



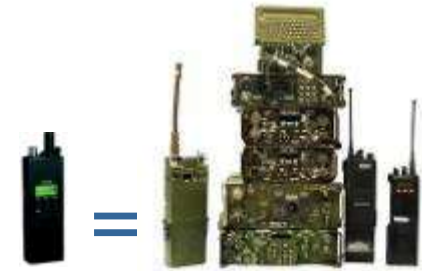
- Thales- Introduction
- Thales Battery-powered Portable Products
- LWSB Battery Concept
- Lithium Ion Cell Capacity Trends
- Increased Use of Soldier Wearable Batteries
- LWSB Benefits
- Applications
- Test and Evaluation
- Questions





What We Do:

- Pioneer new concepts and lead in the development, manufacture, and support of battle-proven, software-defined radio equipment around the globe
- Leverage our expertise in size, weight, and power (SWAP) constrained battlefield environments into adjacent domains:
 - Handheld/Soldier Military Radios
 - Handheld Public Safety Radios
 - Vehicle Radios and Accessories
 - Airborne Systems
 - Shipboard HF Communications Equipment
- Play key role in the Joint Tactical Radio System (JTRS) Programs of Record:
 - JEM/CISCHR
 - Handheld, Manpack, and Small Form Fits (HMS)
 - Airborne, Maritime, and Fixed Site (AMF)
 - Multifunctional Information Distribution System (MIDS-J)



60 lbs of communications equipment down to 2 lbs



Our Customers:

- We serve:
 - U.S. Department of Defense
 - U.S. Department of Homeland Security
 - U.S. Civilian Agencies
 - Allied and Coalition Forces Globally

- With technology developed and produced in the U.S. and supported around the world



Our Locations:

- Headquartered in Clarksburg, Maryland, just 45 minutes from our nation's capital
- Four U.S. facilities
- In-theater locations supporting warfighters in Kuwait, Iraq, and Afghanistan
- Plus, customer maintenance depots established across the U.S



Headquarters – Clarksburg, MD



Clarksburg, MD



Germantown, MD



Clarksburg, MD



Kuwait

Liberty™ Multiband LMR
Public Safety



AN/PRC-148 JEM
Tactical



AN/PRC-154 Rifleman
Tactical





- Thales has produced more than 200,000 AN/PRC-148
- Thales offers two batteries for AN/PRC-148 radio
 - Standard 4.8AH battery
 - New High capacity 5.8AH battery
- Both batteries are compatible with all released charger accessories and vehicular systems
- In the field, users are using AN/PRC-148 rechargeable batteries with a competitor product
- AN/PRC-148 rechargeable batteries have been licensed to a number of other major defense companies for use in their products

Current Solutions for Longer Missions

The two most common options used to increase available power to AN/PRC-148:

- Use a battery eliminator to attach the radio to a large wearable power source such as xx-2590.
- Use Soldier Power Adapter Interface (SPAI) to allow direct power to the radio while charging the battery





Feature	Battery Eliminator	SPAI
Supply power	No. Does not have internal power source	No. Does not have internal power source
Accept power from DC sources	Yes	Yes
Maintain Communication link when replenishing power source	No	Yes
Maintain Communication link when disconnected from external power source	No	Yes
Fits in the holster	Yes	No. Adds significant height and weight
Reduces Weight	No. Requires a battery eliminator in addition to the standard battery carried by the user	No
Provides Smart Interface for Charging when connected to secondary sources	No	No

Light Weight Smart Battery (LWSB)

- LWSB battery is also referred to as Universal Battery
- LWSB is a new rechargeable battery compatible with AN/PRC-148 with reduced weight, capable of harvesting power from or supplying power to stationary and wearable power sources
- It maintains the same physical and electrical interfaces as current AN/PRC-148 batteries

Interface to Radio-
Same as current
AN/PRC-148 Batteries

External Interface-
Keyed Circular
Connector



Universal Battery (LWSB)- Key Features



- ✓ Internal battery using 18650 lithium ion cells
- ✓ Provides a bi-direction (input/output) side port- Power sourcing and harvesting applications
- ✓ Smart SMBus interface to allow smart charging- battery controls charging rate and status
- ✓ Intelligent charger on board which allows either side or bottom charging
- ✓ Its architecture allows for future expandability to incorporate inductive charging, . .
- ✓ Greater than 30% reduction in weight compared to standard AN/PRC-148 battery
- ✓ Provides a user indicator status
- ✓ Flush mount side charging

Compatibility with Fielded Ancillary Products

Interoperates with fielded ancillary equipment



THALES USB - COM7 Refresh list

Performance Parameters

- Available Capacity: 2.9Ah
- Max. Capacity: 3.0Ah
- State of Charge: 95%
- Estimated Time to Complete: 0.1h
- Cycle Count: 0

Battery Information

- Serial No.: 1
- Manufactured: 1-Jan-2011
- Rated Capacity: 3.1Ah/33Wh



Thales 6-bay
Combo charger
1600700-3

LWSB

PRC-148 Battery

PRC-154 Battery

Liberty

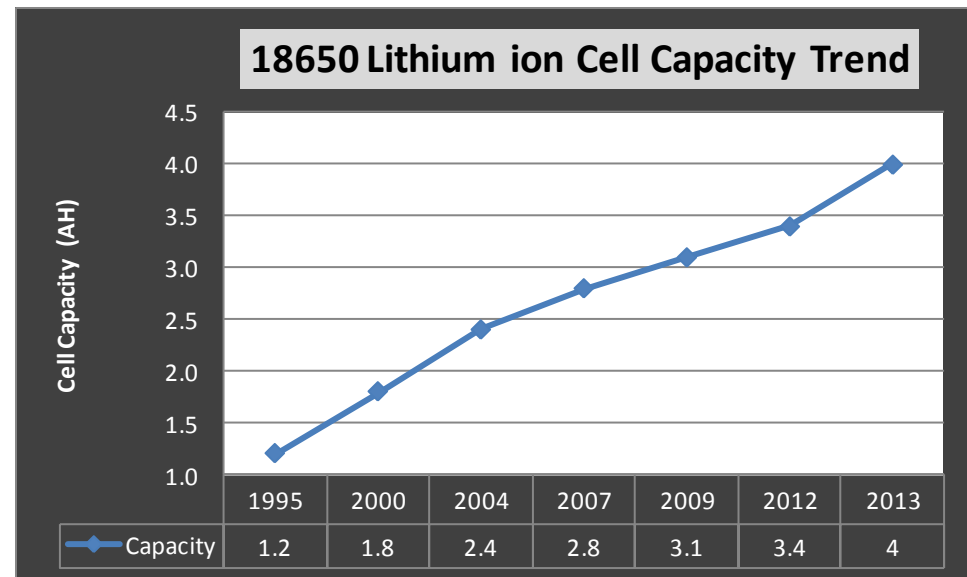


Charger Series	PRC-148	PRC-154	Liberty	Liberty	Liberty
Available Capacity	2.9Ah	2.9Ah	2.9Ah	2.9Ah	2.9Ah
Max. Capacity	3.0Ah	3.0Ah	3.0Ah	3.0Ah	3.0Ah
State of Charge	95%	95%	95%	95%	95%
Estimated Time to Complete	0.1h	0.1h	0.1h	0.1h	0.1h
Cycle Count	0	0	0	0	0
Serial No.	1	1	1	1	1
Manufactured	1-Jan-2011	1-Jan-2011	1-Jan-2011	1-Jan-2011	1-Jan-2011
Rated Capacity	3.1Ah/33Wh	3.1Ah/33Wh	3.1Ah/33Wh	3.1Ah/33Wh	3.1Ah/33Wh



Impact of Lithium Ion Cell Capacity Upward Trend

- The 18650 cell capacity has improved dramatically during the last 10 years
- The current standard AN/PRC-148 high capacity battery is 60% higher in capacity today than in 2004.
- The 18650 cell capacity is anticipated to increase in the coming years.
- 3.4 AH 18650 cells are expected to be in production by 2012 and 4.0AH cells by 2013
- This upward trend will provide about 43 WH of energy in LWSB in 2013





- LWSB power can harvest power from various available wearable and fixed power sources

- Zinc Air
- Fuel Cell
- Wearable Batteries
- Vehicle Power
- Solar

LWSB
Rechargeable
Battery



Li-145
Rechargeable
Battery

- LWSB design architecture allows future growth for wireless energy harvesting



- LWSB voltage range supports direct connection to Zinc-air batteries to support extended life missions
- In this scenario, the user can charge the battery while operating the radio when LWSB is connected to 8140 or similar Zinc-air batteries.



Zinc-air
BA-8140S

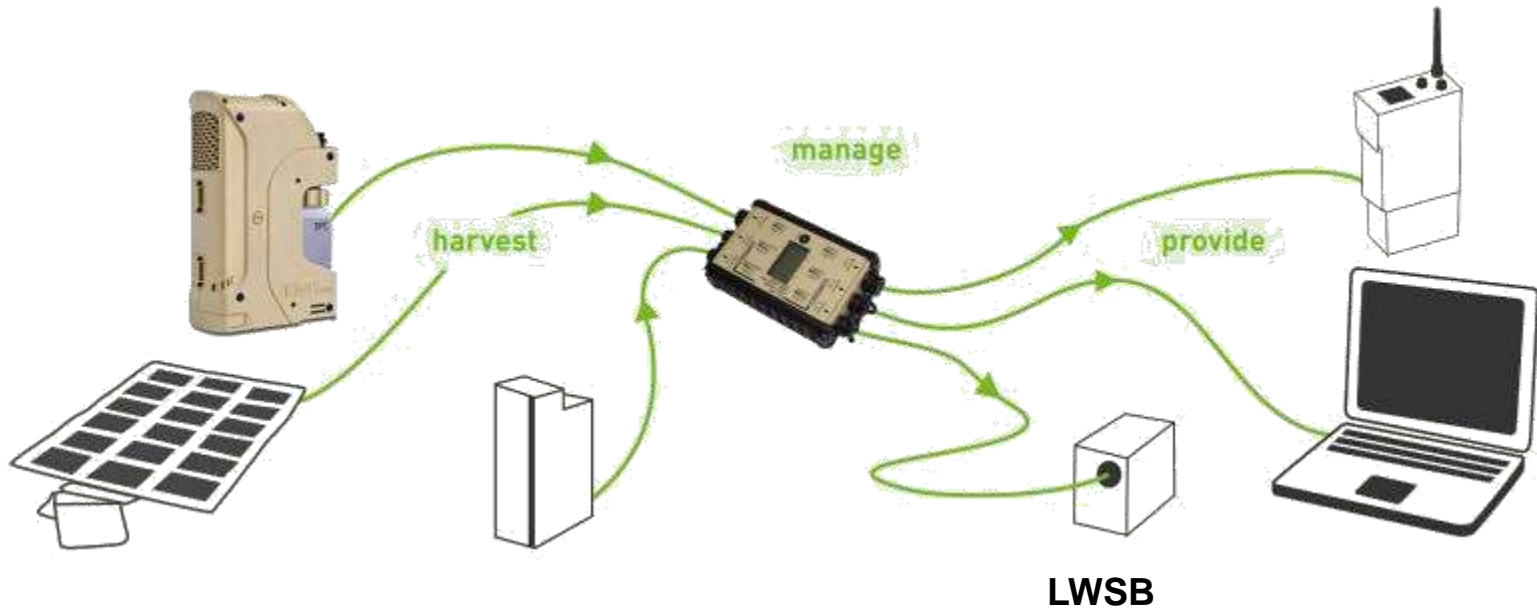


- Over 1,000,000 zinc-air cells shipped in the last 8 years of production
- 13.6 volt Nominal Voltage
- 30 Amp Hour/400 Watt Hours
- Weighs about 3 pounds
- Designed to slide into the Plate Pouch in Body Armor on the outside surface of the SAPI Plate
- Utilizes the Standard Gen 3 Zinc Air cell used in the BA- 8180





- LWSB voltage range supports direct connection to fuel systems to support field charging applications
- In this scenario, the user can charge the battery while operating the radio when LWSB is connected to Jenney fuel cell or similar





- Similarly, the LWSB can directly connect to most available fuel cell solutions to support field charging applications
- In this scenario, the user can charge the battery while operating the radio when LWSB is connected to a portable fuel cell.
- The picture here shows is direct operation using SFC Jenney fuel cell.





- LWSB allows both sourcing and charging power through its secondary port
- For instance, LWSB can be used to provide power to a DAGR (Defense Advanced GPS Receiver) to substantially improve DAGR runtime across temperature
- LWSB can supply power while being charged simultaneously for specific applications



Table 2-1. Key Characteristics and Advantages of DAGR Solution

Item	Current Solution: Primary Battery Magazine	External Rechargeable Battery using LWSB
Power Source	Attached to DAGR	External
Battery Technology	Alkaline	Lithium ion
Cell Type	AA	18650
Runtime @ 25 C	~ 16 hours	~ 63 hours
% increase runtime	---	360%
Runtime @ -20 C	~ 2 hours	~ 50 hours
Wireless charging	NA	Yes
Low Temperature Spec	-18 C	-30 C



The LWSB design allows addition of wireless technologies for charging.

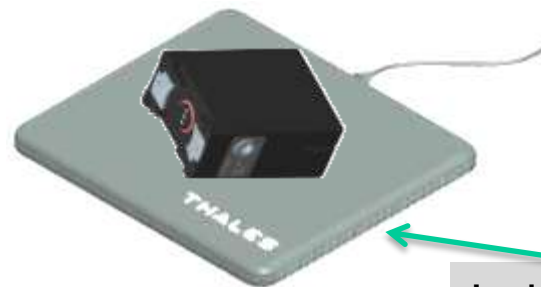
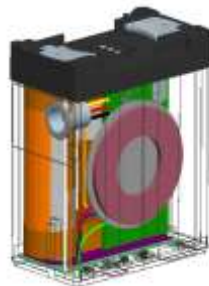
The two areas of focus at Thales are 1) inductive charging and 2) RF energy Harvesting

1. Inductive charging

- Incorporate inductive charging to allow <8 hour charging

2. RF Energy Harvesting

- currently evaluating RF energy harvesting for long term storage applications and residual charging during actual radio use



Inductive Charger



- Initial prototype testing at AFSOC in Ft Walton Beach FL was successful. Demonstrated direct charging from Fuel cell, and XX-2590 with BRITES, and SFC power management interfaces.
- Also demonstrated interoperability with AN/PRC-148 and AN/PRC-152 radio.





LWSB connected to AN/PRC-148,
SFC Power management unit and
XX-2590 battery



LWSB connected to AN/PRC-152,
Protonix Power management unit
and Ultracell Fuel Cell

