Joint Service Power Expo 2011
Small Unit Power Requirements
Purpose

• Look at the Company and small unit power requirements

• Look at the camp structure in Afghanistan in relation to unit power requirements

• Review the alternative power equipment currently fielded to support Company sized units

• Impact of Renewable Energy Systems

• New requirements / opportunities
Marine Air-Ground Task Forces

- Marine formations deploy as integrated MAGTF’s of various sizes. The MAGTF brings Air, Ground, and Logistics support elements with them.
- There are four core elements of the MAGTF.
Marine Air-Ground Task Forces

- Power requirements depend on the size of the MAGTF and the size of the MAGTF is tailored to meet the needs of the mission.

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<tr>
<th>Marine Expeditionary Unit (MEU)</th>
<th>1500-3K Marines</th>
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<tbody>
<tr>
<td>Marine Expeditionary Brigade (MEB)</td>
<td>3-20K Marines</td>
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<td>Marine Expeditionary Force (MEF)</td>
<td>20-90K Marines</td>
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<td>Special Purpose MAGTF</td>
<td>As required</td>
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MAGTF Elements and Camps

- Command Element
- Logistics Combat Element
- Aviation Combat Element
- Ground Combat Element HQ
- Infantry Battalion 1
- Rifle Company 3
- Rifle Platoon 9
- Rifle Squad 27
- 10 Infantry Battalions
- Camp
- Forward Operating Base (FOB)
- Combat Outpost (COP)
- Patrol Base (PB)
- Observation Post (OP)
The Entry Point
Forward Operating Base

FOB LEATHERNECK

Marine Expeditionary Brigade
3 Infantry Battalions
The Entry Point
Forward Operating Base and Camp

Command Element

CAMP LEATHERNECK MEF (FWD)

Aviation Combat Element

Logistics Combat Element

Ground Combat Element
Characteristic's of the Expeditionary CAMP

- Mobile Electric Power readily available
- Tactical vehicle support readily available
- Airfield
- Hospital
- Large logistics support facilities
Extending Forward Presence with the Forward Operating Base

- Aviation Combat Element
- Command Element
- Logistics Combat Element
- Ground Combat Element HQ
- CAMP LEATHERNECK
- FOB DWYER
- INFANTRY BATTALION
- FOB FIDDLERS GREEN
- FOB CAFERETTA
- INFANTRY BATTALION

HQ
Tactical Convoys remain at risk to IEDs

Eliminate bottled drinking water
- Increase use of local water sources

Reduce high fuel consumption
- Optimize efficiency of generators
- Minimize waste of power and water
- Reduce overall power demand
- Employ renewable energy technologies
Standard CLB-8 Tactical Logistics Convoy

- Thirty percent (6 of 20) vehicles are for force protection
- Only one vehicle used for fuel
- Thirty-five percent (7 of 20) vehicles are for bottled water transportation
MRAP pushes a mine roller during a five-day convoy to provide resupply. During one resupply convoy it took nearly 40 hours to travel a mere 70 miles.
Characteristics of the FORWARD OPERATING BASE

- Battalion sized organization
- Mobile Electric Power readily available
- Tactical vehicle support readily available
- May contain an airfield or FARP
- Limited medical support
- Limited utilities personnel for generator support / planning
- Provides logistics support to COP’s
Forward Operating Base (FOB) and Combat OutPost (COP)

To reduce reaction time and increase time on task, Battalions establish Company sized COPs.
Characteristics of the COMBAT OUTPOST

- Company sized organization
- **Limited generator support** (2kW to 3kW)
- Lack of trained generator mechanics
- Few generators running at optimal levels
- Unsupported commercial generators result in frequent loss of power
- **Limited Tactical vehicle support**
- Dependent on resupply from supporting FOB
- Increased reliance on primary batteries
Primary Batteries and Re-supply

- **Weight.** 2 DOS battery load is 100-120 pounds, on average, 20 Lbs. per Marine in addition to combat load.

- **Re-supply.** Ties patrol to LOC’s limiting abilities to push into enemy territory. Completely stalls operational momentum.

- **Cost.** One BA-5590B/U costs $60.00.
  - II MEF FY10 BA-5590 costs = 2.1 Million $

- **Not always available.** BA-5590B/U battery demands during OIF-1 (April – May 2003) peaked at 330,000 batteries per month and backorders quickly rose to over 900,000.
To reduce dependence on primary batteries you must have the capability to charge and maintain rechargeable batteries.
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Ground Renewable Expeditionary Energy Network System (GREENS)

Capabilities Description
- Man-transportable devices with renewable energy collection and storage that can energize Comm-Elect equipment, sensors, and radios

Technical Description
- Man-portable components
- Electrical output: 300 watt continuous 24 / 7
- 24 VDC output
- Key Components:
  - Batteries, Controller, and Energy Input sources
Solar Panel Durability – PB Gombadi

Pictures depict GREENS set up at PB Gombadi. Blast caused by grenade explosion shattered 2 solar panels. Report from Marines “no noticeable loss in power or performance” resulted.
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## On-Board Vehicle Power

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Fielded or being fielded

- QP-1800
- OBVP - HMMWV
- OBVP - MTVR
Kilo Company has been using a running M1114 with an A/C inverter to support power requirements for their COC. The power demands have taken a mission critical gun truck out of the fight.

The vehicle was not designed to run in idle for days. This can put wear and tear on the vehicles components (engine, alternator, battery...) requiring maintenance.

The exact fuel consumption of a M1114 is unknown but an estimated figure is 5 gallon/day in idle. It has a 21 gallon tank and needs refuel about every 3-4 days.
On-Board Vehicle Power HMMWV
30 kW stationary
10 kW On-The-Move

Add generator between engine and transmission
QTY 15 to be delivered by the end of CY11
On-Board Vehicle Power MTVR
120 kW stationary
21 kW On-The-Move

Replace transmission with engine driven generator
QTY 6 to be delivered by the end of CY12
Combat OutPost (COP), Patrol Base (PB) and Observation Points (OP)

To further integrate with the population

Check Point
Observation Points
Local Village
Local Police

RIFLE COMPANY

Platoon 40-45

Platoon 40-45

PLATOON / SQUAD SIZE UNITS

Squad 13-20

Squad 13-16

Squad 13-16

OP
Characteristics of the Patrol Base and Observation Posts

- No generator support
- No tactical vehicle support
- Dependent on resupply
- Dependent on primary batteries

Over 100 Patrol Bases and OP's that continuously change locations keeping the enemy off balance
Individual Power Requirements

COMM / OPTICS / SENSORS / LASER DESIGNATORS / POSITION LOCATION / PROTECTION

AN / PVS-17
AA Battery

AN / PVS-14
AA Battery

AN / PAS-13D
AA Battery

AN / PEQ-16A
Dl-123A Battery

MIOX Water Purifier
AA Battery

MIOX Water Purifier
AA Battery

Hand-held flashlight
AA Battery

Quiet Pro Headset
Unique Battery

Squad Digital Camera
Unique Battery

AN / PRC-148 or 152
Unique Batteries

AN / PRC-153
Unique Battery

AN / PRC-117F
BA-5590 / BA-5390 / BB-2590 Batteries

Rugged Laptop
Unique Battery

AN / PVS-17
AA Battery

AN / PVS-14
AA Battery

AN / PAS-13D
AA Battery

AN / PEQ-16A
Dl-123A Battery

MIOX Water Purifier
AA Battery

MIOX Water Purifier
AA Battery

Hand-held flashlight
AA Battery

Quiet Pro Headset
Unique Battery

Squad Digital Camera
Unique Battery

AN / PRC-148 or 152
Unique Batteries

AN / PRC-153
Unique Battery

AN / PRC-117F
BA-5590 / BA-5390 / BB-2590 Batteries

Rugged Laptop
Unique Battery
Challenges associated with PATROL BASE and OBSERVATION POSTS

- Large AO’s
- Long duration patrols (8-10 days)
- Critical dependence on radios
- Carry 1-2 days + of supply chow / ammo / batteries / water
- **BATTERY RESUPPLY EVERY 48 HOURS**
- Re-supply ties patrols to LOCs stalling operational momentum
Rechargeable Batteries

Even if you choose to use primary batteries you still have to plan to support those radios that only use RECHARGEABLE batteries.

AN/PRC-148  AN/PRC-152  AN/PRC-153
Battery Resupply Every 48 Hours

- Operating AN/PRC-152 radios continuously powered for two days can require 216 AA or 160 3 Volt batteries per radio
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HH-RPA for the AN/PRC-152
The SPACES MSD collects energy from various sources (solar, DC/AC, Vehicle) to recharge BB-2590 batteries and to power external devices (12 and 24 VDC radios).
SOLAR PORTABLE ALTERNATIVE COMMUNICATION ENERGY SYSTEM (SPACES)

DC 9-36 Volts 10A

StarPower Module

Output 1

Output 2

AN/PRC-150/117F
AN/PRC-148/152
AN/PRC-119 A-D
AN/PRC-119 F
BB-2590/U

12V Accessories
115VAC W/Micro Inverter

Panasonic ToughBook

BA-5590B/U
BA-5590A/U
BA-5390/U
BA-5390A/U
BA-8180/U

24 VDC
90 Days without the usual daily re-supply of batteries.

3 week patrol no batteries (norm every 2 days re-supply).

Powered two patrol bases with renewable energy only.

Fuel consumption reduced by 90% at the company level.

Reduced weight by 700 lbs. and cost by $40K on one 3 week patrol.
New Requirements and Opportunities

- Smaller and more capable SPACES (renewable energy) systems (SPACES Generation II pending)
- Longer lasting primary batteries (new chemistries)
- GREENS (renewable energy) increased wattage and smaller footprint
- Small man-portable generators
- Tactical general purpose UPS