



**THE OFFICE OF NAVAL RESEARCH**  
**Expeditionary Warfare Operations Technology Division**

[http://www.onr.navy.mil/sci\\_tech/special/353\\_exped/logistics.htm](http://www.onr.navy.mil/sci_tech/special/353_exped/logistics.htm)



# Expeditionary Unit Water Purification

## PROGRAM APPROACH:

- Two concurrent efforts:
  - 100K Demonstrator based on current state-of-the art (U.S. Army Tactical Water Purification System).
  - Science & Technology efforts to explore novel approaches to reduce cost of desalination.
- 500K Demonstrator based on engineering analysis conducted on 100K demonstrator.

## PAYOFF:

- Strategic level water production capability. Humanitarian, Disaster Relief, Homeland Defense implications.
- S&T insertions for future water treatment systems both military and municipal.

## SCHEDULE:

## OBJECTIVES:

- Develop a 100K gallons per day, C-130 transportable water purification unit (FY03 funded).
- Develop a 500K gallons per day C-17 transportable water purification unit (Provided FY04 funding).
- 100K demonstrator provided to the Tularosa Basin Water Research Facility: Alamogordo, New Mexico.

## PARTICIPANTS:

- NAVY: Office of Naval Research; NAVSEA -Philade
- ARMY: Tank-Automotive Research Development, and Engineering Center (TARDEC), Research Development and Engineering Command.
- Dept of Interior: Bureau of Reclamation
- SANDIA National Lab
- City of Alamogordo, New Mexico
- Senator Domenici's Office

TASK	FY03 - \$6.25	FY04 - \$6M	FY05	FY06
EUWP 100K/C130 AWARD	◆			
EUWP DEVELOPMENT/TESTING	◆	◆		
EUWP DELIVERY			◆	
S&T AWARDS		◆		
S&T PHASE I		◆	◆	
S&T PHASE II			◆	◆
EUWP 500K/C17 DESIGN		◆	◆	
EUWP 500K/C17 AWARD			◆	
EUWP 500K/C17 DEV & TEST			◆	◆



# EUWP Congressional Interest

Initiated by Late Congressman Skeen in July 02 (New Mexico – R).

- Afghanistan: Operation Enduring Freedom: Providing Water was identified as a key logistics issue.
- New Mexico:
  - Surface water sources susceptible to droughts.
  - Ground Water: Trillion Gallon Aquifer: extremely salty.

## Dual Use Program:

- DoD: Further the state of the art in Desalination Technologies. High Capacity Water Systems?
- New Mexico: Reduce the cost to desalinate water.



EUWP Briefing to Senator Domenici on 14 July 2003  
Energy and Natural Resources Hearing Room

Congressional interest transitioned to Sen Domenici's office in FY03. Mr. Stephen Traver Key POC.



# EUWP Integrated Program Teams



The Science and Technology IPT, chaired by Office of Naval Research, is responsible for management of S&T efforts for emerging water purification technologies and novel approaches to desalination.

The Testing IPT, chaired by the Bureau of Reclamation, is responsible for coordinating the transition of the EUWP demonstrator to the Tularosa Basin Research Facility



The Demonstrator IPT, chaired by U. S. Army Tank-Automotive Research Development and Engineering Center (TARDEC), is responsible for development of the 100K EUWP Demonstrator.

The Requirements IPT will be responsible for determining what general requirements apply to the program.

Identify  
In  
2004



# EUWP 100K Demonstrator

## Primary Design Constraints



C130:

Capacity: 35,000 lbs;  
LWH: 40ft x 9ft 11in x 9ft



HEMTT-LHS

Capacity: 26,000 lbs.  
LWH: 20ft x 8ft x 8ft

## Approach

Initial concept design and consulting provided by the U.S. Army TARDEC.

Further development and fabrication by contractor

Preliminary testing at U.S. Navy's Seawater Desalination Test Facility, Port Hueneme, CA

Deliver to Tularosa Basin National Desalination Research Facility for demonstration and for use as test bed to investigate emerging technologies





# EUWP Improvements over TWPS



Tactical Water Purification System



Expeditionary Unit Water Purification System

Technology	TWPS	EUWP
Desalination: Reverse Osmosis	38% recovery rate	<ul style="list-style-type: none"> <li>➤ 50% recovery rate</li> <li>➤ Novel approach to membrane implementation to increase flux</li> </ul>
Prefiltration: Membrane-based ultrafiltration	25 gallons per square foot per day (gfd)	40 gallons per square foot per day (gfd)
Energy Recovery: Reduced energy consumption	Pressure Exchanger	<ul style="list-style-type: none"> <li>➤ Work Exchanger</li> <li>➤ Pressure Exchanger</li> </ul>
Packaging Optimization	10K forklift requirement	Optimized for C130 Transport
Materials: Reduced overall size & weight	Standard Composites	<ul style="list-style-type: none"> <li>➤ Carbon composites for the RO pressure vessels,</li> <li>➤ Fiberglass reinforced plastics for low-pressure piping and pumps,</li> <li>➤ Lightweight, corrosion resistant metals for the high-pressure system</li> </ul>



# EUWP Science & Technology Objectives

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## Basic Research: Alternative Desalination Techniques:

Approaches to reduce the costs and energetics for desalination. These efforts will likely entail modeling, detailed energy balances, and laboratory feasibility studies.

## Applied Research: Improvements to Current Portable Desalination and Purification Units:

- 1) RO improvements
- 2) Ultrafiltration improvements
- 3) Alternative pretreatment strategies
- 4) Energy conservation and reclamation strategies
- 5) Sensors and controls
- 6) Post treatment and Chem/Bio disinfection
- 7) Brine disposal issues