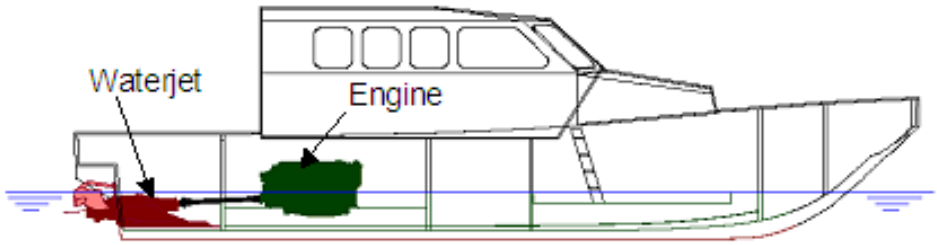
RNLI FCB2 (Fast Carriage Boat 2)

FCB2 is designed to replace the Mersey class which first came into service in 1989 and is now nearing the end of its planned 25-year life span. FCB2, like the Mersey, will be launched and recovered from a beach, but could lie afloat if necessary. As with other all weather lifeboats she will be inherently self-righting in the event of capsize and must be able to cope with the roughest conditions to be found around our coasts. FCB2 will incorporate the latest SIMS (Systems and Information Management System) and after extensive trials will be the first modern generation RNLI all weather lifeboat to use waterjets in place of propellers.

Why use waterjets? As a carriage boat FCB2 will operate in shallow waters and will be intentionally beached. Waterjets are extremely effective in both of these scenarios and the likelihood of damage occurring compared to a traditional propeller driven lifeboat is greatly reduced. If a 25 knot FCB2 with propellers and rudders were to be given the same level of protection there would be a significant drop in both manoeuvrability and performance. Apart from the issue of protection, waterjets will also give the Coxswain greater control when alongside other craft, in confined waters and in all sea conditions.

The rudders and propellers on the Mersey are susceptible to damage during launch and recovery and when in shallow waters. As a result they sometimes need replacing otherwise performance and speed will be reduced.



The hull of FCB2 will have no external appendages, apart from small bilge keels. This allows her to operate in depths that a traditionally driven propeller boat could not go.

There are currently 31 Mersey stations; 24 of these stations launch and recover the boat on the beach via a carriage. FCB2 will be launched from a carriage that can act as either a mobile slipway for launch close to the shore or as a platform that can be driven into deeper water from which FCB2 can then power herself off.

The Supacat system provides sufficient flexibility to allow the method of launch and recovery to be tailored to the local beach conditions. The launching mechanism on Supacat features a single release point at the bow, meaning the present system of Mersey launching using chains released by four crew members is no longer necessary. The new system is more user-friendly and removes the possibility of a foul up during launch because of incorrect chain release or the launching falls snagging on the propellers or rudders.

One of the main requirements when developing the launch and recovery system was to recover FCB2 bow first to the carriage. Mersey recovery requires the lifeboat to be pulled up the beach until enough space is available astern to position the carriage/tractor and then pull the Mersey backwards onto the carriage. This takes time to achieve and on some beaches the recovery may need delaying until the tidal conditions are more favourable. In fact at some locations Shorehelpers end up paddling when completing the recovery! Waterjets and a shallower draft enable the boat to get much closer to the shore before grounding, and in rough conditions coming ashore at speed allows the boat to clear the danger area and be recovered safely.

When FCB2 is safely on the carriage it is rotated by hydraulic power through 180° ready for the next launch. One of the many benefits of FCB2 launch and recovery is the saving on man (or woman!) power, especially during the recovery phase. To launch, only a Tractor Driver and Head Launcher are required, plus any Banksmen to ensure public safety. Recovery can be handled by smaller numbers too, as skids will not be needed in most cases.

The newly developed Launch and Recovery System comprises a completely new submersible tractor [Mercedes-Benz V6 12 litre engine producing 422bhp] and powered-carriage combination, for which Bosch Rexroth was selected to supply the hydraulic drive system to the individually powered tracks. The system has computer controlled hydrostatic transmission, and the permanent four-track drive provides a high level of traction for climbing steep gradients with poor surfaces, such as loose shingle. The L&RS can operate in heavy surf and in water at depths approaching 3m. In case of breakdown, the L&RS is designed to withstand submersion in water up to 9m deep.
The unit can reach top speeds of 10.5mph, at a overall vehicle weight of around 47 tonnes, including lifeboat. The 360° rotating cradle on the carriage enables the FCB2 to be swivelled from its recovery position (bow forward) to its launch position (bow aft), in under two minutes.

The FCB2 Project Team will design and build the first five FCB2s by 2015. This will include through life support, quality management, training, documentation and liaising with the relevant departments as required. The RNLI New Construction Section will then continue to build the remaining lifeboats in accordance with operational needs. FCB2 must comply with all the requirements defined by the Operations Department. As with the new Tamar class, she will need to achieve 25 knots in good sea conditions, but will also be able to operate at 17 knots in sea conditions associated with a Beaufort Force 7. She must be inherently self-righting, have seating for 6 crew (including a doctor), 6 survivors, and enough fuel for 10 hours operation at full power in all weather conditions with a 10% reserve.
Experimental Lifeboat: The current hull is based on an existing commercial design. Unfortunately in rough seas severe slamming has been experienced, which on occasion has led to minor crew injuries (despite the installation of the new Tamar style seats). This problem means she would not be suitable as an operational lifeboat. The FCB2 Project has therefore been extended by three years while a new hull is sourced, fitted out and trialled. Although the delay is disappointing, ensuring our crews have a lifeboat that is effective and safe to operate in all sea conditions takes precedence.

Although the current Experimental Lifeboat will not be developed any further, she will continue to be used for trials for various elements including electronics (SIMS), machinery (engines/waterjets) and wheelhouse design. Over the past 6 months the team have been researching other hull forms for FCB2. Most of this work has involved looking at, and trialling existing commercial hulls, however other new designs (including an in-house option) have also been developed. Eighth scale model testing will soon be conducted in both the open water and towing tanks. The new hull selection process should be completed by January 2009, after which the Prototype FCB2 will be built.

A FCB2 User Group will consist of selected Coxswains, Mechanics and Crew. They will provide comment (before, during and after build) to ensure that input from the coast is considered prior to finalising the design.

It is planned that the prototype will be ready for sea trials in May 2011 with the first FCB2 being operational early in 2013. This may seem distant, but the complexity of RNLI lifeboats far exceeds that of other similar sized craft. Taking time now to get the design right will save time and money later and ultimately result in a better lifeboat.
Information & Images courtesy of RNLI.

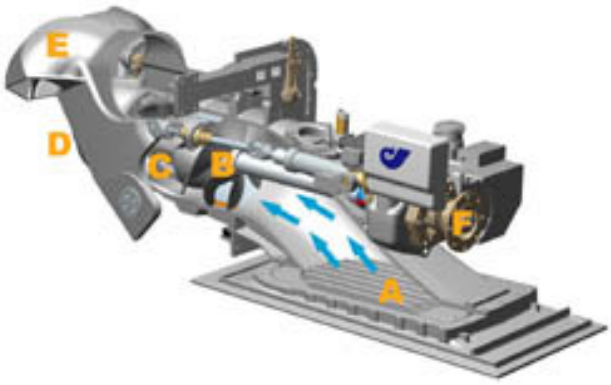
Photo by Scott Snowling

How a Waterjet Works

A waterjet generates propulsive thrust from the reaction created when water is forced in a rearward direction. It works in relation to Newton's Third Law of Motion - "every action has an equal and opposite reaction". A good example of this is the thrust felt when holding a powerful firehose.

Put simply, the discharge of a high velocity jet stream generates a reaction force in the opposite direction, which is transferred through the body of the jet unit to the craft's hull, propelling it forward (see diagram below).

In a boat hull the jet unit is mounted inboard in the aft section. Water enters the jet unit intake on the bottom of the boat, at boat speed, and is accelerated through the jet unit and discharged through the transom at a high velocity.



The picture below shows where water enters the jet unit via the Intake (A). The pumping unit, which includes the Impeller (B) and Stator (C), increases the pressure, or "head", of the flow. This high pressure flow is discharged at the nozzle (D) as a high velocity jet stream. The driveshaft attaches at the coupling (F) to turn the impeller.

Steering is achieved by changing the direction of the stream of water as it leaves the jet unit. Pointing the jet stream one way forces the stern of the boat in the opposite direction which puts the vessel into a turn.

Reverse is achieved by lowering an astern deflector (E) into the jetstream after it leaves the nozzle.

This reverses the direction of the force generated by the jet stream, forward and down, to keep the boat stationary or propel it in the astern direction.

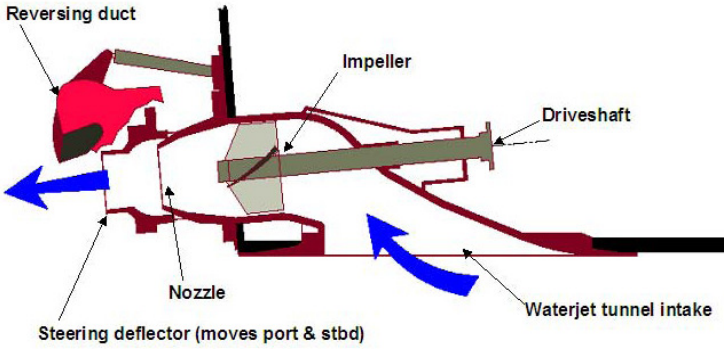


Fig 1. Ahead

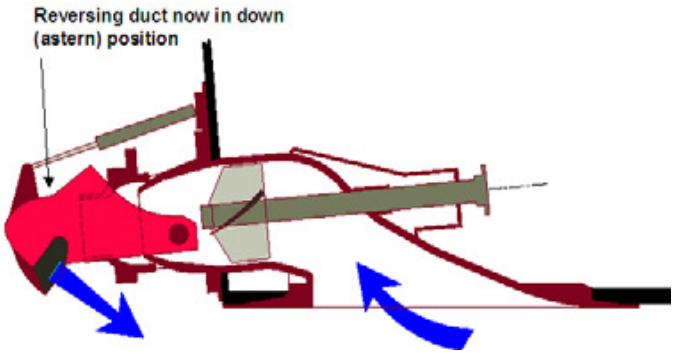


Fig 2. Astern

Information and images from Hamilton Jet & RNLI.
Further information: http://www.hamiltonjet.co.nz/

In mid April, the RNLI posted this first picture of their revised FCB2 hull

RNLI

Update

Back in May I wrote about the RNLI's replacement for the Mersey Class Lifeboat such as 'Lady of Hilbre' at Hoylake. There were problems with the Experimental Lifeboat hull and the project had to be delayed. I recently received an update on the project dated Aug 2009.

'The project is making rapid progress and the develoment of the Prototype is now well in hand. Trials have proved the concept of water jets on a modern All Weather Lifeboat with some Coxswains undertaking specialist training. Trials have also proved the new Supacat launch and recovery system, able to recover the FCB2 bow first. The cab is undergoing redesign and the carriage, inspection and marinisation.

The Experimental Lifeboat hull was not operationally acceptable due to severe slamming experienced upsea. The project was extended by a further 3 years so a new hull could be identified. This involved existing and new commercial designs as well as an inhouse option. Trials have been both full size and model.

Five eighth scale models of potential hull forms were built as well as a model of the existing Experimental Lifeboat. Tests were undertaken both in a ship tank and on the open water. In the final analysis the RNLI inhouse design was deemed to be the best suited for FCB2.

Compared to the Experimental Lifeboat the RNLI design was shown to have 70% less slam events, 53% improvement in transverse motion and vertical motions improved by over a third.

- Various seat options are being tested.
- Scania engines are to be fitted. They are capable of producing more power than existing engines, meaning that at 25 knots they need not work at maximum rating, reducing stress levels.
- SIMS (Systems and Information Management System). Like the Tamar Class, FCB2 will incorporate SIMS, a system which allows crews to monitor and operate the boat's systems remotely from their seats. The FCB2 being smaller than the Tamar, the system has been redesigned to provide a lighter solution, reducing cabling by 20%.

The Prototype is due in the water for operational trials in summer 2011 and scheduled to be on station in 2013.

I understand that Hoylake will get one of the first six boats. However, I have also been given to understand that the Coxswain doesn't want to be the guinea pig with the first.

Thanks to the RNLI for the information in this article. Ed.