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New Zealand Army Dismounted Soldier Power Requirements

Oliver M Broughton
December 2013

NEW ZEALAND ARMY DISMOUNTED SOLDIER POWER REQUIREMENTS

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ABSTRACT

This report investigates the power requirements of electronic equipment that New Zealand soldiers carry dismounted into theatre. It analyses different soldier roles and units for missions up to 72 hours without re-supply. Foreign soldier power requirements are evaluated to estimate possible future NZ Army dismounted energy requirements.

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EXECUTIVE SUMMARY

BACKGROUND

The New Zealand Defence Force 'Soldier Power' Battlelab commenced on 1st July 2012 with the purpose:

“To investigate the different avenues that are currently being offered in individual soldier electronics charging and how they may be employed in the future by Army. Ultimately, this battle-lab will help build knowledge and inform capability development and acquisition relating to individual soldier power and charging systems that could be employed at the patrol/sub-unit levels.”

The program of work also called for a series of reports, co-authored by the DTA, detailing the observations, conclusions and recommendations resulting from the Battlelab.

SPONSOR

DTA Project D0821 Power & Energy

Lt Col Kaio; Queen Alexandra's Mounted Rifles

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AIM

This report aims to address two objectives of the Battlelab:

Objective 1: Identify and record the total power requirements of dismounted soldiers to support in-service equipment and equipment which may be employed in the foreseeable future (i.e. systems that are currently commercially available and may be introduced into service within two to five years).

Objective 2: Develop an understanding of the total mass of the conventional batteries that power this equipment.

RESULTS

For a 72 hour mission NZ infantry section commanders carry approximately 2kg of batteries. Standard members of an infantry section carry approximately 0.3kg of batteries.

Fire support group operators (Javelin) are expected to carry up to 9kg of batteries each for 72 hours.

A dismounted signaller in a platoon or company command can be expected to carry approximately 7kg of primary batteries.

Signals retransmission stations and company HQs each require approximately 35kg of batteries to operate for 72 hours. For a dismounted retransmission (uncommon), this is a significant load.

Due to upgraded technologies, foreign nations have approximately double the energy requirements of the NZ Army infantry units. Australian and British section commanders carry at least 7.5kg of batteries for their command and control systems. They also carry counter IED equipment with a significant energy requirement.

Future energy requirements for NZDF are estimated at 1440Wh total for 72 hours dismounted for a standard infantryman, or 2300Wh for a battlefield management system equipped commander. This estimate is based on the power requirements of other nation's operating systems as mentioned above.

GLOSSARY

2IC	Second in command
AN/PEQ-15	Army/Navy night-vision equipment
AN/PRC 119	Army/Navy portable single channel ground and airborne radio System (SINCGARS), 5 watt output man-pack radio
AN/PRC 148	Army/Navy portable handheld radio, power output 0.1 to 5.0 watts
AN/PRC 150	Army/Navy Man-pack radio with high frequency and power output, up to 20 Watts.
BA5590	Non-rechargeable medium format battery, typically used for AN/PRC 119 and 150 radios in theatre.
BB2590	Lithium Ion rechargeable battery, typically used for AN/PRC 119 and 150 radios, in training exercises.
BCU	Battery Cooling Unit (Javelin Weapon)
CIED	Counter Improvised Explosive Device
CLU	Command Launch Unit (Javelin Weapon)
CR5	Small lithium battery
CZY 10	Army/Navy cryptic data transfer device
DSTL	Defence Science and Technology Laboratories (United Kingdom)
DSTO	Defence Science and Technology Organisation (Australia)
FCS:	Fire Control System (50 calibre machine gun accessory)
FSG	Fire Support Group; infantry heavy weapons; rocket launchers (javelin), heavy machine guns etc.
HQ	Headquarters
HWTS	Thermal Weapon sight
kW	kilowatt: 1000 Watts
kWh	kilowatt-hour: one kilowatt output for one hour (3.6 megajoules)
MINI N/SEAS	Night vision weapon sight

PRR	Personal role radio – small, low output radio, typically used for intra-section communication
UNS	Inline weapon night vision
W	watt: power output= one joule per second
Wh	watt-hour: one watt output for one hour, (3.6 kilojoules)

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1. INTRODUCTION

The soldier power battlelab initiated by Capability Branch aimed to investigate the viability of improving power generation, distribution and storage for dismounted soldiers over a 72 hour mission, with no re-supply. To ensure that the correct technologies were assessed the baseline for existing NZ Army soldier equipment power requirements was established, as well as an estimate of power requirements the NZ Army may have in the mid-term future if additional equipment is introduced. This report summarises the different roles within 1st Battalion; lists the equipment each role requires and analyses the different batteries used to power them. A 72 hour mission profile of battery mass and energy content was then assessed.

2. STANDARD ELECTRONIC EQUIPMENT

Throughout all infantry roles in the NZ Army, a basic set of electronic equipment is carried; there are subtle variations between units but the general configuration is:

- Weapon sights
- Night vision
- Personal role radio
- Sidewinder torch

This equipment is powered by either CR123 or alkaline AA batteries (detailed in Annex A); this equipment typically needs 220 grams of batteries for 72 hours.

Specialised roles have variations in radios and additional equipment; this is examined in the following sections.

3. 1RNZIR ENERGY REQUIREMENTS

Battery use data was collected in interviews with 1RNZIR personnel from several different roles within the regiment. Their current requirements derive from training exercise experience. Where appropriate, estimates have been made to determine battery profiles that would be required in theatre.

Radios AN/PRC 119F & 150C require large BB2590 or BA5590 batteries. The BB2590's are rechargeable and are used only in training. BA5590's are disposable, have higher energy density and are more expensive, hence these are reserved for theatre. The BB2590's have an expected life of 300 charge cycles.

Detailed quantities of batteries and electronic equipment within units are available in Annex A and mission mass and energy totals by role are available in Annex B.

3.1. Company Structure

The following figure details a 1st Royal New Zealand Infantry Regiment Company's vertical structure. Full platoon and section quantities in addition to detailed electronic equipment are omitted. Key radio devices carried are included for reference; these are the AN/PRC 148, AN/PRC 119 & the AN/PRC 150. Personnel numbers are bracketed.

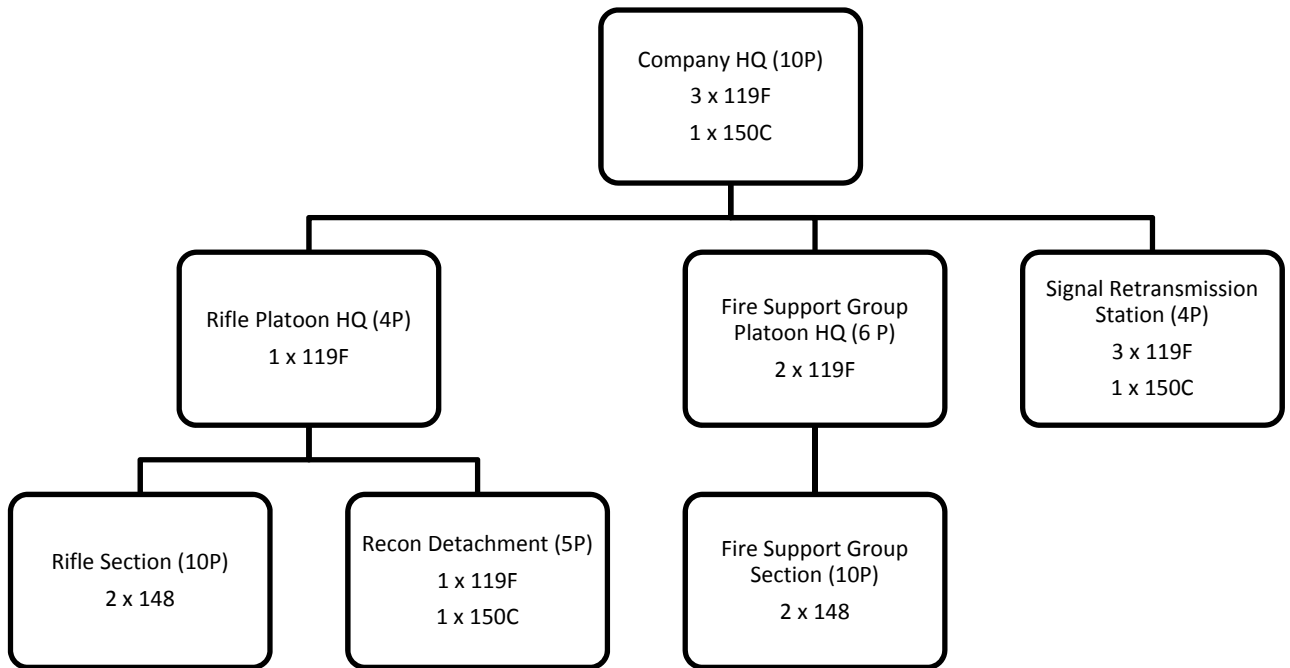


Figure 1 –1RNZIR Company Vertical Structure

3.2. Rifle Infantry

3.2.1. RIFLE SECTION

1RNZIR rifle sections consist of ten riflemen. Each carries standard electronic equipment. The two commanders in each section also carry one GPS and one AN/PRC 148 radio each.

The AN/PRC 148 batteries weigh 0.34 kg; these form the majority of the commander's battery mission mass of 2kg (360Wh energy) for the 72 hour exercise. The AN/PRC 148 batteries may be distributed amongst subordinates.

3.2.2. RIFLE PLATOON HQ

A 1RNZIR Rifle Platoon HQ typically consists of four personnel; a platoon commander, sergeant, signaller and a medic. Each carries standard electronic equipment. The commander also carries a GPS powered by AA batteries.

The platoon signaller operates an AN/PRC 119F radio; requiring 7kg of BA5590 batteries (1300Wh energy).

The other personnel in the platoon HQ carry the standard 0.22kg of batteries over 72 hours, though when dismounted they may carry spare AN/PRC 119F batteries for their signaller.

A platoon HQ is almost always mounted, though dismounted missions may occur.

3.2.3. INFANTRY COMPANY HQ

A 1RNZIR Infantry company consists of ten personnel; two commanders, two sergeants, three signallers, a medic and two riflemen.

All personnel carry standard electronic equipment. One commander carries a GPS powered by AA batteries.

The signals detachment uses four extra radios; three AN/PRC 119F and one AN/PRC 150. To operate these dismounted for 72 hours a company HQ requires 6500Wh of power which is provided by 36kg of batteries, consisting mainly of BA5590.

A company HQ is usually stationary and sometimes mounted; on rare occasion it may be dismounted. A 2kW combustion generator is usually used to provide battery charging and lighting at a stationary company HQ. Some weight savings may be achievable dependent on command and specific operational requirements.

3.3. Fire Support

3.3.1. SECTION

Like the rifle section the Fire Support Group (FSG) section consists of ten personnel, carrying and distributing the same standard electronic equipment.

In addition, the different weapon systems within this section require specialised batteries to operate their targeting, cooling and command electronics. The weapon with the highest energy requirement is the Javelin system; operated by two people. For a 72 hour mission with several firings the command launch and coolant units require approximately 17kg of batteries (3000Wh of energy). This load may be distributed between the two personnel or within the section.

Fire support group units are typically mounted; therefore there is less urgency to reduce their energy burden. Missions may eventuate in a dismounted capacity, but due to their heavy weapons this is unlikely to involve large distances travelled on foot.

3.3.2. PLATOON HQ

A 1RNZIR FSG Platoon HQ typically consists of six personnel; a platoon commander, sergeant, two signallers and two drivers. In addition to the standard electronic equipment, the commander and sergeant also carry GPS's powered by AA batteries.

The platoon signallers operate AN/PRC 119F radios; for a 72 hour mission 7kg of BA5590 batteries are required each (1300Wh).

The other personnel in the platoon HQ carry special weapon sighting devices, their battery burden is approximately 0.3kg of batteries over 72 hours, though when dismounted they may carry spare AN/PRC 119F batteries for their signallers.

A FSG platoon HQ is almost always mounted.

3.4. Signallers

A signals retransmission post (RTX) consists of four signallers relaying communications from an elevated stationary location; they are usually inserted by helicopter or ground vehicle. An RTX may however under some circumstances be established with a dismounted approach; this qualifies its energy requirements for analysis under this battlelab.

As well as carrying the standard electronic equipment, the signallers in an RTX use several radios. The RTX radio component consists of three AN/PRC 119F radios and one AN/PRC 150C radio, an encrypting device is also used with small specialised batteries.

To operate dismounted for 72 hours an RTX requires 6400Wh of power which is provided by 36kg of batteries, consisting mainly of BA5590.

A signal RTX may be required to operate for over 72 hours, often up to a week; in these instances a petrol generator can be used in conjunction with battery chargers to resupply the radios.

3.5. Reconnaissance

A 1RNZIR reconnaissance detachment consists of five scouts. Each carries standard electronic equipment and the commander in the detachment carries a GPS. A signaller scout also either carries one AN/PRC 119F or AN/PRC 150C (depending on mission parameters). One scout utilizes a laptop; the MR-1 laptop has an adapter to draw power from a BA5590 to its own battery.

For a 72 hour mission a recon AN/PRC 119 signaller requires 7kg of batteries consisting mainly of BA5590 (1300Wh energy). A recon AN/PRC 150 signaller requires up to 14kg of batteries for a requirement of 2600Wh, this is a significant burden for a unit specializing in being highly mobile.

The signallers are likely able to distribute the BA5590 batteries amongst their squad, however some advantage could be achieved by implementing lighter alternatives, as discussed in DTA report 366 (*Experimentation Report New Zealand Army Battle Lab: Soldier Power*) and DTA Technical Note 1628 (*Power Source Technologies For The Dismounted Soldier*).

3.6. Mounted vs Dismounted

Platoon headquarters, company headquarters; fire support group elements and signal retransmission stations are typically inserted by vehicle. Operations may eventuate where these are unsupported by vehicle transport. As these roles have a high energy requirement, an improved dismounted capability for reducing this battery burden may offer some advantage.

3.7. 1RNZIR Summary

Within a section, commanders and 2IC carry approximately 2kg of battery weight into a 72 hour mission; this mass comes mainly from MBITR batteries. A regular infantryman without an MBITR typically only carries a tenth of this battery weight. Conversely, a signaller at company, or section level, can be expected to carry approximately 7 kg of batteries for the AN/PRC 119F or 14kg for the AN/PRC 150C radios.

A RTX requires approximately 35kg of BB2590/BB5590 batteries for a 72 hour operation; this burden may be split at 9kg each for the four signallers which operate it.

The most potential in energy management optimisation, is in the signaller roles. Table one summarises the results and further detail is continued in Annex B.

Unit	Average battery mass/person (kg)	Max battery mass/person (kg)	Total battery mass for unit (kg)
Rifle Section	0.6	2.0	5.9
Rifle Platoon HQ	2	7.2	8.0
Rifle Company HQ	3.6	14.2	36.0
FSG Section	4.2	8.5	41.9
FSG Platoon HQ	2.6	7.2	15.4
Signals RTX	9	14.2	36.0
Recon	3.4	14.2	16.9

Table 1 - 1RNZIR 72 hour mission batteries mass

4. 2/1RNZIR ENERGY REQUIREMENTS

Data for battery use by electronic equipment were estimated by 2/1RNZIR personnel. They were requested to provide data in the same format as 1RNZIR. The structure of 2/1RNZIR is similar to 1RNZIR; however personnel numbers in each section & platoon HQs vary slightly. As personnel were not interviewed face-to-face, there may be some differences in interpretation of instructions.

4.1. 2/1RNZIR Company Structure

The following chart details 2/1 Royal New Zealand Infantry Regiment company vertical structure. Full platoon and section quantities in addition to detailed electronic equipment are omitted. Key radio devices carried are included for reference; these are the AN/PRC 148, AN/PRC 119 & the AN/PRC 150. Personnel numbers are bracketed.

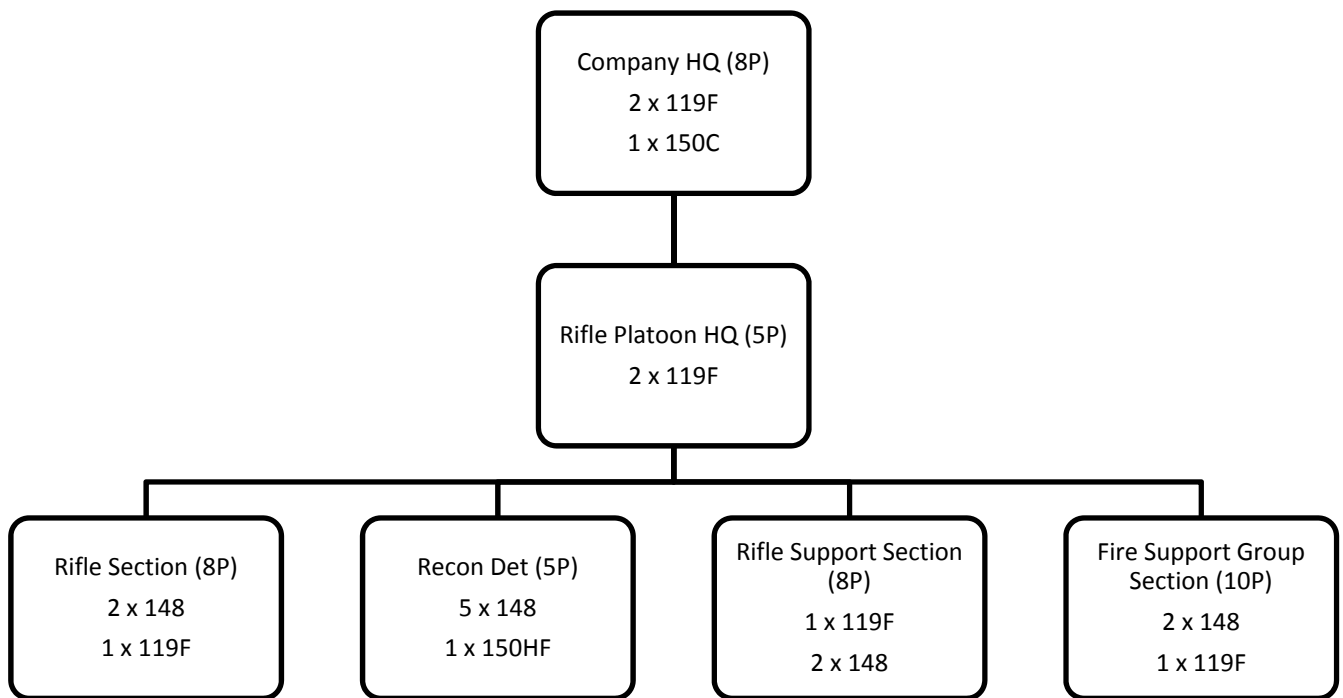


Figure 2 - 2/1RNZIR Vertical Company Structure

4.2. 2/1RNZIR Summary

The electronic equipment carried by 2/1RNZIR is similar to 1RNZIR. The standard equipment utilizing AA batteries and CR123 gives the same baseline of 0.22kg for 72 hours. The reconnaissance detachment uses an AN/PRC 148 for each scout.

Table 2 summarises the 2/1RNZIR battery mass distribution, refer to annex B for additional detail.

Unit	Average battery mass/person (kg)	Max battery mass/person (kg)	Total battery mass for unit (kg)
Rifle Section	1.2	4.2	9.5
Rifle Platoon HQ	1.8	4.2	9.2
Rifle Company HQ	2.0	6.2	15.8
FSG Section	4.4	8.5	43.9
Recon	2.4	6.9	11.8

Table 2 - 2/1RNZIR 72 hour mission batteries mass

See Annex B for tables of mission mass & energy by role.

5. FUTURE POWER REQUIREMENTS

5.1. Foreign Requirements

Compared with other nations, the New Zealand Defence Force currently has relatively small power requirements for dismounted soldiers over 72 hours. The standard NZ riflemen requiring 30Wh, a commander 360Wh and a AN/PRC 119F signaller 1300Wh.

The USA land warrior program estimates the average soldier's peak power at 20-60 watts, with an energy requirement of 240Wh over 12 hours; or 1440Wh for 72 hours (4). Australia has not yet defined their target gravimetric and volumetric energy densities (2) & (3). More detail is available in the 2012 DSTO Land Operations Division Report (1), page 4.

Other nations utilize 'battlefield management' as well as 'counter-improvised-explosive-devices' (CIED) in theatre; NZDF is assessing command and control technology for dismounted soldiers under the Battlelab 'Soldier Modernisation' FY 13/14 and as part of the 'Network Enabled Army' project (NEA). Approximately 45% of a British soldier's energy burden is batteries for CIED (5) (figure 3). DSTO Australia approximates that soldier power requirement increases by approximately 50% when a battlefield management system is carried (6).

UK section infantry carry between 5-16.5kg batteries for 72 hours (5). The role with the highest burden are their signallers, as with the NZ army. UK section, company and platoon commanders carry approximately 7.5kg of batteries each, (utilizing battlefield management systems). It is not discussed whether the UK commanders carry all 7.5kg of batteries for the BMS or whether some have been distributed to subordinates within their section.

Australian infantry carry between 3-20kg for 72 hours (6). Australian section commanders use approximately 2600Wh total (battlefield management system), for an estimated total 72hr battery burden of 14.5kg. This is significantly more than the UK figure for similar BMS technology; it is likely the Australian data precludes distribution of burden to subordinates within the section.

Battery Type Breakdown

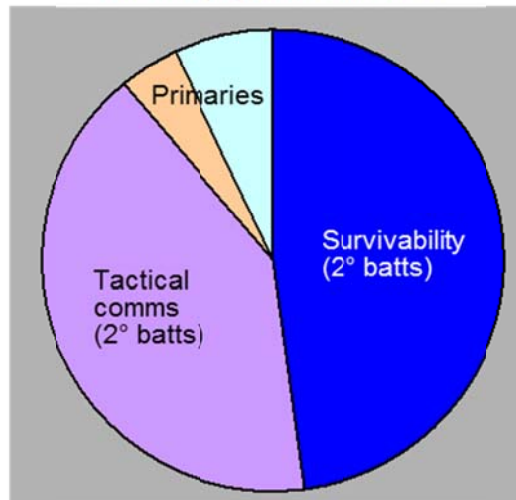


Figure 3 - UK infantry batteries by function

5.2. NZ Requirements

Based on foreign predictions, if section commanders and 2IC are equipped with Battlefield management systems, their 72 hour mission energy requirement will increase to approximately 2300Wh (6). This will increase mission battery mass to approximately 13kg each.

If the NZ army were to take on CIED for dismounted soldiers then battery burden would also increase by approximately 3kg for each soldier equipped (5). For a standard infantryman this would result in a total 72 hour battery burden of approximately 3.3kg.

6. CONCLUSIONS

For a 72 hour mission NZ infantry section commanders and 2IC carry approximately 2kg of batteries each, primarily for powering their MBITR radios which require up to 350Wh of energy. Other members of an infantry section carry approximately 0.3kg of batteries, consisting mainly of AA batteries for powering equipment such as rifle sights, personal role radios (PRR) and torches.

Fire support group are typically mounted, though for a dismounted mission lasting 72 hours the javelin system operators are expected to carry up to 9kg of primary (disposable) batteries each, or 17kg between two, for powering their command launch unit (CLU) and battery coolant unit (BCU).

Depending on radio selected, a dismounted signaller in a platoon or company command can be expected to carry approximately 7kg of lithium sulphur dioxide batteries (primary).

Signals retransmission stations and company HQs each require approximately 35kg of batteries to operate for 72 hours. For a dismounted retransmission (uncommon), this is a significant load. Means to reduce this burden are investigated and summarised in DTA report 366 (*Experimentation Report New Zealand Army Battle Lab: Soldier Power*) and DTA Technical Note 1628 (*Power Source Technologies for the Dismounted Soldier*).

Foreign nations typically have almost double the dismounted energy requirements of the NZ Army. This is due to 'counter improvised explosive device' (CIED) technology and digital battlefield management/simulation systems. British and Australian Section commanders and 2ICs each carry at least 7.5kg of batteries, with some rifleman carrying in excess of 11kg for the whole 72 hours. Approximately 45% of a British soldier's energy burden is for survivability alone (CIED).

Future energy requirements for NZDF are estimated at 1440Wh total for 72 hours dismounted for a standard infantryman, or 2300Wh for a battlefield management system equipped soldier. This estimate is based on the power requirements of other nation's operating systems as mentioned above.

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ANNEXES

Interviewed soldiers provided data estimated from their training exercises, this has been converted to the equivalent batteries that would be used in theatre; the following paragraph details this conversion:

A 1RNZIR Signaller estimates taking six BB2590 batteries for 72 hours to power their AN/PRC 119F radio. Each of these Ultralife rechargeable batteries has a capacity of 207Wh. This puts the radio's 72 hour requirement at 1242Wh.

A BA5590 battery would be used theatre in place of the BB2590; this battery weighs 1kg and has a capacity of 180Wh. Therefore in theatre the signaller would be expected to carry $1242\text{Wh} / 180\text{Wh} = 6.9$, or 7kg of BA5590 batteries.

Using the battery data from Annex A total battery mass and energy for each soldier role/unit has been assessed in Annex B. This has been calculated for a 72 hour dismounted mission using theatre (primary) batteries.

ANNEX A- EQUIPMENT AND BATTERIES

Battery Type	Equipment	Number batteries per device	Typical discharge duration (hours)	Number batteries required for 72 hours	Individual mass (grams)	Amp hours	Volts	Capacity (wh)
Alkaline AA	MINI N/SEAS	1	36	4	23	2	1.4	2.8
	PRR	1	12	2				
	Garmin GPS	2	36	4				
	Sidewinder Torch	2	72	2				
	50 Cal holographic sight	2	72	2				
	AN/PEQ-2A	2	12	6				
	N/CROS MK II	6	72	6				
	Strobe IR	2	12	2				
	AN/PVS 22	2	36	6				
	Dictaphone	2	36	6				
Lithium Thionyl Chloride AA	HWTS	6	36	18	19	2.4	3.6	8.6
	Javelin BCU	2	1	8				
	PRC-343	2	36	4				
CR123 (DL123A)	Shotgun holographic sight	1	72	1	17	1.5	3	4.5
	AN/PEQ-15	1	12	2				
	T2	1	18	4				
	UNS	1	18	4				
	CYZ-10	2	72	2				
Spec Battery	AN/PRC 148	1	14	5	340	5.8	10.8	63
BA 5800/U	FCS	2	72	2	327	7.5	5.8	45
BA5590	AN/PRC 119F	1	12	7	1000	12	15	180
	AN/PRC 150C	2	10	14				
	MR1 Laptop	1	72	1				
	Javelin CLU	1	6	12				
CR5	Vector	1	72	1	40	1.5	6	9

ANNEX B – BATTERY ENERGY AND MASS TOTALS BY ROLE

1RNZIR		Quantities of batteries								Energy & Mass Totals	
Role	# personnel	Alk AA	Lith AA	CR123	MBITR	BA5590	FCS	BCU	CR5	Battery Mass (kg)	Battery Energy (kWh)
Rifle Section											
Commander	1	12		2	5					2.01	0.3576
2IC	1	12		2	5					2.01	0.3576
Riflemen	5	8		2						0.218	0.0314
Shotg rifleman	1	8		3						0.235	0.0359
T2 Rifleman	1	8		6						0.286	0.0494
UNS Rifleman	1	8		6						0.286	0.0494
Total	10	56		21	10					5.917	1.0069
Rifle Plat HQ											
Commander	1	12		2						0.31	0.0426
2IC (Sergeant)	1	8		2						0.218	0.0314
Signaller	1	8		2		7				7.218	1.2914
Medic	1	8		2						0.218	0.0314
Total	4	36		8		7				7.964	1.3968
Rifle Comp HQ											
Commander	1	12		2						0.31	0.0426
2IC	1	8		2						0.218	0.0314
Signaller CYZ	1	8		3		7				7.235	1.2959
Signaller HF	1	8		2		21				21.218	3.8114
Signaller	1	8		2		6				6.218	1.1114
Riflemen	5	8		2						0.218	0.0314
Total	10	52		13		34				36.289	6.4497

FSG Section											
Commander	1	6	2	2	5				1	1.95	0.367
2IC	1	12	2	2	5					2.048	0.3748
50 Cal operator	2	8	8	2			2			1.024	0.1902
50 cal assist	2	10	2	2						0.302	0.0542
Javelin operator	2	6	2	2		1		4		6.49	1.223
Javelin assistant	2	4	2	2		11				11.164	2.0174
Total	10	46	18	12		12	2	4	1	41.958	7.7114
FSG Platoon HQ											
Commander	1	10	2	2						0.302	0.0542
Sergeant	1	10	2	2						0.302	0.0542
Signallers	2	6	2	2		7				7.21	1.303
Riflemen/Drivers	2	6	2	2						0.21	0.043
Total	6	32	8	8		7				15.444	2.8004
Signal Re-Trans											
Signaller OC	1	12		2		7				7.31	1.3026
Signaller 2IC	1	8		2		7				7.218	1.2914
Signaller CYZ	1	8		3		7				7.235	1.2959
Signaller HF	1	8		2		14				14.218	2.5514
Total	4	36		9		31				35.981	6.4413
Recon Det											
Signaller	1	8		7		14				14.303	2.5739
Sniper	1	22		7						0.625	0.0931
Rifleman	1	16		2						0.402	0.0538
Commander	1	12		2						0.31	0.0426
Laptop operator	1	8		2		1				1.218	0.2114
Total	5	66		20		15				16.858	2.9748

2/1RNZIR		Quantities of batteries								Energy & Mass Totals	
Role	# personnel	Alk AA	Lith AA	CR123	MBITR	BA5590	FCS	BCU	CR5	Battery Mass (kg)	Battery Energy (kWh)
Rifle Section											
Commander	1	12		2	5					2.01	0.36
2IC	1	12		2	5					2.01	0.36
Riflemen	3	8		2						0.22	0.03
Shotg Rifleman	1	8		3						0.24	0.04
T2 Rifleman	1	8		6		4				4.29	0.77
UNS Rifleman	1	8		6						0.29	0.05
Total	8	56		21	10	4				9.48	1.66
Rifle Plat HQ											
Commander	1	12		2						0.31	0.04
2IC (Sergeant)	1	8		2						0.22	0.03
Signaller	2	8		2		4				4.22	0.75
Medic	1	8		2						0.22	0.03
Total	5	36		8		4				9.18	1.61
Rifle Comp HQ											
Commander	1	12		2						0.31	0.04
2IC	1	8		2						0.22	0.03
Signaller CYZ	1	8		3		4				4.24	0.76
Signaller HF	1	8		2		6				6.22	1.11
Signaller	1	8		2		4				4.22	0.75
Other	3	8		2						0.22	0.03
Total	8	52		13		14				15.85	2.79
FSG Section											
Commander	1	6	2	2	2				1	0.93	0.18
2IC	1	12	2	2	2	4				5.03	0.91

50 Cal operator	2	8	8	2			2			1.02	0.19
50 cal assist	2	10	2	2						0.30	0.05
Javelin operator	2	6	2	2		1		4		6.49	1.22
Javelin assistant	2	4	2	2		11				11.16	2.02
Total	10	46	18	12	4	16	2	4	1	43.92	8.05
Recon Det											
Sniper	1	8		7	2					0.983	0.1799
Sniper	1	8		7	2					0.983	0.1799
Signaller	1	8		2	2	6				6.898	1.2374
Commander	1	12		2	2					0.99	0.1686
Laptop operator	1	8		2	2	1				1.898	0.3374
Total	5	44		20	10	7				11.75	2.10

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13. ABSTRACT This report investigates the power requirements of electronic equipment that New Zealand soldiers carry dismounted into theatre. It analyses different soldier roles and units for missions up to 72 hours without re-supply. Foreign soldier power requirements are evaluated to predict future NZ Army dismounted energy requirements.	

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