


**Presentation 5 – R. Eugene Godwin**

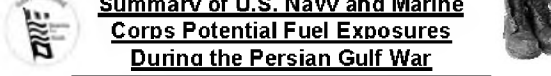


## Summary of Potential Fuel Exposures During the Persian Gulf War

### U.S. Navy & U.S. Marine Corps

Presented by  
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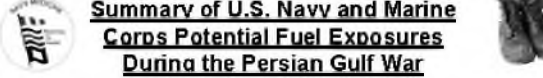
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## Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

- Does NOT include oil fires and associated byproducts
- What fuels were used?
  - Jet fuels/kerosene (Jet A-1, JP4, JP8) (75%)
  - Diesel Fuel (24%)
  - Gasoline (leaded) (1%)
- Approximately 1.8 billion gallons of fuel used
- 1 Aug 1990 – 30 Mar 1991: Approximately 145,000 gallons of gasoline (leaded) consumed per day
  - Saudi Arabia provided jet fuel and leaded gasoline
  - No source was identified for diesel fuel

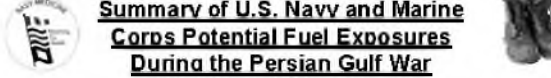
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## Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

- How were fuels used?
  - Vehicle, mobile armament and equipment operation
    - Diesel & gasoline mentioned, typical fueling, motor pool and aviation scenarios
  - Tent heaters, cooking stoves and portable generators
    - Individual service reports from DOD to Institute Of Medicine (IOM) (1996) state Navy used kerosene and diesel fuel for tent heaters, Marine Corps reported using only diesel fuel
  - Dust & sand suppression
    - Diesel & JP4 mentioned
  - Solvents
    - "petroleum" solvents mentioned
  - Accelerant for burning trash & wastes
    - Diesel mentioned for daily burnout of waste cans

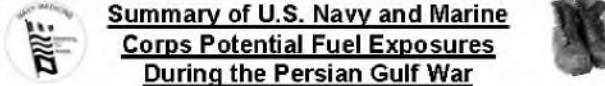
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## Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

- Likely Exposures
  - 1994 National Institutes of Health, *The Persian Gulf Experience and Health, Technology Assessment Workshop* statement
    - "The practices of spreading oil dust suppressants, burning trash and human waste, and using gasoline and diesel fuels for unvented heaters are documented. There were no reported measurements of ambient or indoor pollutants."
  - 1996 Institute of Medicine, *Health Consequences of Service During the Persian Gulf War: Recommendations for Research and Information Systems*.
    - "Monitors of air and soil contaminants were not operating for the full period of ODS/S, and other kinds of exposures were not measured."


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### Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

- Likely Exposures
  - **Fueling operations and/or spills (Inhalation; Dermal)**
    - Gasoline— lead, BTEX (benzene, toluene, ethylbenzene, and xylene)
    - Kerosene based fuels— kerosene, jet fuels, naphtha, PAH (Polycyclic Aromatic Hydrocarbons)
    - Question: Were fuel tanks cleaned?
      - If so, tank entry makes high dermal exposures probable
  - **Tent Heaters, generators, stoves (Inhalation)**
    - Combustion byproducts, i.e., CO, SO<sub>2</sub>, NO<sub>2</sub>, particulates, H<sub>2</sub>SO<sub>4</sub>, NO<sub>x</sub>, organic carbon
    - Lead (leaded diesel & gasoline)
    - Consider poor ventilation & slow smoke dissipation in tents, unvented heaters, and use of non-issued fuels

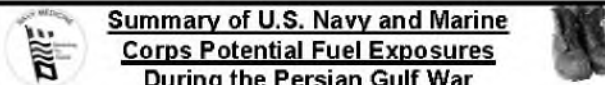
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### Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

- Likely Exposures
  - Vehicle/Equipment Operation (Inhalation)
    - Combustion products
    - Lead
  - Trash and Waste Burning (Inhalation)
    - Combustion byproducts
      - Possible dioxins, PAHs, acids
  - Dust Suppression [Spraying operations on sand and roads] (Inhalation; Dermal; Ingestion)
    - Mists & vapors (volatilization) from diesel & jet fuels
    - Consider ingestion from contaminated hands, clothing, food & water
    - Consider dermal absorption during spray operations
      - Depending on wind direction/speed
      - Proximity of spray to troops

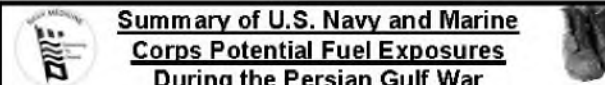
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### Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

- Likely Exposures
  - Cleaning (dermal)
    - Petroleum products used as solvents
      - Kerosene
      - Jet fuel
      - Unknowns?

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### Summary of U.S. Navy and Marine Corps Potential Fuel Exposures During the Persian Gulf War

Questions?

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