Diving in Contaminated Water

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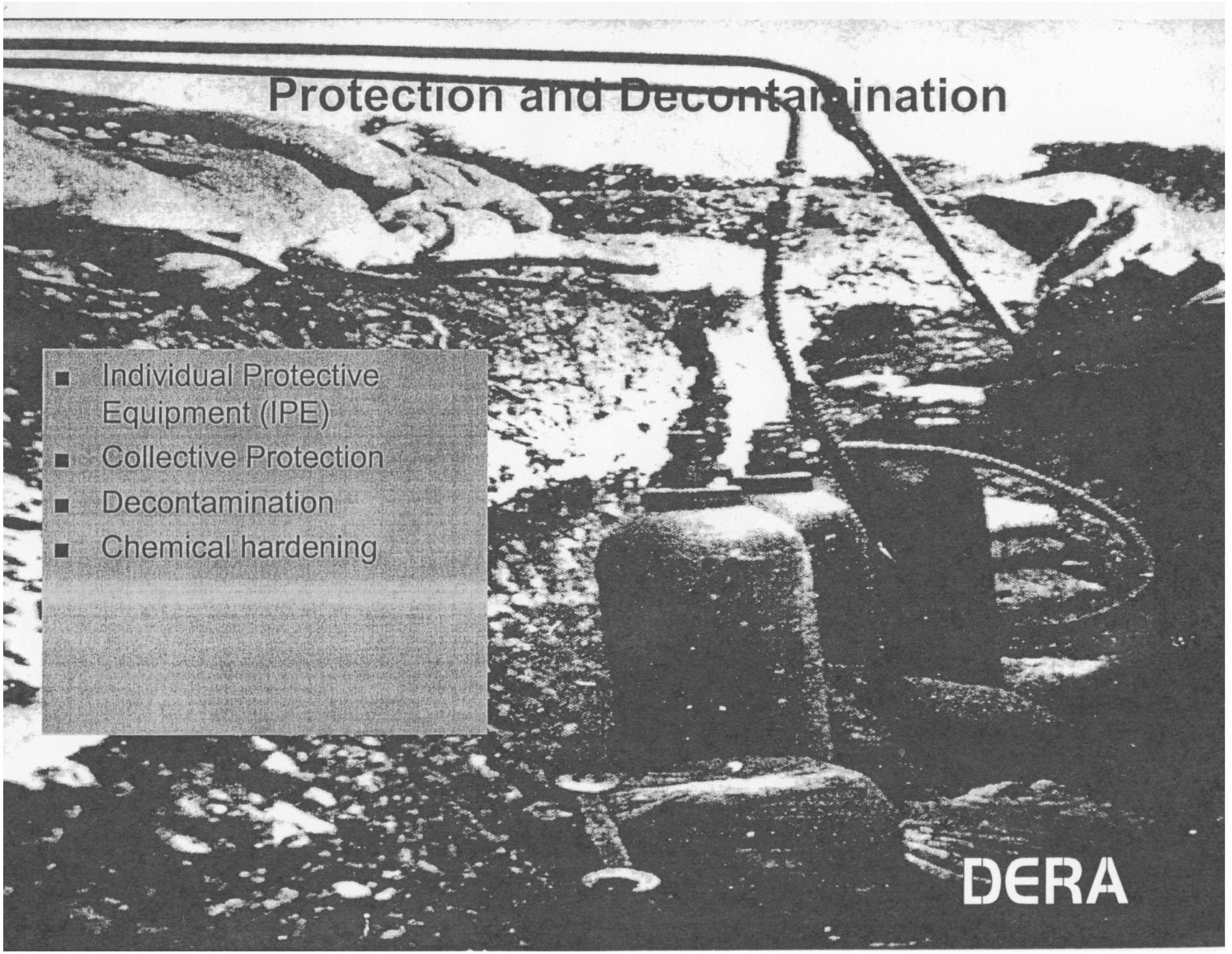
Protection and Decontamination
Individual Protective Equipment (IPE)
Collective Protection
Decontamination
Chemical hardening
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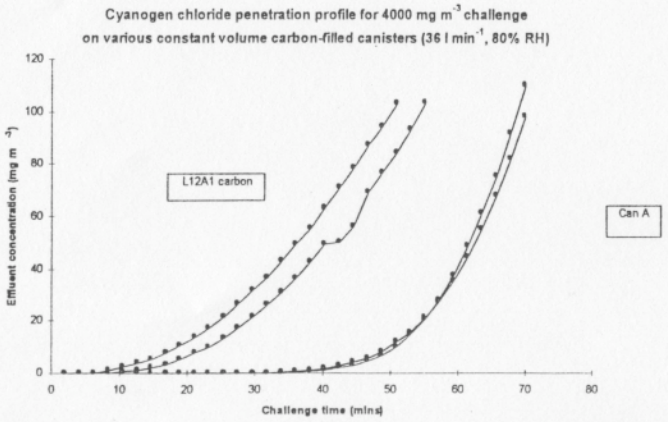
Respirators

- Current in-service respirator S10 with L12A1 Canister
- Due for Replacement ~2005
  - GSR
  - FIST
  - Adsorbent Research
  - e.g.monoliths, fibres
- Canister Design
  - airflow studies



- Material Technologies
- Design Technology
  - e.g.seals
- Physiology/Psychology
- Testing Technologies
  - e.g.remote monitoring

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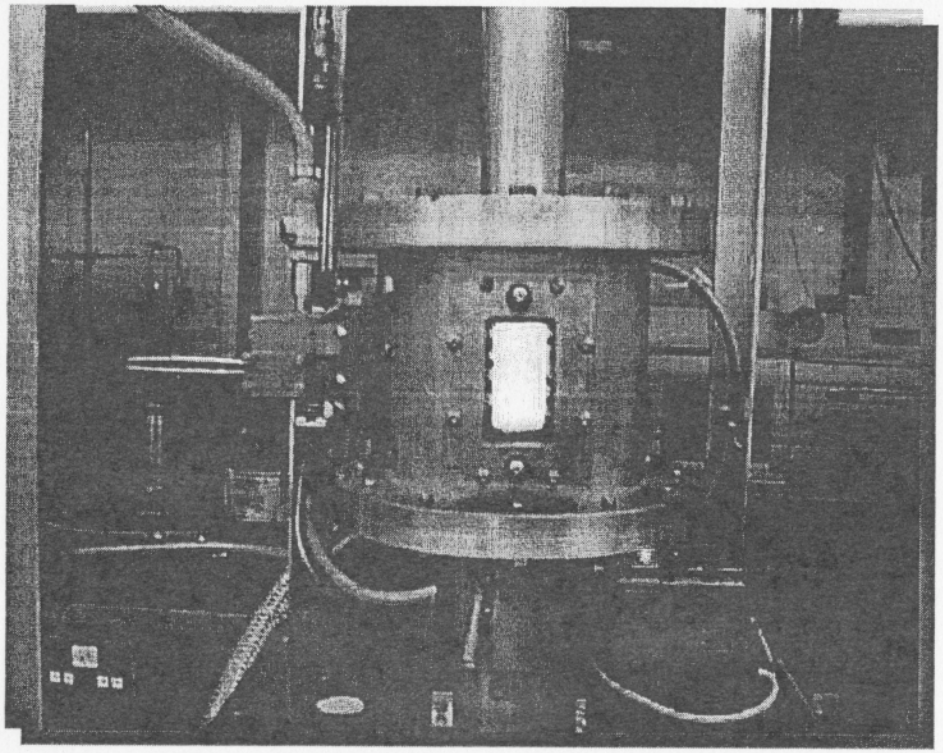
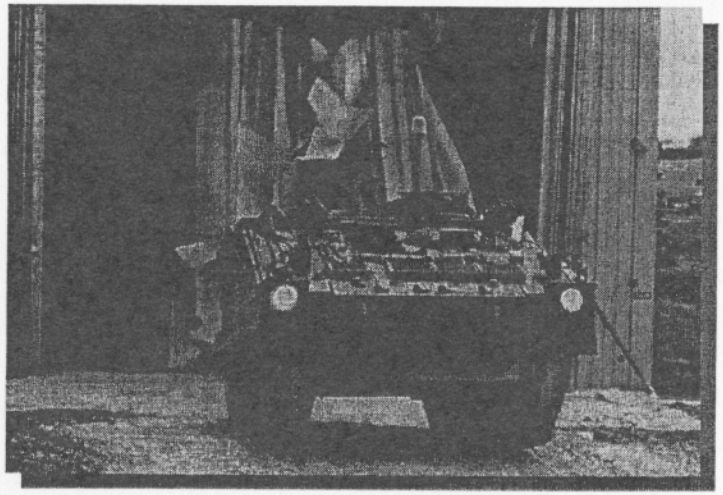
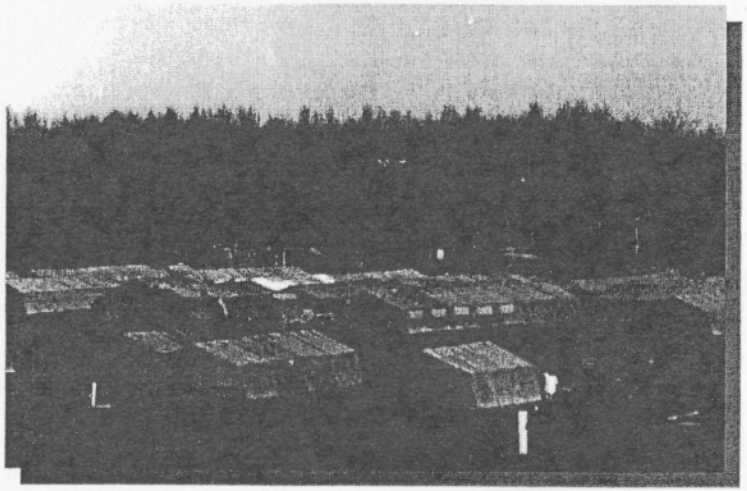
COLPRO

- COLPRO Technologies comprise of:
  - Systems
  - Filters







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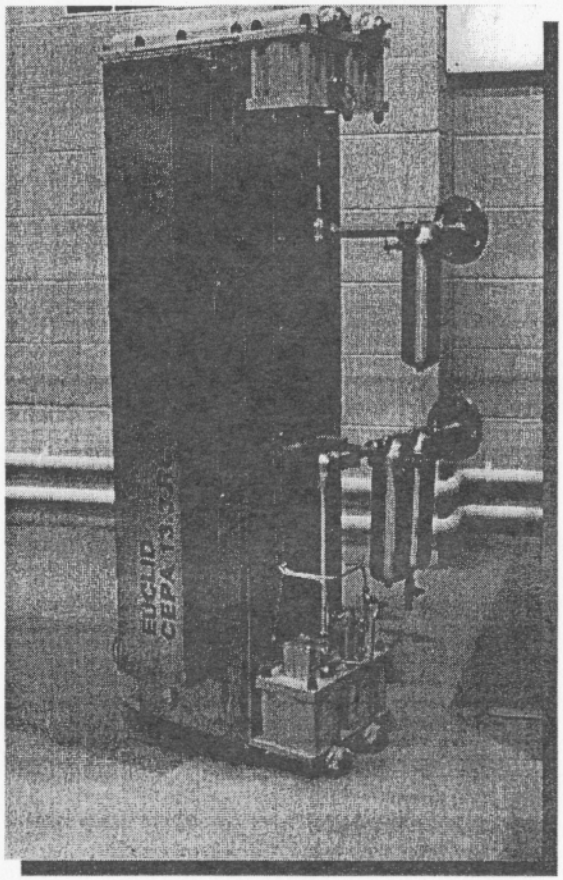
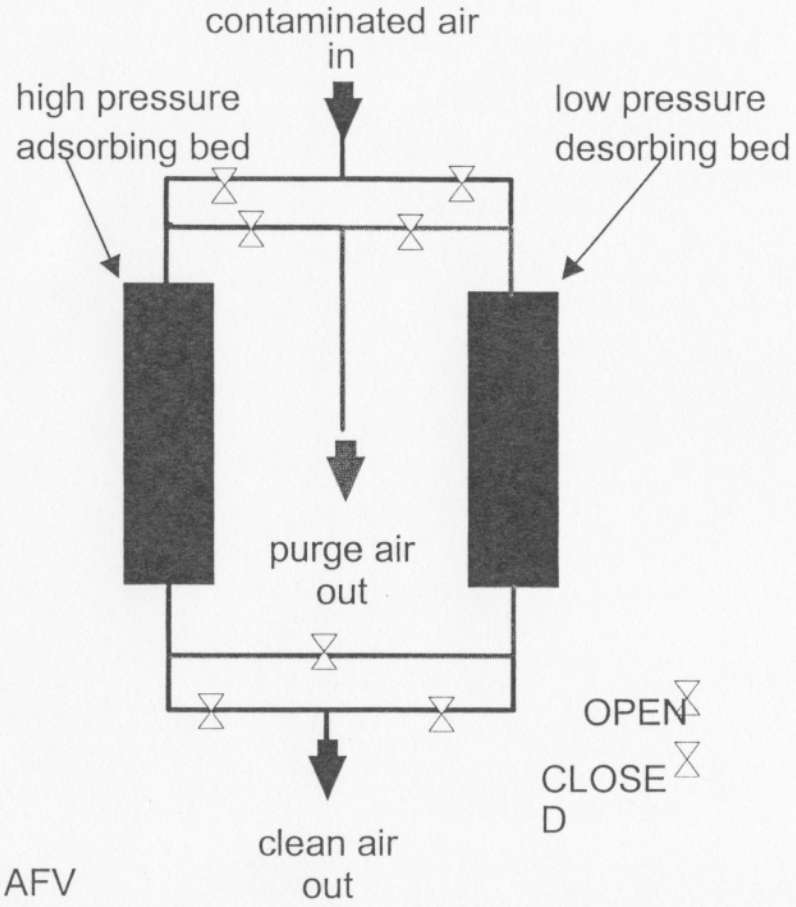
Regenerable Systems - (PTSA)

- R&D to determine bed design, hardware design, performance, robustness
- Effective performance and reliability of PTSA Demonstrated
- **Generic CW protection**





- TDP in AFV
- TDP in ship - RV Triton?

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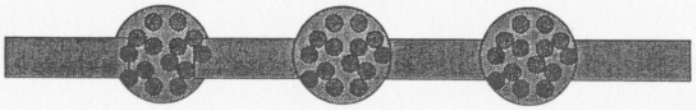
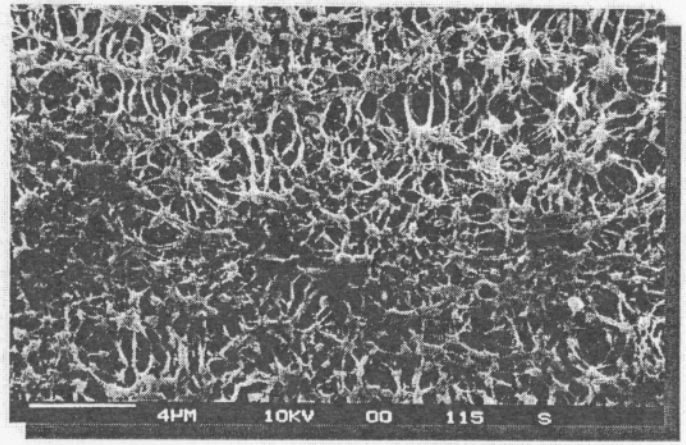
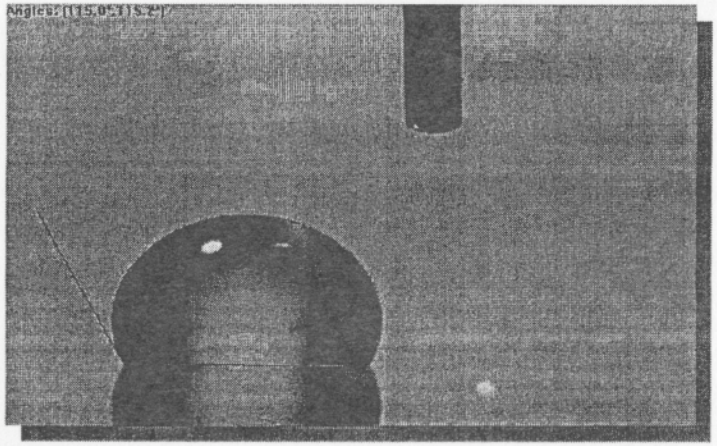
Clothing Materials Programme



- **Structural**
  - Novel weave

- **Material Properties**
  - Regenerable carbon
    - Reactive fabrics
      - Selectively Permeable/Reactive Membranes





- **Liquid Repellency**
  - Polymers, emulsions and plasmas

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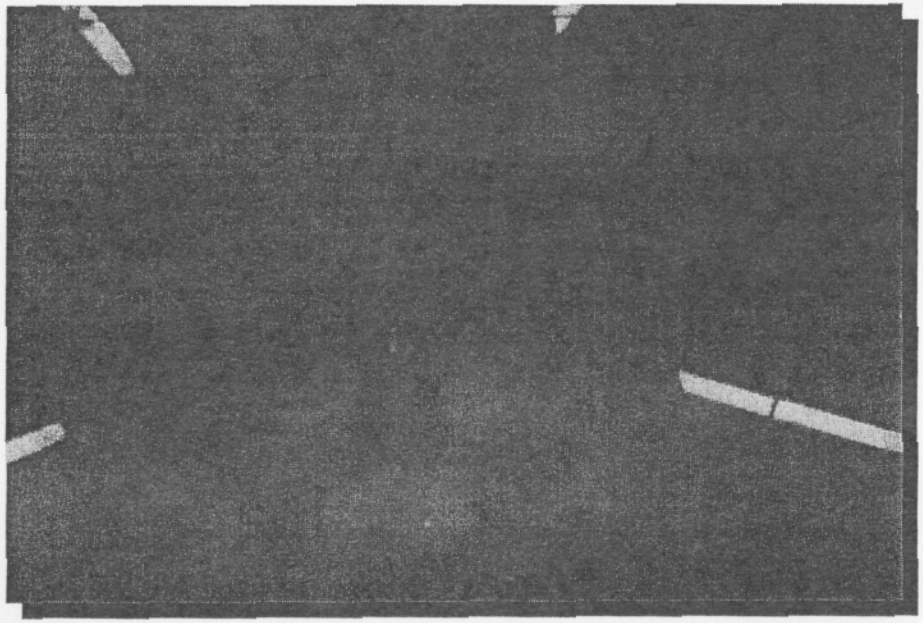
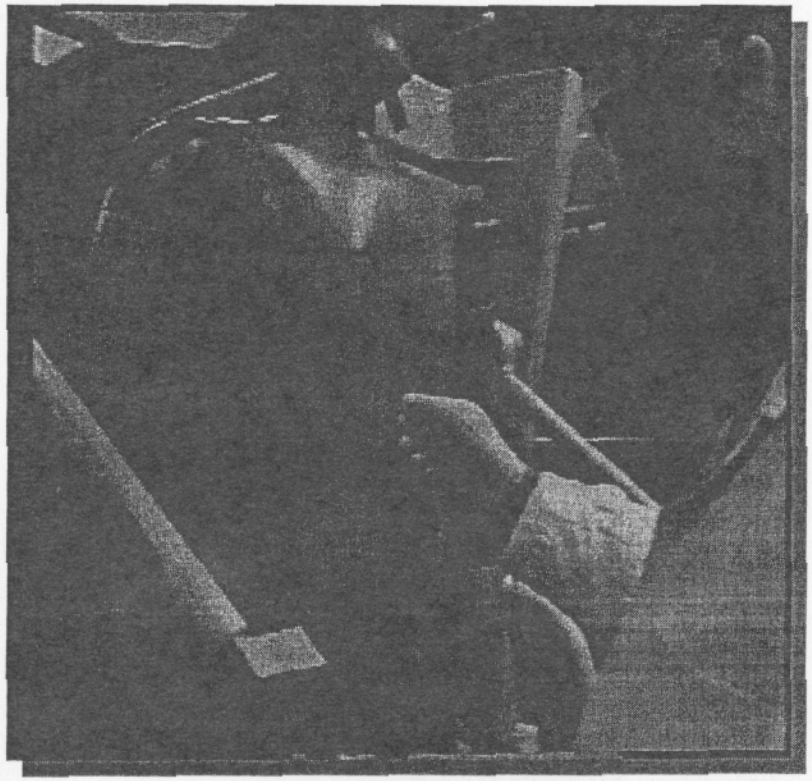
Whole System Test - *Portonman* and "Fives"

- Requirement for "whole system clothing test" for chemical protective performance
- Swatch testing does not allow for closures,seams, bellows,fit
- Solution, use a robot - **Portonman**
- Whole system test for particulate contamination - Fluorescence Interactive Video Encapsulation System - **"FIVES"**





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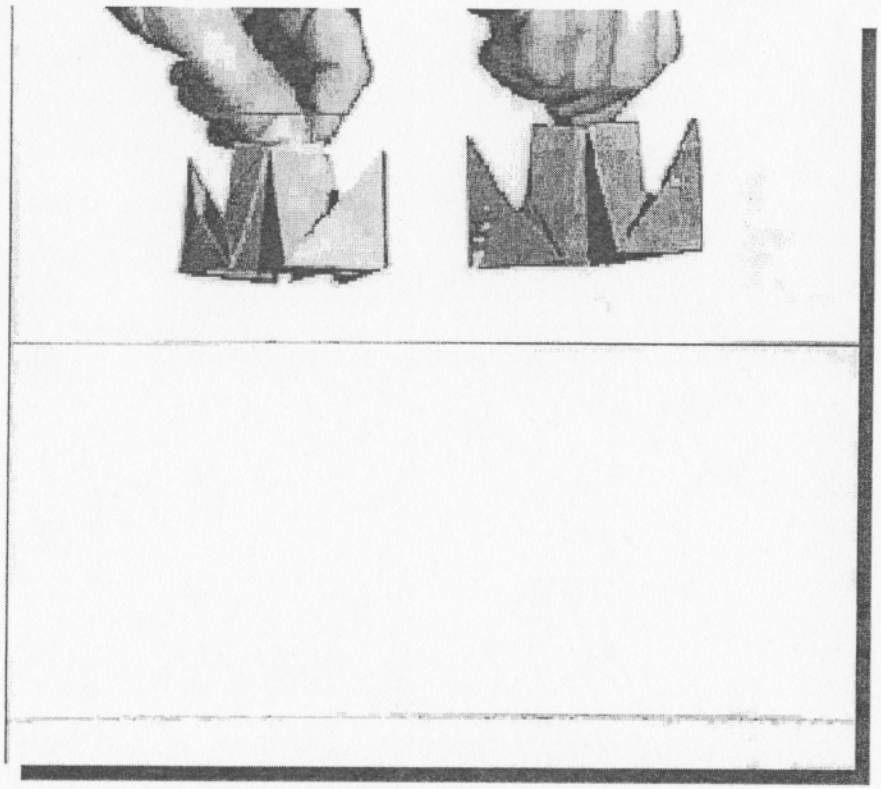
Plasma Treatment



	Adv.θ water	Adv. θ CH_2I_2	γ_{total} mNM^{-1}
PFAC8	124.8	108.0	6.07
PFAC8	124.4	108.3	6.00
FX3509	108.8	100.9	9.7
FX3509	104.5	94.3	11.08
PTFE	-	-	18.06

- Plasma Treatment significantly reduces surface energy
- Treat complex shapes
- Substrate Independent
- Stable to chemical degradation
- Work continuing on mechanical stability

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CW Agents and Seawater

- Laboratory experiments showed that chemical agents dropped on seawater do not sink.
- Thickened agents trap air bubbles and float.
- Unthickened agents spread on the surface through surface tension effects
- Many BW agents stable in seawater
  - Ingestion, inhalation ,occular hazard

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Consequences of agent spreading and flotation

- An extremely high transient rate of evaporation of agent from the surface.
- Contact hazard from floating agent to personnel wading in shallow water.

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Diving in CW Contaminated Water

- Chemical Weapons use: Access Denial
- Biological Agents: Respiratory Hazard

- Primary Hazard (CW): Bulk Release
  Number of Small Bulk Releases
  Disposed Munitions

  Surface Contamination (HD)
  Inter-tidal Area
  Strategic / Offshore Installations

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Diving in CW Contaminated Water

- Personnel Exposure:
  - Entering / Exiting Water
  - Vapour Hazard
  - Contact Hazard

- Concerns:
  - Agent Effects on Wet Skin Exposure
  - Persistency of CW Agents in Seawater
  - Chemical Hardening Characteristics of Diving Equipment
  - Decontamination
  - Contamination of Breathing Gases
  - Pressure Effects on Thickened Agent

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Diving in CW Contaminated Water

- Issues (1):
  - Hazard Assessment:
    - Survivability of CW Agents in Seawater
    - Dispersion of CW Agents
    - Toxicological Effects of CW Agents in Seawater
  - Material / Equipment:
    - Agent Effects on Materials, Welds, Interfaces & Closures
    - Seawater impact on Adsorption / Desorption Characteristics
    - Effects on Mechanical Properties

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Diving in CW Contaminated Water

- Issues (2):
  - Decontamination
    - Efficacy of Decontamination Processes (On Unhardened Equipment)
    - Extent of Residual Hazard - Equipment Re-Use?
    - What needs to be Decontaminated? To what Level?
  - Toxicological Effects
    - Adsorption Characteristics of Fully Hydrated Skin
    - Consequent Toxicological Impact

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Diving in Polluted Water

- Hazard:
  - Bacteriological / Viral
  - Industrial Chemicals
  - Petroleum, Oil & Lubricants (POL's)

- Issues:
  - Similar Issues as with CW Agents BUT....
  - Immersion Hazard for Bacteriological / Viral Contamination
  - Industrial Chemicals - Greater Volume Releases

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Diving in Contaminated Water

- Generic Issues
- Hazard Assessment
- Suit / Equipment Design - Dry Suit
  - Interfaces with Gloves, Hood & Facemask
  - Seals & Zip (closure) Design
  - Material Selection
- Entry, Exit & Decontamination Procedures
- Impact on Littoral Operations

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