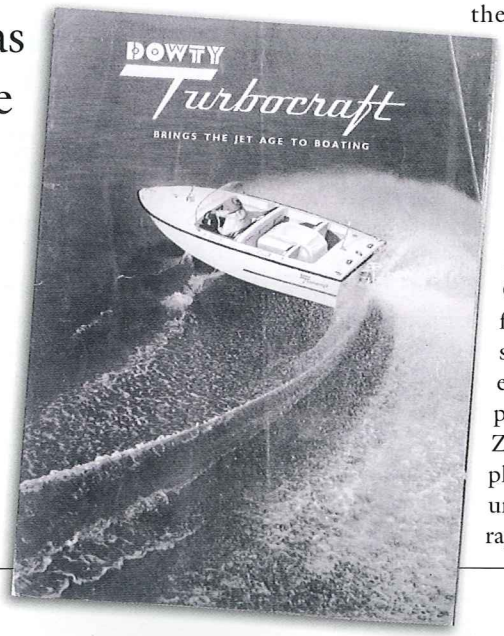
DOWTY Turbocraft

When boats moved into the jet age

The speedboat that was supposed to banish the propeller 50 years ago is fondly remembered by *Adrian Waddams*



Right and above: **The original brochure, showing the strapline: 'Brings the jet age to boating'**

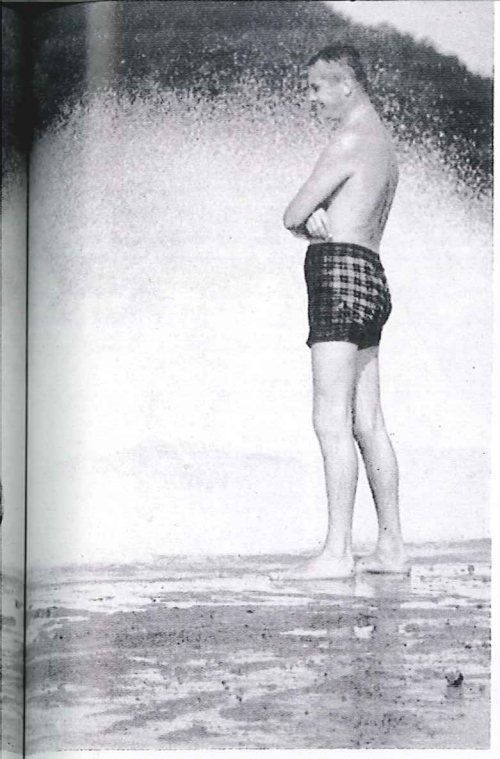
Fifty years ago the Dowty Turbocraft speedboat, unique at that time in being waterjet-propelled, was introduced at the 1960 London Boat Show.

It looked, felt and sounded powerful and could perform manoeuvres and stunts that no conventional speedboat could match. With its flush jet intake, it had no underwater appendages and a shallow draught which meant the Turbocraft could plane at full speed in ankle-deep water and slide sideways dramatically in turns.

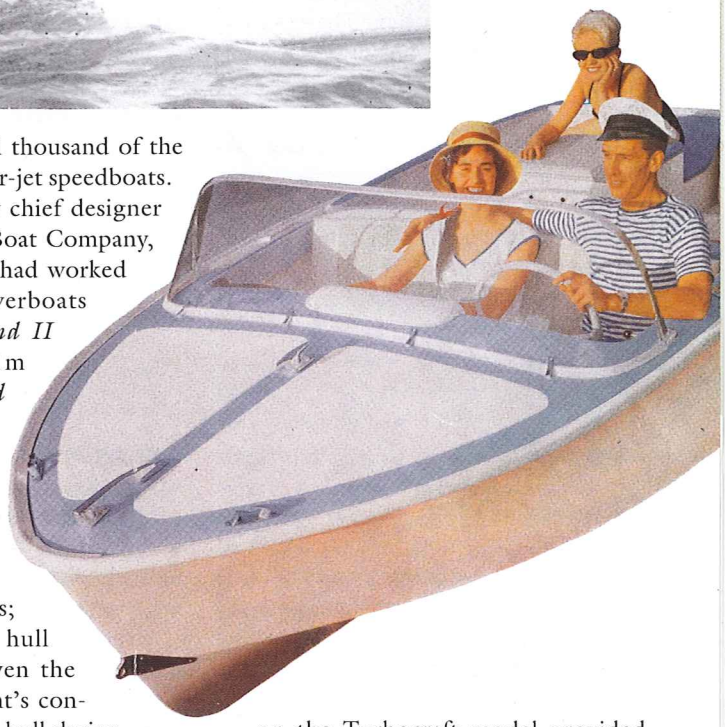
With its propulsion machinery protected inboard there was no risk of damage from grounding and swimmers were safe near the boat. It was an ideal sports boat, particularly suitable for towing waterskiers and shallow-water operation or as a fast tender for large motor yachts.

The Dowty Turbocraft story began in 1959. The 14ft 6in (4.4m) Boat Show model was the first production boat fitted with waterjet propulsion, and it shared this distinction and the Hamilton waterjet unit with the larger Turbocraft models produced by Dowty in Canada and Buehler in the United States. All started their Turbocraft production around 50 years ago as a collaborative venture with the Hamilton company of New Zealand to manufacture jet units under licence with boats to match.

Like its North American sisters, the British Dowty Turbocraft described here had its hull and deck moulded in GRP and was stylish, well finished and fully trimmed. With seating for five or six people and comprehensive standard equipment it was an attractive premium product. The marinised 6-cylinder Ford Zephyr petrol engine was directly coupled to a two-stage Hamilton waterjet unit developed by Dowty that delivered rapid acceleration and 35mph. The price



Far left: **What shear pin? The waterjet unit, with no propeller, meant incredibly low draught, resulting in stunts like this** ***Left:*** **No propeller also meant no danger to swimmers, so it was an ideal boat for waterskiing**



ex-works in 1960 was £798, and with a trailer at £96 10s and a few other extras from the options list you could take your Turbocraft anywhere and be afloat for around £950. It was an expensive package marketed as 'bringing the jet age to boating'.

Dowty Turbocraft were in production until about 1965. The number built is unknown though believed to be more than 1,000, many going to warmer climes. The final Mk III models were built by Watercraft of Shoreham, Sussex, better known as builders of lifeboats and fast patrol boats.

Jet propulsion pioneer

New Zealander CWF (Bill) Hamilton's pioneering development of an effective waterjet propulsion unit is well known. Hamilton wanted a motorboat capable of navigating shallow, fast-flowing rivers and in the early 1950s experimented with an American Hanley Hydro Jet unit, basically a centrifugal pump discharging through a steerable underwater nozzle. Despite poor performance it worked and encouraged further development, but the real breakthrough was to reposition the nozzle above the hull bottom to discharge water through the transom. This eliminated appendage drag, and with the jet stream emerging above the water into air at planing speed, boat performance increased significantly.

Hamilton's own centrifugal waterjet units were in production by 1956, and in 1957 an axial flow unit was introduced. This new Chinook model had two impeller stages; later a three-stage version was added. It was the two-stage unit that Dowty Marine developed under licence as the Dowty-Hamilton jet unit for the Turbocraft, in Britain and in Canada.

Dowty Marine Limited was set up as a subsidiary of the Gloucester-based Dowty Aerospace Group as an ambitious venture to produce several thousand of the Dowty Turbocraft water-jet speedboats. Fred Cooper, formerly chief designer for the British Power Boat Company, designed the hull. He had worked on many famous powerboats including *Miss England II* and Sir Malcolm Campbell's *Bluebird* hydroplanes as well as the RAF High Speed Launch. The lines of the Turbocraft bear a distinct family likeness to these older, bigger and faster sisters; in fact its hard-chine hull was already dated, given the emergence of Ray Hunt's constant deadrise deep-vee hull design.

Donald Campbell's stunts

The Campbell family connection was no coincidence. Sir Malcolm's son Donald Campbell was a director of Dowty Marine and he tested the prototypes and demonstrated the Turbocraft at its press debut in late 1959. One of Donald's stunts was to drive a Turbocraft flat out across a sandbank separating two lakes at South Cerney, becoming fully airborne in the process, and then to carry on after landing on the adjacent lake. He was also the first person apart from Dowty test engineers to demonstrate the spinout turn and crash reverse stops that only waterjet propulsion can achieve.

Having drawn the hull, Fred Cooper commissioned tests on a quarter-scale wooden model at the Saunders Roe towing tank in East Cowes on the Isle of Wight. These occurred during the summer of 1959 when the SRN1, the world's first hovercraft and built by Saunders Roe, was being trialled and demonstrated. Tank tests on the Turbocraft model provided data on running trim, resistance and motion in waves at different positions of longitudinal centre of gravity, and included observation of spray profiles at a range of speeds equivalent at full-scale of up to 40 knots. The slightly warped, hard-chine hull form had a raised forefoot, flared forward sections and a shallow deadrise of 10° at the transom. Once Fred Cooper's design was approved, the full-size prototype using a Ford Zephyr engine was built, and its performance matched the tank tests.

The boat's construction was massive, reflecting the limited experience with GRP at the time. The hull was strengthened by four longitudinal timber beams bonded into it and running from the transom to the flare of the bow. The inner pair acted as engine bearers and were braced with transverse steel bars that also provided davit lifting points. The area around the underwater jet intake was heavily reinforced in GRP for it to bolt directly to the hull. The flange joining the impeller casing

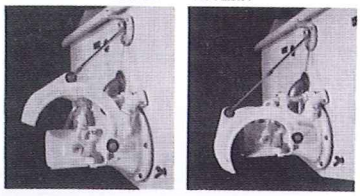
to the jet outlet sandwiched the transom to brace the structure and help transmit thrust to the whole boat. These were very tough boats indeed.

The GRP deck also contributed to structural rigidity and gave a secure feel to the front cockpit, which was protected by a windscreen. A one-piece removable GRP cover protected the machinery in the rear cockpit. On early Mk I boats the engine cover was a simple curved design, and on later Mk II and III models this was more angular, and the deck moulding was also improved with prominent fins which gave some spray protection to rear seat passengers and enhanced the styling. The full-width division between fore and aft cockpits was also lowered on the centreline for better access between.

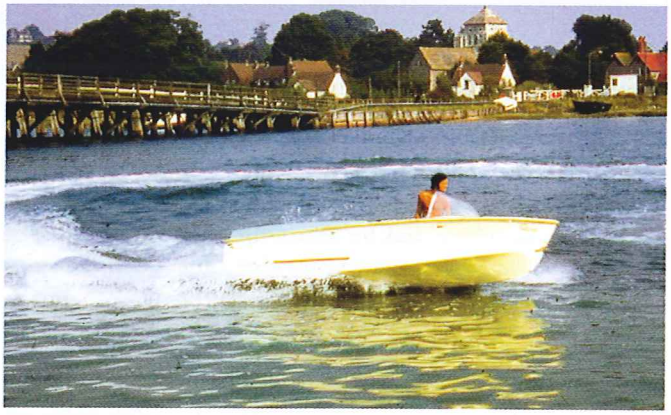
Other improvements were a large ski tow eye and padded covers over the engine and jet unit to provide additional, albeit rather exposed seating. The whole interior was trimmed with PVC-covered GRP panels incorporating storage recesses. A generous freeboard and broad waterline beam gave good static stability and load capacity, making recovery of skiers and movement around the boat unusually easy and reassuring.

Jet unit steering showing two positions of the deflector.

AHEAD ASTERN



Steering was by deflector buckets shown, *right*, in the ahead and astern positions



Z-Cars engine

The 2,553-cc, in-line six-cylinder Ford Zephyr engine was straight from the Z-Cars of the TV series. This cast-iron engine and the aluminium alloy and stainless-steel jet unit together accounted for about half the boat's unloaded weight of 1,400 lb (635kg). The flexibly mounted engine with a Hardy-Spicer universally jointed and splined driveshaft connecting the flywheel directly to the jet unit drive flange tolerated the G forces generated by rapid manoeuvres and choppy water. No gearbox was needed, as the waterjet unit gave forward, neutral and reverse thrust via its cast-aluminium alloy deflector bucket, controlled via a push-pull cable. It is this instant reverse thrust at any engine speed that allows jet boats to perform dramatic crash stops and manoeuvre with precision.

Steering was by a pulley drum, cable and quadrant system moving a simple pair of waterjet deflector vanes. Early boats are distinguished by their exposed steering quadrant over the jet nozzle. This was later replaced with an internal quadrant and shaft arrangement, keeping the cable inboard and allowing all external steering and deflector bucket parts and exhaust to be protected under a GRP transom pod.

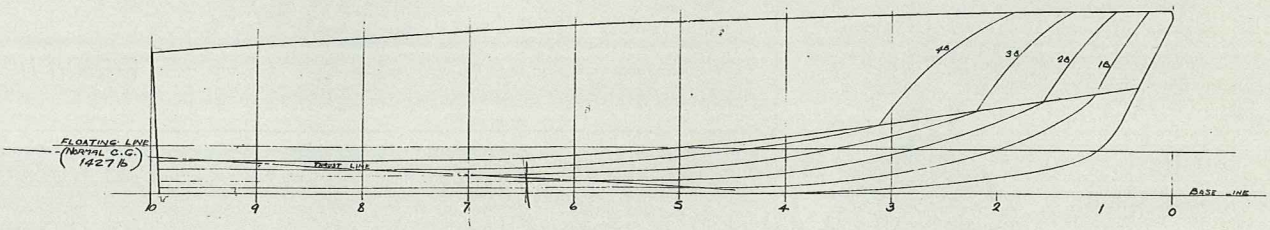
The Zephyr engine was smooth, lazy and simple to maintain. Fitted to the car it developed 85bhp at 4,400rpm, but the coarse pitch of the four-bladed, 7.5in(190mm) stainless-steel impellers in the jet unit loaded it down to 3,500rpm and 70bhp. Keeping full-load engine revs down ensured long life and economy, typically three gallons per hour. It also reduced the risk of over-revving when the boat became airborne or the jet ingested air, as often happened in other than smooth water. For more power, Ruddspeed or Raymond Mays tuning conversions gave 40mph.

Advertising emphasised the appeal to the water-ski market

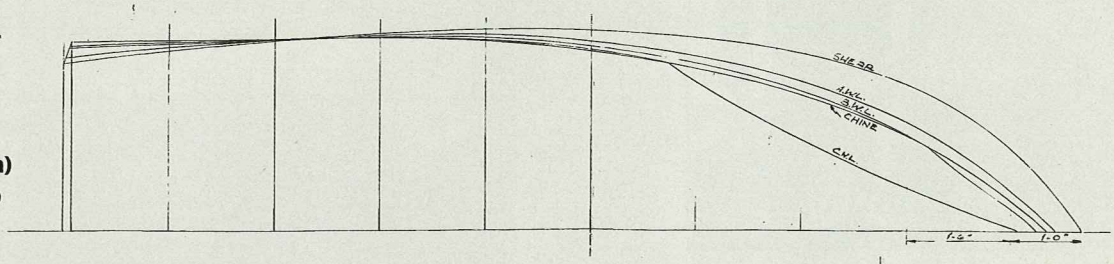
Healey sports boats

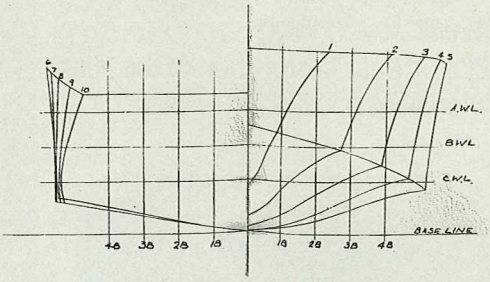
Hamilton jet-propelled Turbocraft started the waterjet revolution. To demonstrate the effectiveness, a team of Buehler Turbocraft were used in the 1960 expedition on the raging Colorado river of the Grand Canyon, shooting the rapids in both directions. Soon after, the Dowty Turbocraft appeared in Britain. Donald Healey and his son Geoffrey installed waterjet propulsion in a number of their well-established Healey sports boats, including the 15ft 9in (4.8m) Healey Corvette sports boats with the 6-pot Austin Healey 3000 engine. These boats were aptly named Healey 707, after the Boeing jet, and could reach 40mph.

With the end of Dowty Turbocraft production in the mid-1960s, Donald Campbell moved on to the Jetstar boats produced by



DOWTY TURBOCRAFT
LOA: 25ft 6in (7.8m)
LWL: 18ft (5.5m)
Beam: 6ft 9in (2.1m)
Draught: 3ft 6in (1.1m)
Engine power: 70 bhp





The Turbocraft was easy to beach

Bluebird Marine at Bolney in Sussex. These were smaller and lighter with more modern deep-vee hulls, and GRP production craft used Italian Castoldi jet units and Ford Cortina-derived 4-cylinder engines. Despite the efforts of Dowty, Bluebird Marine and others, it was well into the 1970s before waterjets began to gain widespread acceptance in sports boats. Dowty continued with waterjet developments of their own for military and amphibious craft and the marine jet business was taken over by Ultra Dynamics.

CWF Hamilton & Co is now one of New Zealand's largest manufacturing businesses, with their jet units in use worldwide propelling large, high-speed vessels like vehicle and passenger ferries, as well as recreational power boats and the shallow-river tourist jet boats, now a big attraction in New Zealand where this story started.

My Turbocraft

My own interest in the Turbocraft began when my cousin bought a 1962 Mk II. During the 1960s *Querida* was kept at Shoreham Harbour in Sussex on a trailer. As a teenager in the 1960s I enjoyed many trips along the coast to Brighton, learning to waterski and helping with maintenance. By 1974 *Querida* needed an overhaul, and having completed my mechanical engineering studies I bought her.

Querida's mechanical systems required an overhaul due to wear or in most cases corrosion caused by inadequate marinisation and original use of non-marine components. The engine was generally in good order having only run about 110 hours. A cosmetic clean-up and a new windscreen completed the job. The effort was rewarded with a boat that worked reliably to original specification.

Driving a Turbocraft is simple after a little practice. Using the foot throttle, jet control and steering wheel in concert the boat can be held stationary, moved sideways, backwards or turned on the spot. It can be driven on and off a trailer or a beach, and driven flat out in less than a foot (30cm) of water.

From a standing start the boat gets quickly over the hump and settles to an almost level trim. Jet units can absorb full power and deliver instant response without excess slip so generally provide greater static thrust than a propeller, and the Turbocraft's manoeuvrability and ease of control was ideal for teaching water skiers, who could be safely approached in the water and cling to the side, legs under the boat as they rested between runs.

In choppy conditions that would be fun in a deep-vee hull, the Turbocraft became uncomfortable, although her easily-driven hard-chine hull and shallow deadrise did allow minimum planing speed of around 10 knots to be maintained in quite large seas. With its substantial weight, strength and freeboard it could still make passage without undue stress on boat or crew.

Future development

The Dowty Turbocraft was a novel mix of older hull design and a safer new propulsion technology, and the combination worked and paved the way for future development. The softer riding deep-vee hull was rapidly attracting interest in the 1960s and soon led to vastly improved high-speed boat designs.

Waterjet propulsion is now widely used in high-speed marine craft from jet skis and personal watercraft to motor yachts, lifeboats and high-speed ferries and military craft, simply because when correctly matched to the boat and application it offers the benefits of durability, safety, performance and efficiency.

The Dowty Turbocraft was no doubt quirky and not without vices, but she was entertaining, capable, and half a century ago demonstrated that waterjet propulsion worked and had a big future.