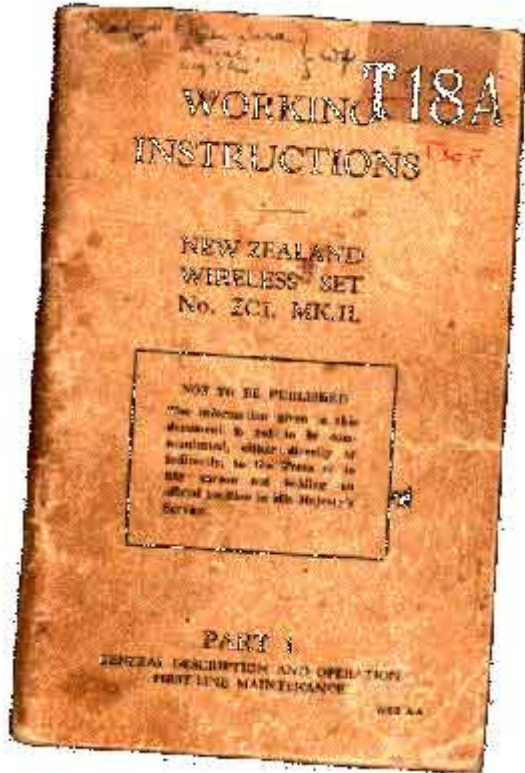


A BRIEF HISTORY OF THE NEW ZEALAND ZC1 HF MILITARY RADIO TRANSCEIVER

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Requirement

With the outbreak of War in 1939, authorities in New Zealand gave urgent consideration to the training and arming of the troops that would be sent overseas to help the British war effort. Equipment of all types was in short supply including field radios. The Ministry of Supply surveyed New Zealand industry to determine what could realistically be manufactured locally under wartime conditions. The Ministry identified a total of six manufacturers of domestic radios, including a smaller number capable of manufacturing a wide range of radio equipment including high power transmitters.

It was decided that New Zealand industries had the capacity to design and/or manufacture a range of special purpose radio equipment including a field radio to be known as the ZC1. There was dissatisfaction with the reliability and range capability of the few existing field radios held by the army. These were generally considered to be barely adequate for training

purposes. The new radio had to be much better and suitable for both mobile and field base operation.

A special committee was set up with representatives from the army, industry, Ministry of Supply and the Post Office to oversee the specification, design, procurement of components and the manufacture of the new radio. This committee reported in April 1942 that sufficient materials were now available for the manufacture of 750 sets of the 1000 Mk I sets approved. Considerable difficulty was being experienced in obtaining certain components, especially meters. Difficulty was also being experienced in retaining skilled technical staff. The ongoing delays in commencing manufacture was causing the Draft Board to lose patience and making it become ever more difficult to convince not to draft the radio technicians required for the manufacture and testing of the radios.

Supply problems were only improved in late 1943 after samples of the ZC1 Mk I were tested by the Canadian Signal Engineering Establishment. Such independent testing was a requirement under the provisions of Lend Lease and the Canadians provided copies of their report to the American and English authorities controlling war materials supply. The report compared the ZC1 with a laboratory No. 19 set Canadian and indicated that overall the ZC1 was superior. The Canadian report particularly noted the following in order of importance.

The ZC1 Mk I gave better:

1. Range, both transmit and receive under normal in abnormal conditions,
2. · Decided saving in primary power due to low battery drain,

3. · Ease of operation in the field by even inexperienced operators, simplicity of dials and operating knobs on front panel,
4. Accessibility in as much as servicing and replacement in the field is concerned,
5. Capability of being able to trouble shoot speedily and easily due to separate send and receive circuits and increased space for assemblies,
6. Flexibility as to type of aerial which may be used with sets,
7. Simplicity of netting procedure, and tuning, indicated by a definite dip in plate circuit,
8. Compact and light in weight approximately half the weight of the No. 19 and comparatively easy to install in any vehicle, and
9. Does not require extensive installing kits to set up for operation.

Records indicate after the Canadian report was circulated that the American Pacific forces showed interest in acquiring a large number of ZC1 Mk II's for their own use. Rather than outright purchase completed sets were to be swapped for essential components required for the manufacture of the sets. Although a small number of sets seemed to have been supplied no major orders eventuated.

Initial plans called for up to 30,000 ZC1's to be manufactured but in practice only about half this number was ever built. During early production runs each individual ZC1 took 60 man-hours to construct. Initial production was 20 sets per week, with a production goal of 2,000 sets per month at peak production. It is not clear if this rate was ever achieved. Delivery of the first batch of five hundred ZC1 Mk I's was planned for December 1942.

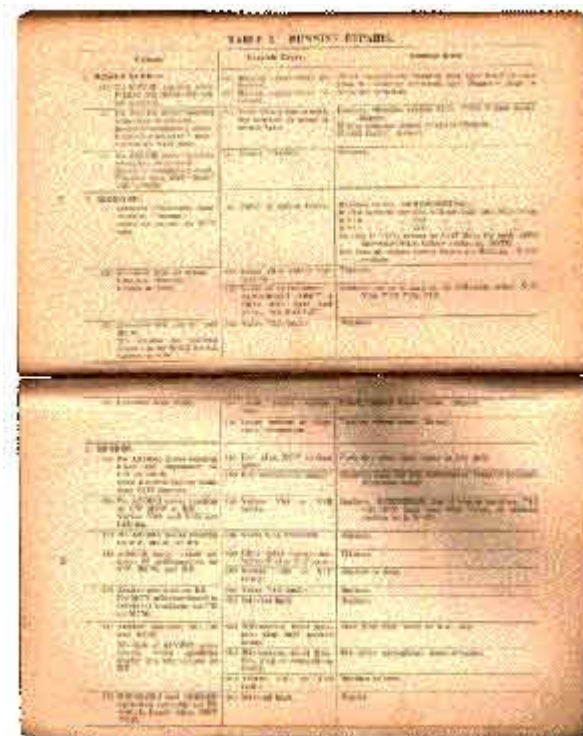
Design

Design of the ZC1 Mk I. is generally credited to Percy Collier and Bill Fever of Collier and Beale; a Wellington based radio design and manufacturing company. It was to at least some extent designed around components available at the time, largely those used in the manufacture of domestic radios.

Specification

The ZC1 Mk1 is a 2 - 6 MHz, single band. CW, MCW and phone capable radio transceiver suitable for vehicle installation (jeep or radio truck) and/or field base operation. The receiver use's a 6U7G RF stage, 6K8G mixer, 6U7G IF, 6Q7G detector and 1st audio stage, 6U7G output and 6U7G BFO. The transmitter use's a 6U7G master oscillator, 6U7G buffer, 6V6GT PA, 6V6GT modulator and 6U7G modulation amplifier. The power supply use's

a non-synchronous vibrator with two 6X5GT rectifiers in conjunction with a tapped transformer permitting switchable HT voltages to provide two different RF power outputs. Its power requirements are 12 volts at 4 to 6 amps depending on mode of operation. In transmit mode a maximum of 2.75 watts RF output is achievable in standard configuration. Using the supplied 34 foot rod field base antenna and associated counterpoise earth, the transmission range is typically between 25 to 34 miles over rolling country. Use of more



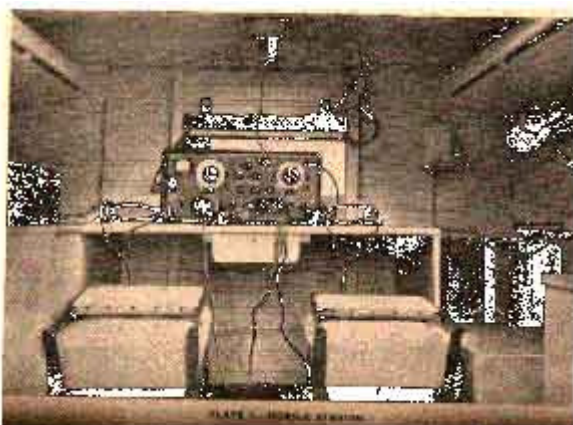
efficient aerials and sky-wave working permit much greater distances to be worked. The top sections of this antenna were suitable for mobile use over shorter ranges.

At least three versions of the Mk I are known:

1. The first version, produced in small numbers, was fitted with an aerial current meter. IF transformers with fixed cores and variable capacitors were used,
2. The second version, also produced in small numbers, used the same IF transformers but had a plate with a watch holder fitted in place of the aerial current meter, and
3. The third and most numerous version used different IF transformers with fixed capacitance and variable cores. The watch holder is fitted directly to the front panel without the need for a plate.

Note: Serial numbers of sets are deliberately not in sequence to disguise build numbers hence providing little clue as to date of manufacture or actual numbers built.

Companion RF Amplifier ZA1 Mk I & II



The ZC1 had a matching RF power amplifier, model ZA1, for long range coverage.

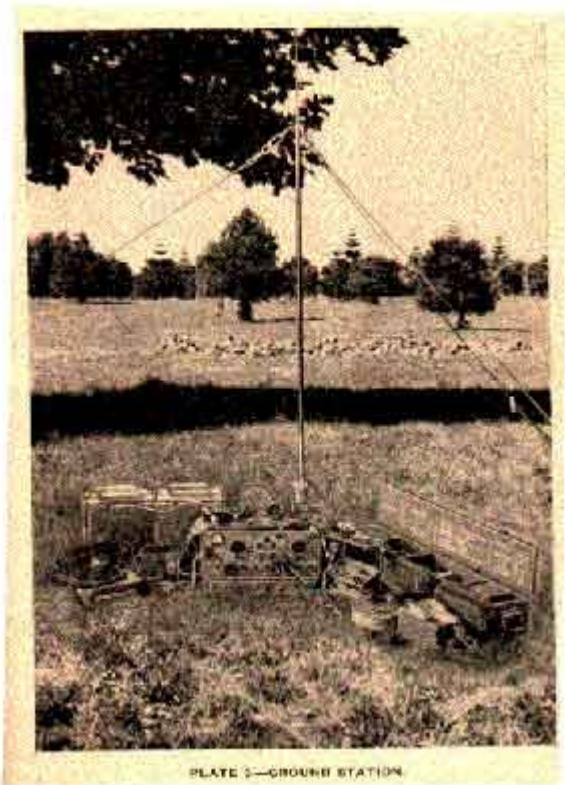
This unit used a similar, but much smaller, case to the ZC1. Two parallel 807's operating in class AB1 were used as an RF linear amplifier producing 50 watts of RF. A later version, the ZA1 MkII, differed in that the parallel 807's were operated in class C and were modulated by a second pair of 807's fed from a 6V6 phase inverter and a 6U7 microphone preamplifier.

Neither mark of the ZA1 was produced in quantity. Official records indicate that it is likely only twelve production ZA1 Mk II's were ever made being ordered, and delivered, during mid 1943.

Manufacture

All ZC1 Mk I units are believed to have been manufactured by Collier and Beale although some sub-components may have been manufactured by other companies. Key components such as meters, valves and the main tuning capacitors were all of Australian, American or English manufacture. Shortage of these components was to plague production until the later part of the war when American "Lend Lease" components became available. Official NZ war records show considerable frustration with shipping problems with large quantities of urgently needed, and already paid for, components being held up for many months on the wharves in the USA while officials argued over their shipping priority.

In all, approximately 1,200 ZC1 Mk I sets were made. However even before manufacture of the Mk I was commenced, design and production of the Mk II was already being planned.



In New Zealand the ZC1 Mk II continued in service with the Territorial Reserve forces until the mid 1960's. They were also issued to many Government Agencies and Departments including the Ministry of Transport, Civil Defence and the NZ Post Office. The Amateur Radio Emergency Corps (AREC) also received a significant number of sets and many were also disposed of as Army surplus. During the 1950's and 60's many NZ Amateur radio operators "cut their Teeth" using ZC1's on 80 Metres. Their owners extensively modified many of these ZC1's and numerous articles appeared in Break In during this period on improvements that could be made. Collier and Beale produced a modification kit for the Mk II to make the set more suitable for small ships maritime use and large numbers of ZC1's were used in this service. The LF receiver section was changed to the AM broadcast band and the HF TX and RX

sections to the marine band.

Common modifications included xtal control for fixed channel use, used by the MOT for car to car communication for their traffic control cars, the Post Office for point to point services and various organisations and individuals for Maritime use. Changes to improve RF power out and modulation depth were also common.

Acknowledgements

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