

History of Naval Ships Wireless Systems

Part XII(A) – Integrated Communications Systems

This is the final part of the RNZN Ships' communications systems that I will be involved in. After this, it gets simplified, and I must confess, too easy with Satcoms and digital communications. The ICS system in the RNZN was built around the Leander Class Frigates.

Leander Class Frigates – The backbone of the RNZN for nearly 40 years.

Canterbury F421 – ZMCR
Southland F104 – ZMSD
Waikato F55 – ZMPS
Wellington F69 – ZMFS

Broad beamed improved Type 12s:

Dimensions: 372ft x 41ft (Canterbury and Wellington 43ft) x 18ft.

Displacement: 2450 tonnes standard, full load higher, depending on fitout.

Propulsion: 2-shaft double reduction steam turbines, 30,000 hp.

Auxiliary machinery: Turbo-alternators/diesel generators providing 1400 kW at 440V.

Speed: 30 kts.

Complement: 245 – 260

Armament: **Canterbury, Waikato and Wellington** – 2 x 4.5" DP guns, 1 x quadruple Seacat SAM launcher, two x 20mm Oerlikons, 2 x 3 stack torpedo tubes.

Southland – 1 x Ikara A/S rocket launcher, 2 x quadruple Seacat SAM Launchers, 2 x 40/60 Bofors.

Aviation: one Westland Wasp A/S helicopter armed with homing torpedoes.

Canterbury last equipped with the SH-2G Seasprite helicopter.

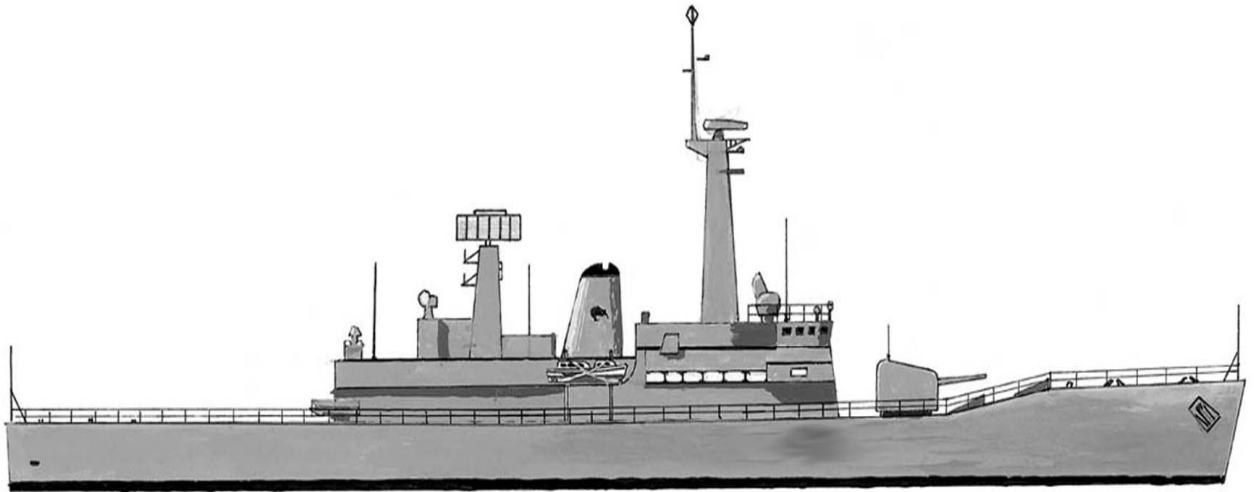
Sonar: the original Type 184 was replaced with the Graseby Dynamics Type 750 sonar.

Radar: Type 993 early warning – foremast

MRS3 x 2 gunnery radar – seacat and turret

Type 965 – long range air early warning – mainmast. Replaced with a Dutch model - **Signaal LW-08 D Band.**

The improved Type 12 frigate had a number of changes to it. No scuttles in the hulls and a washdown system to protect against nuclear fall-out.



The first Leander for the RNZN was **Waikato** – a Batch 2 Leander. Commissioned at Belfast 16 September 1966, went to Portsmouth and Portland for workup and exercises. Sailed from Portsmouth 8 April 1967 and arrived in her home port at Mount Maunganui 2 June 1967. Decommissioned in 1998 and sunk as a diving attraction off Tutukaka. This ship has already broken in half.

Canterbury (Batch 3) commissioned at Scotstoun 22 October 1971, worked up at Portsmouth and Portland and sailed for NZ 1 June 1972, arriving at her home port, Lyttelton 4 August 1972. Decommissioned end of March 2005. Sunk in the Bay of Islands as another diving attraction - Deepwater Cove 3 November 2007.

Wellington (Batch 2) (**ex-Bacchante**) commissioned into the RNZN 1 October 1982 at Portsmouth and departed for NZ 11 October 1982, arriving at Auckland 2 December 1982. Wellington went into refit early 1983 and stayed in refit until 1986. Decommissioned in 2000 sold for \$1 and sunk November 2005 in the Cook Strait, Wellington, as a diving attraction.

Debris from the wreck was washed ashore in Island Bay after a storm - the weekend of 3/4/5 March 2006. 8 March 2006 ship found to have broken in two - identical to **Waikato** - between the gun turret and the bridge. The ship has now broken into three major pieces and has been declared off limits to divers by the Wellington Harbourmaster.

Southland (Batch 1) (**ex-Dido**) transferred to the RNZN at Portsmouth 18 July 1983 and commenced refit at the Vosper Ship builders, Southampton, on the next day. Commissioned at Southampton 21 December 1983, worked up and sailed for NZ 9 May 1984. She called in to Wellington briefly 14 July 1984 before going on to her home port at Bluff, 16 July 1984. Decommissioned in 1995 and sold for scrap. She was towed from Auckland to the Philippines, where she had her engines removed for use in a rubber plantation. After that, towed to Singapore and purchased by an Indian salvage firm, towed to Goa and scrapped on the beach.

All four Leanders served in South East Asia, **Canterbury** at Mururoa, **Canterbury**, **Wellington** and **Waikato** in the Middle East, **Canterbury** to East Timor and **Canterbury**, **Wellington** and **Waikato** to Bougainville. Great sea-keeping qualities as were the Type 12/Whitby class before them.

Communications Fit:

Waikato, Wellington and Southland originally ICS I
Canterbury originally ICS II.

1. Requirements of ICS.

The need for an integrated system became clear in the mid 50's. The reasons for having a new communications system were obvious since at that time, all our HF and MF equipment was outdated and unable to accept modern types of modulation. The control of HF/MF and UHF equipment was not integrated and the layout of ships with Transmitters divorced from the Main Office was inefficient. In addition, each transmitter had its own aerial and the RF was fed from the transmitter to the aerial through a large trunk system.

- a. The initial detailed requirement was for a complete communications system covering the whole frequency range of MF to UHF. However, this was considered to be too costly and so the existing UHF fitting programme (691/692/693/CUH/CUJ) was allowed to continue and the ICS became related to HF and MF frequencies.
- b. It was decided that the new ICS should provide stable, accurate equipment using the most modern techniques so that any form of modulation for the passing of information might be used. EG: SSB Voice, ISB, Multi-channelling, Data Links, etc. The most important single factor being the stability and frequency accuracy, necessary to improve Voice Communications in the HF band using SSB techniques.
- c. At the same time when design was started, it was considered advisable for the equipment to be completely transistorised and so much was built around miniaturised valve circuits with the result that it was rather large and required forced ventilation.

2. Facilities and Capabilities.

The system was built around the following points:

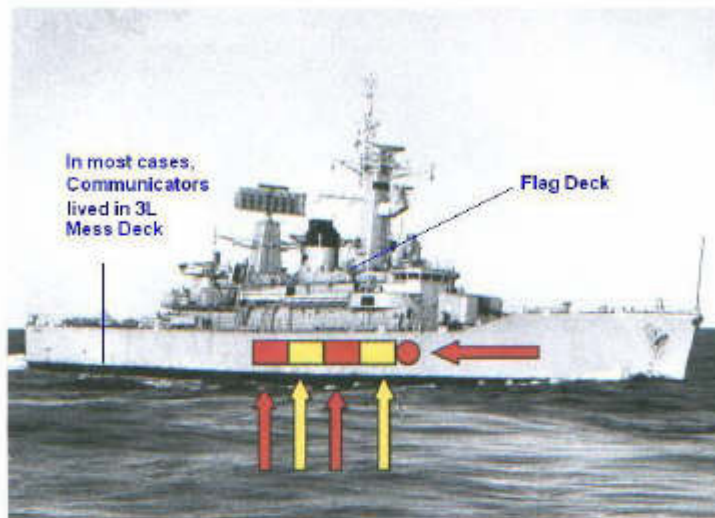
- a. The use of SSB techniques.
- b. Broad-band transmitting aerials using suitable parts of the ship's superstructure as aerials.
- c. A transmitter common aerial working (CAW) System so that several transmitters on different radio frequencies could use the same broad-band aerial simultaneously.
- d. The use of some form of aerial selection for reception of HF transmission using the sky wave mode of propagation.
- e. The provision in each ship of an accurate and stable frequency source from which the radio frequencies for the transmitters and receivers could be derived.
- f. The provision of a central control and monitoring system.

3. Layouts.

The aerials in the ICS were fed by coaxial feeders as the aerials were base tuned.

a. In an ICS ship there was a Main Communications Office (MCO) adjacent to the Operations Room, a Communications Control Room (CCR) next to the MCO which was subdivided to provide a Transmitter Annex for the Power Amplification equipment. UHF equipment was sited in a separate office.

Leander Class



From Left to Right: All on 2 Deck

- LMA/CCR – Lower Maintenance Annex and Communications Control Room
- MCO – Main Communications Office
- Operations Room
- SCR – Sonar Control Room
- UHFO – Ultra High Frequency Office – on port side of SCR

Canterbury's layout (ICS2) differed to the other RNZN Leanders in that the CCR was immediately aft of the MCO with the C and M Desk being just inside the access door from the MCO. ICS1 ships had no access door from the MCO. In later years, the access door on Canterbury was removed and a bulkhead put in place.



MCO on Waikato 1970 - starboard aft. The RO on the left is using the taping up bay, with the LRO standing at a RATT Tactical Bay, used for ship/shore and inter ship. The operator on the right is also using a spare taping up bay - above him are the racks for UHF secure voice - in those days it was mainly fitted for but not with. All the teleprinters were Creed Type 12s.

Unfortunately, the complete layout is too big to effectively show on here.

4. List of Equipment.

Terminology differed from previous fits as follows:

a. Transmission

Outfit TDA - HF and MF Drive Units.

Outfit WBA - HF Wideband Amplifier.

Outfit WBB - Wideband Amplifier modified to cover HF and MF frequencies.

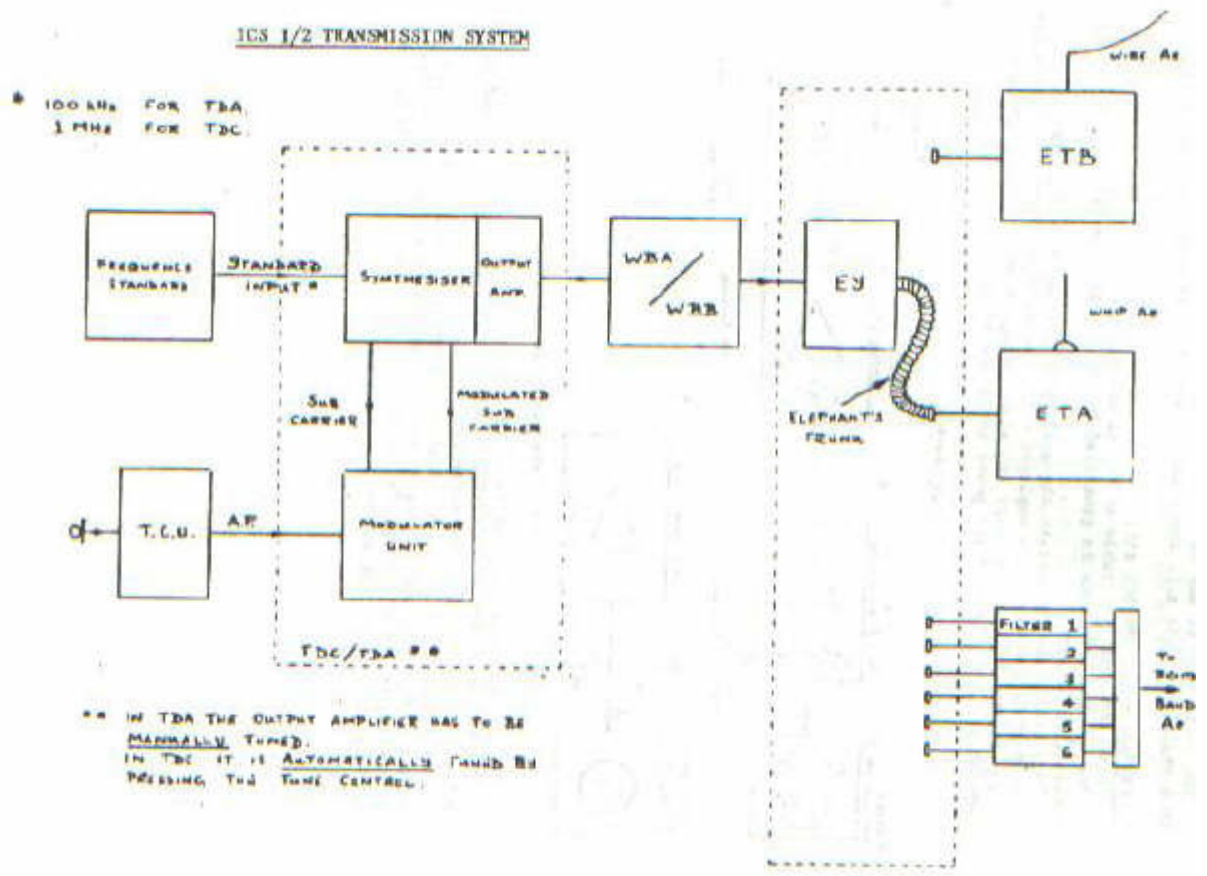
Outfit EY (2) - Transmitter Aerial Exchange for small ships.

Outfit EAW (3) - Transmitter Common Aerial System for Leanders.

(i) Filter units for feeding the output from WBAs to a broad band aerial structure such as the mast.

(ii) Bus bars for connecting the filters to the coaxial feeder to the aerial matching transformers at the base of the aerial feeder.

(iii) HF and MF Base Tuners for individual aerials - HF ETA(1) with AWF whip and MF ETB with wire aerial. The base tuners were tuned from the C & M Desk.



b. Reception

The receiving aerials were normally conventional AWN whips. These were connected to an exchange by coaxial feeder. A degree of space diversity was achieved.

Outfit EZ - Receiver Aerial Exchange which enabled any receiving aerial to be connected to any receiver using CAW.

Receiver Output Exchange (ROX) - gave flexibility in pairing an HF receiver and an HF transmitter.

Outfit CJA - HF receiver with synthesiser for unattended operation.

Outfit CJC - HF general purpose receiver for attended operation in the MCO.

Waikato and Canterbury both had B40 receivers in the MCO, with a B41/Outfit FAZ. These were replaced in the early 80's with CJP receivers.

Outfit CJD - LF receiver for unattended reception. Information on this set is limited although being all valves in the "front end" made it ideal for operation after a nuclear blast.

5. Frequency Standard.

The frequency standard provided a stable frequency output from which all circuits could be given the equivalent stability and accuracy. It was accurate to plus or minus 1 part in 10 to the ninth power. The Leander class frigates used FSA(1).

6. Control and Monitoring Desk.

This was the focal point of the system. It provided for the remote control and tuning of the equipment in a central position and for monitoring any particular radio channel. Ideally this desk was manned 24 hours a day whilst at sea - didn't happen on RNZN ships.



Control and Monitoring Desk

7. Radioteletype - The RATT outfit associated with ICS was Outfit RWA.

8. Control Outfit KMM.

This closely resembled the KH control system.

Control Outfit KMM(3) - fitted in the Leanders.



Control Outfit KMM - this sat against the inner bulkhead as you entered the MCO door.



CJD LF Receiver

Part B will show the HF aerial transmitter characteristics of the Broadband system and how important it was to the Leanders and modifications to the communications fit during and after the 80's.