For years the RNZN operated under the guidance of BR222 and BR2924 as the authority for RF Radiation safe distances and this was rigidly adhered to. However, research has shown that a particular age group of communications and radio technical ratings have suffered an abnormally high percentage of common illnesses, many of which have been fatal. This has mainly come about since the advent of Radio Teletype, resulting in constant radiation of High Frequency transmissions, both at sea and ashore (predominantly in the Transmitting hall at HMNZS Irirangi).

The old BR 222 safe distances are given below:
Interesting to note that one of the major differences is that they believed that the lower frequencies were more harmful. In fact, it turned out under the new regulations that the higher you go in frequency, the greater the safe distance required.

15. Safety
   a. There are two types of hazard which may be encountered from HF wireless transmissions, RF Radiation Hazard and RF Shock and Burn Hazard.
      (1) RF Radiation Hazard. An electric field exists in the vicinity of the transmitting aerial associated with Types 89Q, 603, 605, 640 and Outfits WBA and WBB. The extent of the field varies with the frequency to which the transmitter is tuned and the point along the vertical axis of the aerial from where the measurement is being taken. Tables 1, 2 and 3 below give the safe distances, measured horizontally from the centre line of the aerial, for the combinations of transmitter, aerial and frequency indicated in the tables.

   **Table 1. Type 640 – Whip Aerial**

<table>
<thead>
<tr>
<th>HEIGHT ABOVE DECK ON WHICH BASE TUNER IS MOUNTED (ft)</th>
<th>FREQUENCY</th>
<th>2 MHz</th>
<th>4 MHz</th>
<th>6 MHz &amp; above</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Safe distance in feet from centre line of the aerial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Less than 1</td>
<td>Less than 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>1</td>
<td>Less than 1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>2</td>
<td>Less than 1</td>
<td></td>
</tr>
<tr>
<td>12 or more</td>
<td>4</td>
<td>3</td>
<td>Less than 1</td>
<td></td>
</tr>
</tbody>
</table>

B.R. 222

1-11-7

CHANGE NO. 3
Timeline of events is as follows:

1990 Suppression of the US Environmental Protection Agency's report "Evaluation of the Potential Carcinogenicity of Electromagnetic Fields". A US Air Force paper on the EPA report stated: "If published, the EPA report will contribute to public anxiety and have serious impacts on capabilities and costs of air force programs." The EPA report
also mentions that it proposed to classify ELF fields as a probable (Class 2A) human carcinogen and RF/MW fields as a possible (Class 2B) human carcinogen.


1998 The ELF fields were re-categorised to possible (Class 2B) human carcinogen by the US National Institute of Environmental Health Sciences (NIEHS).

1998 NZS 2772 (Intermediate) RF Fields Maximum Exposure Levels possibly in use in the RNZN.

1999 ASNZS 2772 Part 1 1999 - RF Fields Part 1 - Maximum exposure levels - 3kHz to 300GHz is available for purchase from Standards NZ. At about this time, NZBR2924 (RF Hazards in the RNZN) was published changing the safe distances required for HF aerials. **The new safe distances are many times greater than previously known as published in BR222 and BR2924.**

1999 East Timor - HMNZS Te Kaha communicators were unable to raise HMNZS Canterbury by visual means. Unbeknown to Te Kaha, Canterbury’s Flag Deck was not manned because of implementation of ASNZS2772/NZBR2924 - this new evidence decreed that Canterbury’s Flag Deck was off limits when the MCO was manned with the Flag Deck being deemed a possible carcinogenic area.

2000 HMNZS Canterbury visits Dunedin and the Flag Deck found to be off limits due to being a possible carcinogenic area.

2001 The International Agency for Research on Cancer (IARC), a WHO sub-group, also classified ELF fields as a possible (Class 2B) human carcinogen.

2009 HMNZS Hawea visits Dunedin and on Bridge wing ladder leading to radar and radio aerials, there is a sign which states "Warning Possible Carcinogenic Area."

2010 On HMNZ Ships, carcinogenic warning replaced with new RF Hazards signs.

2010 Vatican Radio - Italian courts have been investigating for 10 years whether an abnormally high number of deaths from cancer among families living near the aerials just north of the Italian capital can be attributed to electromagnetic radiation.
The 300-page report, ordered by the courts and carried out by Italy's most prestigious cancer research hospital, now concludes that there is a connection between radiation and the cancer incidents.

The 1999 publication is as follows:

New Zealand Standard

Radiofrequency Fields

Part 1 – Maximum Exposure Levels –
3 kHz to 300 GHz
The following calculations were taken from formulas given in FCC OET Bulletin No 65 to show far-field calculations.

For 1000W transmitting on a Leander Class frigate with 0 dBi operating at 16 MHz taking into account ground reflected waves, the safe distance required in a controlled (occupational) environment is 7.95 feet. Looking at Table 2 below for occupational exposure you will see that the restriction for whole-body SAR (Specific Absorption Rate) is 0.4 W/kg per 6 minutes. That means that if you weighed 70kg and were working within the 7.95 foot radius, you would only be allowed to absorb 28 watts.

<table>
<thead>
<tr>
<th>Exposure category</th>
<th>Frequency range (kHz – GHz)</th>
<th>Whole-body average SAR (W/kg)</th>
<th>Localized SAR (head and trunk) (W/kg)</th>
<th>Localized SAR (limbs) (W/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational</td>
<td>100 kHz – 10 GHz</td>
<td>0.4</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>General public</td>
<td>100 kHz – 10 GHz</td>
<td>0.06</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

**NOTE:**

1. All SAR values are to be averaged over any 6-minute period.
2. Localized SAR averaging mass is any 10 g of contiguous tissue in the shape of a cube; the maximum SAR obtained shall be the value used for the estimation of exposure.

If you feel that your illnesses are attributable to the possible effects of RF Radiation, then you must emphasise the following:

1. In accordance with Veterans Affairs policy, the veteran must be given the benefit of the doubt and that because of now known differences in safe distances, it may be that your health problems were due to exposure to RF Radiation.

2. NZ ships often travelled unaccompanied and were therefore responsible for maintaining communications back to the Command. This invariably meant that two-way communications were required to transmit continuously for 24 hours a day for several weeks at a time. The upper deck adjacent to the High Frequency aerials were often the work areas of communications ratings who would be required to be in the vicinity of these aerials for a minimum of two to four hours at a time. Thereby being exposed to the radiation for more than the now known time limit of 6 minutes.

3. Other instances on the older ships where transmitters were sited in the Wireless Office are known to radiate from the single transmission wire connected to the ceiling prior to entering the aerial trunking due to reflected power radiating within the office. These radiations were often visibly seen as blue arcing between the transmitter and the nearest metallic object or unknowingly being absorbed by the operator.
The following pages from NZS2772 offer evidence that RF radiation is a possible hazard to health. This includes cancer and cataracts which are well known effects of RF Radiation (as taught on the Radio Frequency Managers Course, USAF Keesler AFB, Biloxi, Mississippi, USA). Note: The Biomedical Engineering Department at Dunedin Hospital wear their cellphones in pouches with lead backing to avoid possible radiation to the lower area of their bodies. Remembering that as the received signal level drops, then the transmitter output increases.

As yet, Veterans Affairs does not recognise Health Effects from RF or EM Radiation and as such emphasising particular health problems may not be in your favour. All you can do is to suggest the possibility that your service within the communications field may have attributed to your illnesses and use this report to help you. The more that put in, the better the chance of being recognised. Unfortunately, there are no recognised guidelines that VA can follow on this as they use the US to fall back on with regard to previous conflicts. EG: Agent Orange and Nuclear Radiation sickness. The NZ Medical profession are reluctant to back your claims as they too have no guidelines to follow and feel that they may be out on a limb by saying that your illness is as a result of RF/EM Radiation. The government is currently non-committal as are the cellphone companies as this could eventuate in rather large compensation to the Veterans, the Military and civilians alike.
APPENDIX B
MEDICAL MONITORING/HEALTH SURVEILLANCE OF PERSONS OCCUPATIONALLY EXPOSED TO RF
(Informative)

B1 Pre-placement
A pre-placement health assessment for employees who will be occupationally exposed to RF is required and may be done by self-administered questionnaire. This should provide base-line occupational and relevant medical history information, and must identify the presence of:

(a) Surgically-implanted medical devices susceptible to RF e.g. conductive/metallic devices which may re-distribute incident RF energy, such as metallic implants and prostheses (excluding dental work) and electronic treatment devices which may be susceptible to interference (e.g. pacemakers).

(b) Pregnancy.
A positive response in answer to (a) above triggers referral (including by phone) to an appropriate medical specialist knowledgeable in the medical effects of RF exposures, who should liaise with the person’s treating doctor and appropriate technical advisers. This is to enable an assessment to be made regarding suitability for RF work.

A positive response to query about pregnancy (b) will lead to implementation of relevant personnel policy and procedures. (Refer to 9.2).

Occupationally exposed workers should have their personnel file identified so that retrospective health enquiries can be made.

B2 Post-incident exposure treatment and medical assessments
The following plan of action is suggested as appropriate in the event of RF over-exposure (proven or suspected):

(a) First aid and treatment should be obtained from the nearest doctor or hospital if required.

(b) Employers should arrange for over-exposed employees to be medically assessed as soon as possible after the over-exposure, in conjunction with a medical specialist knowledgeable in medical effects of RF radiation exposures. A plan for medical management of any case of over-exposure should be developed. In the event that medical assessment of the eye is required then referral to an ophthalmologist and use of the appended examination form is recommended.

(c) A record of the over-exposure, the results of medical treatment, medical examinations, or assessment and follow up as advised by professional advisers, should be made in the employee’s personnel file. Notification and recording of the over-exposure should be made in accordance with the relevant Occupational Health and Safety, and Accident Compensation legislation.

(d) The employer should ensure the employee is fully advised and understands the situation.

(e) The over-exposure or incident should be investigated to determine the level and extent of exposure, and which parts of the body were possibly in the RF field. This information should be recorded as specified in (e) above. Appropriate corrective action or changes to procedures need to be instituted with regard to preventing future over-exposures to any employees working in similar situations.
B3
Employees should be advised (in their training etc.):

(a) About the precautions and procedures in the event of them becoming pregnant, or receiving metallic implants or medical devices, during the time they are engaged in RF work.

(b) About the known biological effects of RF (preferably with a written explanation).

(c) Of the procedures to be followed in the event of any over-exposure and advised of a contact point (medical specialist knowledgeable in medical effects of RF radiation exposures).

(d) That if they become sick they should attend their own General Practitioner (as for any illness or medical condition) and inform their doctor that they work with RF and give the doctor the information about RF referred to in B3(b).

B4 Routine or periodic monitoring
There is no requirement for periodic monitoring. If monitoring for research purposes is required, this should be specifically designed to achieve the purpose.

References

<table>
<thead>
<tr>
<th>Number</th>
<th>Surname</th>
<th>Given name</th>
<th>Sex</th>
<th>Age</th>
<th>Birthday</th>
</tr>
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<table>
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<th>Address</th>
<th>Phone</th>
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</table>

**History**

- Previous eye injury or disease? Yes / No
- Note any history of previous injury or disease or relevant medication

**Visual acuity**

- Snellen notation at 6 m with record of letters incorrect at smallest line seen e.g.: (6/4.5 - 3)
- Unaided visual acuity
- Visual acuity with present glasses, if any
- Corrected visual acuity

<table>
<thead>
<tr>
<th>SPH</th>
<th>CYL</th>
<th>AXIS</th>
<th>SPH</th>
<th>CYL</th>
<th>AXIS</th>
</tr>
</thead>
</table>

**Binocularity**

- Is there a strabismus? Yes / No
- If yes, describe type.
- If no strabismus
  - Heterophoria (in prism dioptres)
    - Distance  
    - Near
  - Vertical:

**Colour vision normal?**

- More than 3 errors on Ishihara (24 plates) Yes / No

**External eye examination**

- Ocular adnexa normal? Yes / No
- Pupils normal? Yes / No
- Iris normal? Yes / No
- If no, describe.

**Intraocular pressure (record in mm Hg)**

<table>
<thead>
<tr>
<th>RE</th>
<th>LE</th>
</tr>
</thead>
</table>

**Slit lamp examination (pupil dilated)**

- Cornea normal? Yes / No
- Anterior chamber normal? Yes / No
- Record any abnormality.
- Any lens opacity? Detail lens opacities on adjacent page Yes / No

---

**Figure B1 – Eye examination record proforma**
Ophthalmoscopic examination
Culvar fundus: posterior pole and periphery normal? Yes No
Describe any abnormality.....

Classification of lens opacity
Congenital
1.1 Blue dot
1.2 Coronary/club
1.3 Axial embryonic
1.4 Sutural/stellate
1.5 Anterior polar
1.6 Posterior polar
1.8 Nuclear

Age related
2.1 Cortical lamellar superation
2.2 Cortical spokes/wedges
2.3 Cortical vacuoles
2.2 Nuclear brunesence

Secondary/Trauma/Toxic
3.1 Contusion or penetrating injury
3.2 Equatorial vacuoles
3.3 Posterior capsular
3.4 Posterior sub-capsular
3.5 Posterior polychromatic lustre
3.6 Anterior capsular/sub capsular
3.7 Diabetic (snowflake) cataract
3.8 Other not classified above
4.1 Aphakic or pseudo aphakic

Draw the location and extent of any opacity

Right eye
Transverse View
Axial View

Left eye
Transverse View
Axial View

Description

Figure B1 – Eye examination record proforma (continued)