



**PROGRAM MANAGER
EXPEDITIONARY POWER SYSTEMS
MARINE CORPS SYSTEMS COMMAND**

**USMC Family of Environmental
Control Equipment**

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AGENDA

- **USMC Family of Environmental Control Units (ECUs)**
- **Issues with current ECU Family**
- **Future Family of ECUs**
- **Desired Improvements**
- **Technologies of Interest**
- **Field Refrigeration System/Refrigerated Boxes**
- **HVAC Tool Kit**



FAMILY OF ECUs

- **¾ Ton (9,000 BTU/hr)**
 - **In production verification testing**
- **1.5 Ton (18,000 BTU/hr) ECU**
 - **Fielding**
- **3 Ton (36,000 BTU/hr) ECU**
 - **Fielding**
- **5 Ton (60,000 BTU/hr) ECU**
 - **Fielding**
- **8 Ton (96,000 BTU/hr)**
 - **Developed and tested, but not fielded**





FAMILY OF ECUs

- **USMC unique items**
- **50/60 Hz**
- **R-22 Refrigerant**
- **Replaces multiple types of (vertical and horizontal) military standard units**
- **3/4 Ton unit is single phase 120 VAC**
- **Larger units are three phase 208 VAC**





ECU ISSUES

- **400 Hz ECUs**
 - The family of ECUs does not replace any 400 Hz ECUs.
 - The problem of supporting 400 Hz systems is a known issue.
 - We are developing an interim solution of refurbishing the fleet of 400 Hz ECUs to extend service life until the requirement disappears.
- **Family of ECUs interface issues**
 - The family of ECUs does not interface with some specific systems in the same way as the older ECUs.
 - The interfaces are being redesigned for replacement systems.
 - Interim solution is to retain existing ECUs for those limited applications.



FUTURE ECU FAMILY

- **A new family of ECUs will be developed to replace the current “family of” ECUs in the 2010-2012 time frame.**
- **New refrigerant**
 - **Will need to use a more environmentally friendly (and less regulated) refrigerant.**
 - **Next refrigerant is yet to be determined, but industry and the US Army seem to like R-410A.**
 - **For economy, we will follow industry as much as possible.**
 - **R-134A will see continued use in automotive systems and refrigeration systems.**
- **New family will probably have same ECU sizes, but largest unit may be 10 tons rather than 8 tons.**



DESIRED IMPROVEMENTS

- 1. Reduced power requirements**
- 2. More ruggedization (for transport)**
- 3. “Soft Start” to reduce startup power**
- 4. Better energy efficiency**
- 5. Reduced noise**
- 6. Better heating capability**
- 7. Multi-frequency and multi-voltage capability**



TECHNOLOGIES OF INTEREST

- **Variable speed drive for compressors**
- **Variable displacement compressors**
- **Multi-compressor systems**
- **Environmentally acceptable refrigerants**
- **Heat pumps**
- **Thermo-electric systems**
- **Fabric ducts**
- **Radiant spot heating**



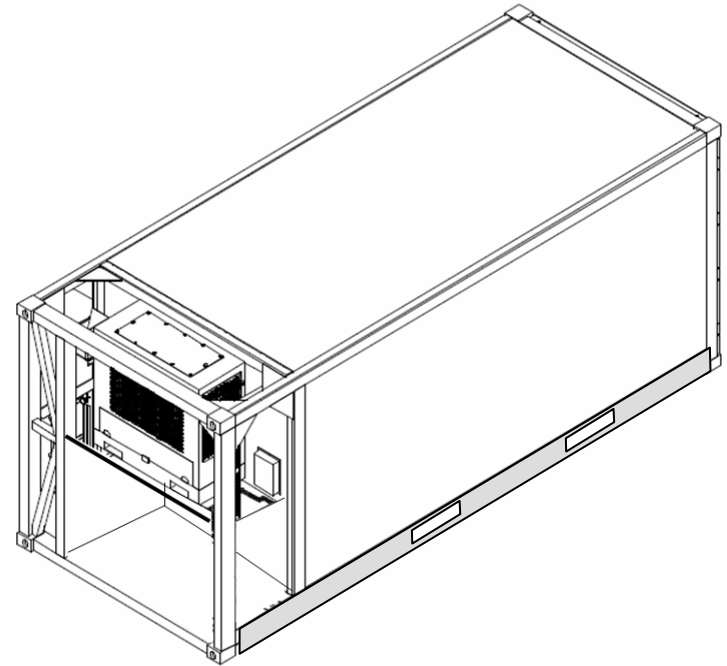
FIELD REFRIGERATION SYSTEMS

- Large Field Refrigeration System (LFRS)
 - Based on standard 20-foot insulated ISO container
- Mortuary Affairs Refrigeration System (MARS)
 - Similar to LFRS, but with unique internal features
- Small Field Refrigeration System (SFRS)
 - Developed by Food Services
 - Based on Quadcon (quarter ISO) container
- “Legacy” 10-foot Refrigerated Boxes



LARGE FIELD REFRIGERATION SYSTEM

- **Large Field refrigeration System (LFRS)**
 - Based on standard 20-foot ISO container
 - Based on commercial equipment modified to meet military requirements
 - Single item for refrigeration unit and insulated box (no longer two separate items)
 - Currently awaiting responses from vendors



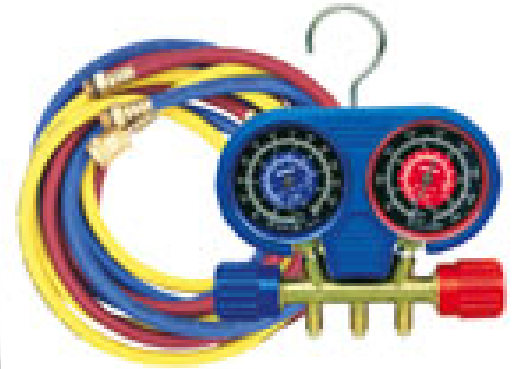
Food Services and Utilities support have landed !





FUTURE RECOVERY SYSTEM

- Will be included in new version of HVAC tool kit
- Replaces functionality of existing recovery machine in a more portable kit
- Advantages:
 - Portable
 - Light
 - No digital screen
 - Faster recovery
 - Oil-less compressor
 - Can be used with more refrigerant types
 - No filters to replace



Notional Solution Only



NEW HVAC TOOL KIT

Replacement for Refrigeration Tool Kit

- Replaces 2 existing items with one
- Modern refrigeration tools
- Updated hand tools
- Also replaces consumables kit that is currently a separate item
- Currently awaiting responses from vendors

Current System



Tool Kit,
Refrigeration
Service, Expendable
Supplies

Recovery
Machine



New
HVAC Toolkit



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Questions ?



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