A TECHNICAL AND COMMERCIAL VIEW OF THE WATERJET PROPULSION MARKET

# JetTorque from HamiltonJet

Vol. 2, Issue 09
March 1999

## Waterjets Favoured for Eco-Tourism

*"The first collision took place on Aug 2 when a humpback whale surfaces a few yards in front of the jet propelled catamaran … this may not have been an avoidable collision … the whale has been sighted since the collision and its wound appears to be healing.*

*… says the humpback would probably have died if it had been struck by a propeller-driven vessel, as was the case on Sept 12 when a minke whale was gored by the propeller of a whale-watch boat from Barnstable, Mass."*

National Fisherman Magazine, December 1998

It makes good sense to minimise the risk to your livelihood and this is exactly what enlightened whale and dolphin watch operators are doing by using waterjet powered vessels. The absence of exposed rotating components underwater is just one of the reasons waterjets are finding favour for this activity. Shallow draft capability, vibration-free operation, outstanding manoeuvrability are just some of the other standard Hamilton Jet features that enhance the experience for patrons on such vessels.

Other users in New Zealand include award winning Kaikoura Whale Watch with a fleet of Hamilton powered monohull and catamaran craft.

17.7m "Discovery IV" Catamaran – twin Hamilton 362 Jets

In New Zealand, Dolphin Discoveries Ltd have recently launched a new 17.7m catamaran capable of carrying 74 passengers on dolphin watching excursions in the Bay of Islands. Powered by twin 362 jets driven by Caterpillar diesel engines, the vessel has a top speed of 38 knots.

On the east coast of the USA, the Bar Harbor Whale Watch Co. operates a 34 metre catamaran vessel powered by quadruple HM461 jets. Capable of carrying 316 passengers at speeds over 31 knots, this vessel runs excursions on the Maine coast of the US.

## In this Issue…



## Special Points of Interest:

- Smaller jet models now with integrated hydraulic reverse systems.
- Modular electronic control system aids installation and commissioning.
- New JT Steerable Nozzle improves jet performance.

## New Waterjet Models

Two new jet models have been introduced to the Hamilton Jet product line in recent times.

### MODEL 213

Suitable for power inputs up to 260kW, the 213 jet is suited to high speed craft typically up to 3 tonnes (single jet) and up to 10 tonnes with triple jets.

### MODEL 274

This jet is suitable for high speed craft typically from 5 tonnes (single jet) up to 17 tonnes (triple jets) with a maximum power input of 265kW per jet.

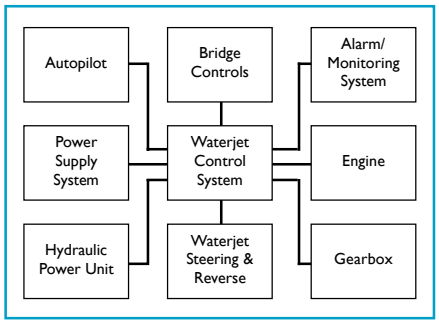
In line with Hamilton Jets policy of providing a completely packaged jet, both these new jets incorporate features such as integral intake and transition duct, hydraulically actuated reverse duct with jet mounted **JHPU** pump and oil cooler and steerable nozzle for precise control.

Model 213 Jet Illustrated

# Modular Electronic Waterjet Control Systems



*The result of an extensive research and development programme, Hamilton Jets new MECS Modular Electronic Control System was recently introduced to the market. This system provides a modular solution to the problem of meeting all the options found in modern propulsion systems. In a typical multiple jet*




Integrated Propulsion System Control Elements

*and control station installation, and considering the need to interface with different bridge, engine and gearbox controls, there can be over 2000 system permutations.*

## Development

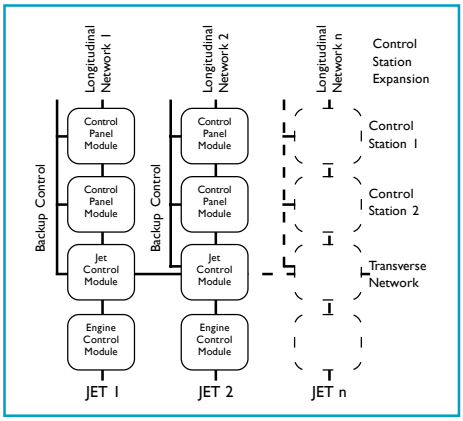
A number of approaches to electronic control system design were considered during the development of the MECS System.

A Centralised Architecture configuration, with each signal hard wired to a single point intelligence was discounted since such systems involve large quantities of cabling and tend to be "project specific" with hardware and wiring variations for each vessel.

A Distributed/Modular Architecture system was deemed to offer the greatest advantages in terms of configuration, installation and operation.

## Design

Meeting Lloyds requirements, the MECS system is a "building block" design based on using a series of standard modules which are arranged on a "per jet" basis with longitudinal CAN bus networks. The network can be built up to suit up to four jets and up to four separate control stations, including aft facing. Modules are interconnected using pre-terminated cables with two-part polarised connectors, an arrangement that reduces installation time and eliminates wiring errors.




Modular Control System Architecture

The modular design allows the system to be easily expanded by "daisy-chaining" panels and special features can be added via this built in expansion capability without changing the basic system.

## Set-Up

The MECS system is software configurable where the Jet Control Module acts as a terminal for all modules and initiates the set-up mode.

The built in set-up software leads the user through the process via a display on the Jet Control Module, resulting in quick set-up with minimal "debugging" by technicians with no prior experience. The software provides automatic control station identification and automated hydraulic set-up for directional valve deadband compensation and steering and reverse cylinder end positions.

## Protocol

The MECS system allows full propulsion system control using conventional helm and single or dual lever reverse/steering controllers. Gearbox control and station transfer is via illuminating push-buttons. Separate back-up control links are provided for each jet and inter-module communication provides a high level of fault monitoring. Status identification is displayed on the operator controls.

Hamilton Jet MECS Control Syustem Components

# Typical MECS Application

The Singapore Police Coast Guard are presently introducing a new series of 18 high speed patrol craft to their fleet. The 18 metre aluminium craft are powered by twin Hamilton Jet HM521 waterjets driven by MTU V16 diesel engines which provide thrust for a top speed in excess of 45 knots. Two other craft, 20 metre Command Craft variants are included in the project. A MECS control system is incorporated in each propulsion system to operate the vessel from either the main or flybridge stations. A remote manoeuvring controller is provided for docking purposes. In terms of ease of installation and operation, reduced installation and commissioning time, rapid set-up and reduced "debugging", the MECS system has been proven to meet all the design objectives.

18m Singapore Police Coast Guard Patrol Craft

Main Helm Station

# Steerable Nozzles



*The steering deflector on a waterjet has considerable influence on the overall performance of the jet, both in terms of steering efficiency and the optimum delivery of propulsive thrust.*

In modern vessels, the steering deflector has to be able to provide…

• Lateral thrust generation with minimum loss of forward thrust.

• Sufficient lock/lateral thrust for good manoeuvrability.

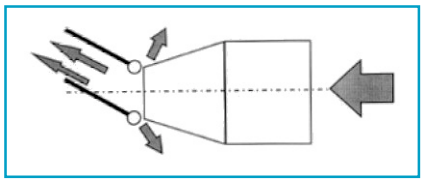
• Minimal actuating loads.

• Reliability under all conditions.

Since the first Hamilton waterjet ran successfully in 1953, as part of Hamilton Jet's ongoing Research and Development programme, steering deflector design has evolved from a basic "gate" type to the modem steerable nozzle.

## Twin Deflector Type T1

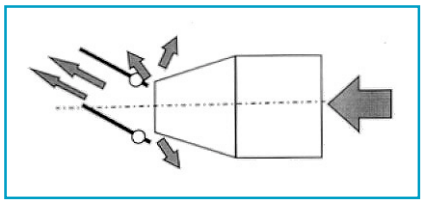
### (circa 1958)



Whilst this first "gate" type steering system was moderately efficient it's operating loads were very high and produced a degradation in forward thrust when the flow was deflected laterally.

## Twin Deflector Type T2

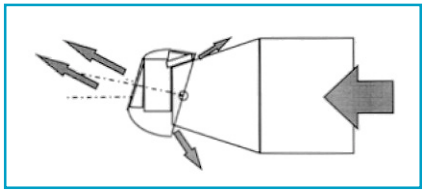
### (circa 1973)



A development of the Type TI, this style saw the deflector pivot point moved aft to reduce the forces on the deflector by having water flow on both sides. Steering efficiency was not significantly reduced but the design meant the steering was not responsive to small helm movements.

## Single Conical Deflector

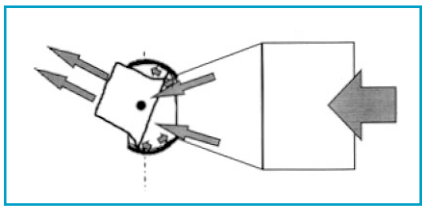
### (circa 1982)



This design saw the reaction forces partly balanced due to the position of the pivot point but forward thrust was reduced when steering and the design tended to generate spray and could be noisy in some applications.

## Ball-Joint Design

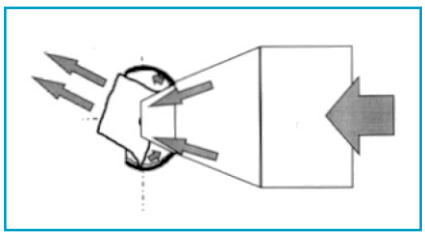
### (circa 1990)



Steering efficiency was good with this design with low, well balanced forces but the pressure drop within the spherical bowl area reduced the for- ward thrust at all times.

## Steerable Nozzle Type JT

### (circa 1998)



This most recent development operates with a stator extension (insert) which allows the flow to exit aft of the spherical bowl cavity, reducing turbulence and improving efficiency. With minimal gap between the stator extension and the inside of the nozzle casing, energy losses are reduced. A nozzle seal eliminates backflow and jamming. Extensive field testing of the JT Nozzle system has shown it to be a vast improvement over the earlier designs. Excellent steering responsiveness has been reported with no engine speed drop off during medium radius turns and an overall performance improvement of up

to 5% is being achieved through improved steering efficiency. A 31 metre passenger ferry achieved a 1.5 knot higher average speed on a 2 hour trip and in an 18 metre 50 knot patrol craft, higher average speed, improved steering responsiveness and reduced noise levels were exhibited.

The key characteristics of the JT Nozzle system are…

• Improved steering responsiveness at all boat speeds.

• Greatly improved low speed steering with no central deadband.

• Reduced nozzle flow disturbance producing lower energy losses.

• Minimal loss of forward thrust when steering.

• Higher overall efficiency through improved course keeping.

• Low steering loads.

• Lower noise levels when steering.

• Patent pending (NZ332031)

## HOW TO CONTACT US

**World Headquarters**
Hamilton Jet
PO Box 709, Christchurch
New Zealand

Phone: +64 3 348 4179
Fax: +64 3 348 6969
Email: marketing@hamjet.co.nz
Internet: www.hamjet.co.nz

**USA Regional Office**
Hamilton Jet Inc.
1111 NW Ballard Way
Seattle, WA 98107
United States of America

Phone: +1 206 784 8400
Fax: +1 206 783 7323
Email: sales@hamiltonjet.com
Internet: www.hamiltonjet.com

**European Regional Office**
Hamilton Jet (UK) Ltd
Unit 4A, The Birches Industrial
Estate. East Grinstead
West Sussex RH19 1XZ
United Kingdom

Phone: +44 1342 313 437
Fax: +44 1342 313 348


**Plus Autorised Distributors Worldwide**

## J5 Distributor Summit

They came from both ends of the Earth to participate in the Hamilton Jet J5 Summit Distributor Conference. 44 delegates from 29 countries as far afield as Finland to Brazil assembled in Christchurch, New Zealand in November 1998. After viewing the recent expansion and upgrading of the Hamilton Jet manufacturing plant, delegates took part in a comprehensive business and social programme and agreed what they saw and heard would enable them to provide even higher levels of service for Hamilton Jet customers and projects in their respective markets.

Renowned US naval architect and marine engineer Mr Donald Blount was keynote speaker for the J5 Summit.

HamiltonJet
The Waterjet Specialists



# From Pleasure...

Worldwide, Hamilton waterjets are making an increased appearance as a standard propulsion option in the recreational cruiser market. The outstanding manoeuvrability of the waterjet makes docking and negotiating crowded marinas safe and simple. The lack of underwater appendages gives a shallow draft capability that allows access to bays and coves that would be off - limits to conventional propeller driven craft. The absence of exposed rotating components also means jet powered craft are safe around swimmers in the water and there is no risk of damage through beaching the craft, running over debris or floating ropes. Good efficiency, low maintenance and worldwide support through Hamilton Jet's Distributor network rounds off the reasons for the jets popularity.

In the U.S.A., builders such as The Hinckley Company and Ted Hood Yacht Builders offer their pleasure cruisers exclusively with Hamilton waterjets. The Hinckley Picnic Boat is a stylish 36 footer powered by a single model 291 jet driven by a Yanmar diesel engine. The "WhisperJet" range of cruisers from Ted Hood incorporates models from 36 to 55 feet long, all powered by twin Hamilton propulsion systems.

Follia 72 – Twin Hamilton HM461 jets – 42 knots

WhisperJet 40 – Twin Hamilton 291 jets – 32 knots

Across the Atlantic, Italian builder AB Yachts offer their range of Follia pleasure yachts with Hamilton Jet propulsion. These craft epitomise the very best of Italian styling and engineering. A recently launched Follia 72 was equipped with HM461 jets driven by Caterpillar diesel engines and has a top speed of 42 knots. Further north in Sweden, Storebro Bruks AB describe their J32 cruiser with Hamilton Jet propulsion as combining the best of the traditional cabin cruiser with all the advantages of the modem day cruiser.

# ... To Treasure

US builder Kvichak Marine have delivered a 52 ft. work boat to underwater exploration company UAS. *"The Surveyor"* is an aluminium craft powered by quadruple Hamilton 321 jets, each driven by 600hp Caterpillar diesel engines. Top speed is 44.5 knots and even with one propulsion system shut down, speeds in excess of 30 knots can be maintained. The vessel will be used for recovering artifacts from shipwrecks etc. and the shallow draft capability allows shoal waters to be worked without risk of damage to propulsion equipment. The high speed allows remote areas to be accessed quickly and adverse weather conditions to be avoided.

An extensive array of electronic equipment is on board to assist salvage operations.