRAFT — Jet Selection

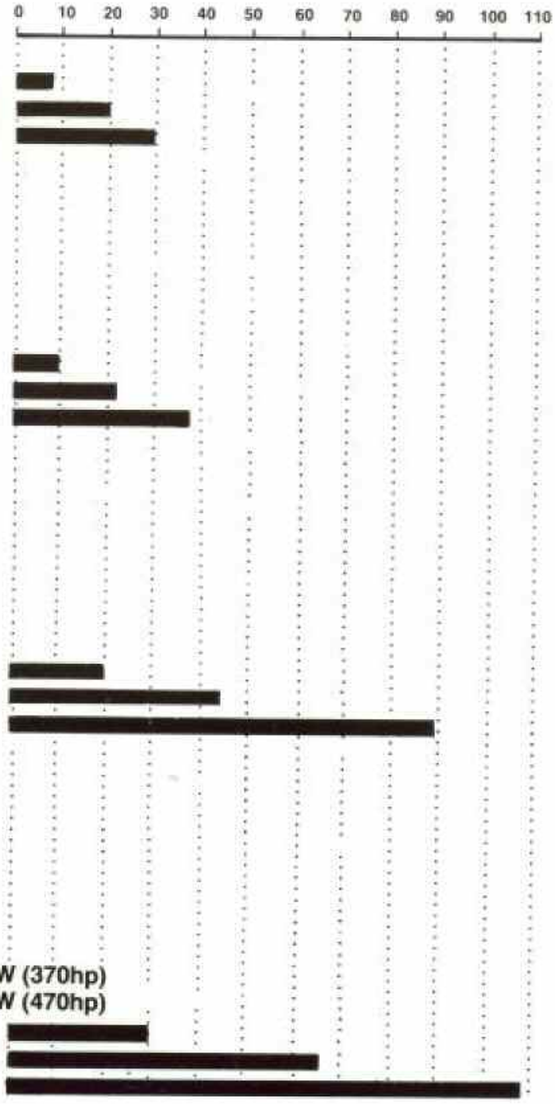
Having determined the hull shape is suitable, estimate the likely all up weight (AUW) of the craft. Include fuel, passengers and payload.

Using the estimated AUW of the craft as a guide select an appropriate model (or multiple of jets) from the "Jet Selection Table" below.

Best efficiency is achieved by selecting a jet (or multiple of jets) below the recommended maximum displacement.

*Maximum Power Inputs Per Jet

Maximum displacement (tonnes) at maximum power input(s).



271

***110kW (150hp)**

— Single Jet — up to 9 tonne
— Twin Jet — up to 20 tonne
— Triple Jet — up to 30 tonne

291

***150kW (200hp)**

— Single Jet — up to 10 tonne
— Twin Jet — up to 22 tonne
— Triple Jet — up to 38 tonne

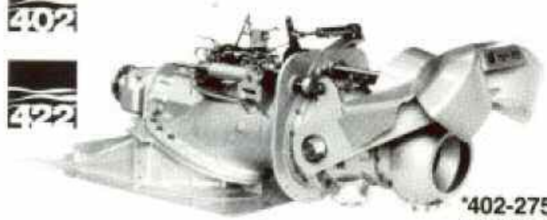
361

***225kW (300hp)**

— Single Jet — up to 20 tonne
— Twin Jet — up to 45 tonne
— Triple Jet — up to 90 tonne

402

422



***402-275kW (370hp)**
***422-350kW (470hp)**

— Single Jet — up to 30 tonne
— Twin Jet — up to 66 tonne
— Triple Jet — up to 108 tonne

Should the application fall outside these limits contact C.W.F. Hamilton & Co Ltd with all relevant data for a detailed appraisal.

HamiltonJet

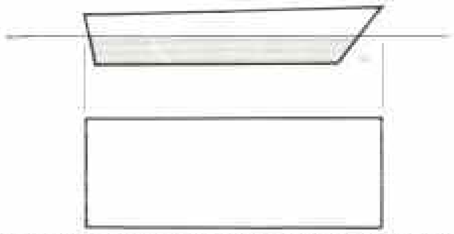
DISPLACEMENT CRAFT — Performance

The speed guide table below can be used to estimate the Natural Displacement Speed (N.D.S.) of the hull. This speed will be achieved at moderate engine power. Do not attempt to exceed N.D.S. with a pure displacement hull shape — doubling the engine power may only increase speed by 1 knot or so.

HIGH RESISTANCE

Displacement Speed
hull shapes

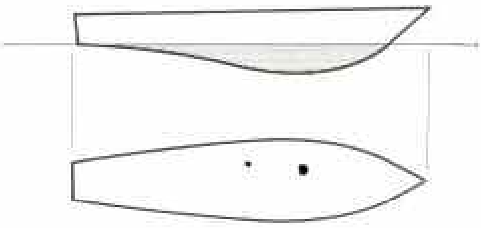
- Low length/beam ratio (below 3:1).
- Flat non-vee'd bow shape (such as Scow type bow commonly used on landing craft and barges).
- Large area of submerged transom.
- Heavy displacement.



LOW RESISTANCE

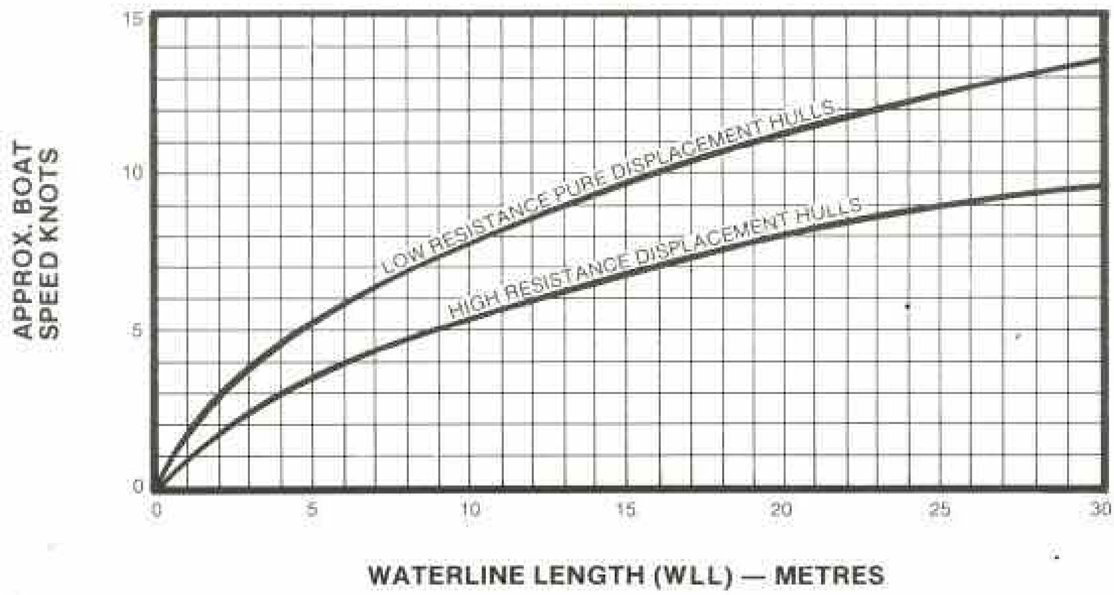
Displacement Speed
hull shapes

- High length/beam ratio (over 5:1).
- Well vee'd bow shape.
- Minimum area of submerged transom.
- Light displacement.



Plot a vertical line corresponding to the waterline length (WLL) — metres, and having determined whether the hull is a high or low resistance shape, read off the approximate Natural Displacement Speed (N.D.S.) of the craft (knots) at the point where the lines intersect.

NATURAL DISPLACEMENT SPEED GUIDE TABLE.



Should an accurate speed estimate be required, having selected a suitable model water jet, hull resistance data can be superimposed over the jet dynamic thrust curves — refer to selected model jet "Designers Manual".

If hull resistance data is not available, submit all relevant information including drawings or photographs to C.W.F. Hamilton & Co Ltd for an accurate assessment.

HamiltonJet

DISPLACEMENT CRAFT — Engine Selection

Determine the required power/weight ratio (hp/tonne) to reach the natural displacement speed of the craft and obtain good manoeuvrability.

Use between:- **5 hp/tonne**
For low resistance hulls, especially with beam/length ratio of 5:1 or more.

and **15 hp/tonne**
For high resistance hulls that are poorly shaped for displacement speeds.

To obtain required total power multiply the approximate all up weight (AUW) — tonnes by the power/weight ratio (hp/tonne).

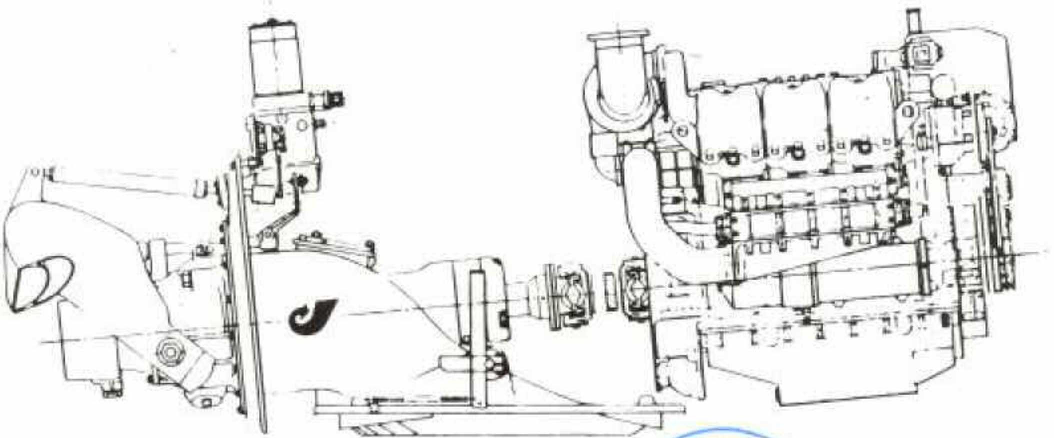
Power/Weight Ratio — hp/tonne **X** **All up Weight (AUW) — tonnes**

= Required Total Power (hp)

For multiple jet installations divide the "required total power" by the number of jets to give the power output required for each engine.

Select an engine of power equal to, or greater than required, within the RPM range of the selected model jet. Refer to power/rpm curves in selected model "Designer's Manual".

Common direct drive engine matchings for displacement craft are listed in engine matching tables in the selected model jet "Designer's Manual".



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