





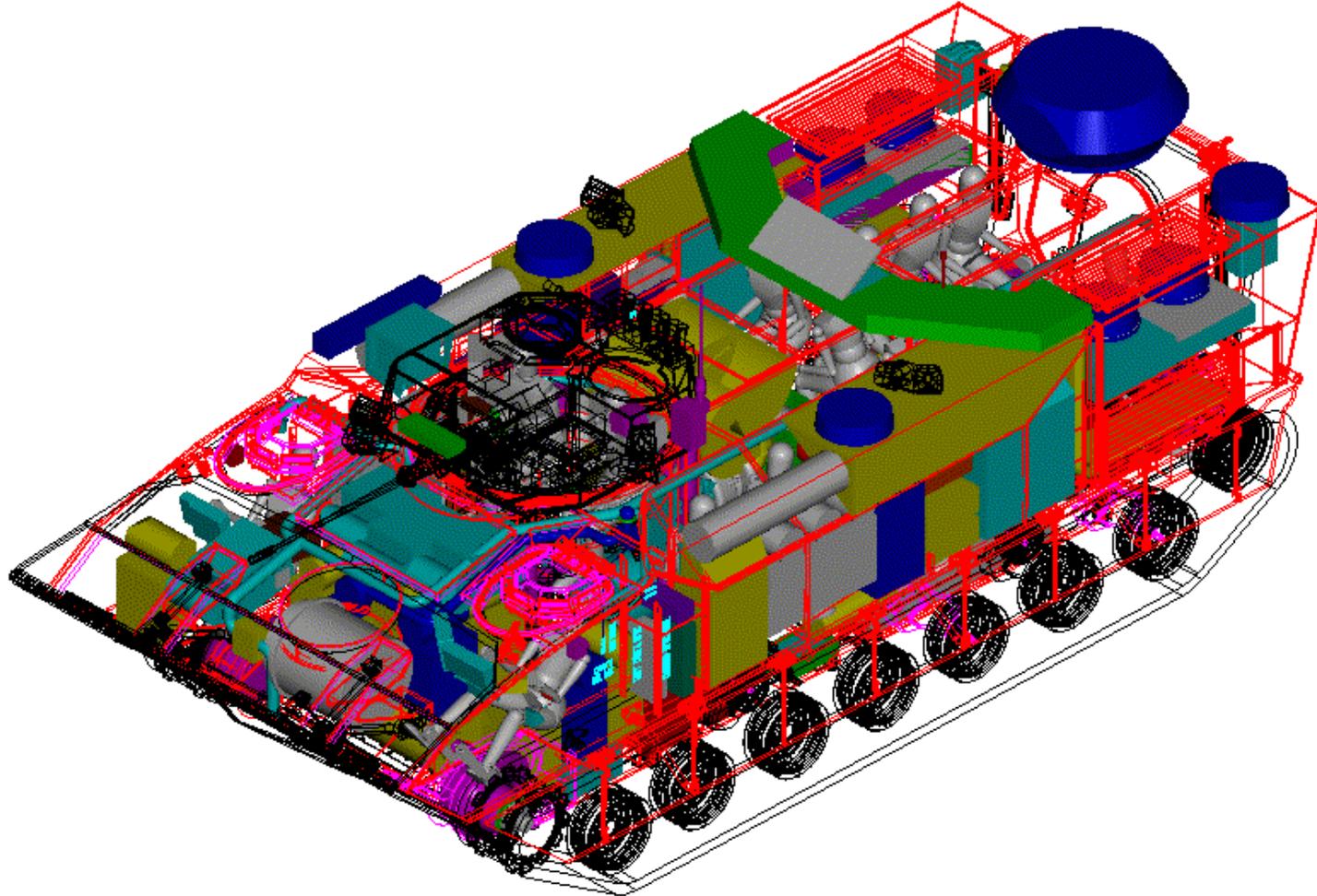


Israel Sa'ar V Class Fast
Missile Corvette





Halter "Ambassador Mk III"
Class of Fast Missile Craft











**A JOINT ARMY-NAVY CONCEPT EXPLORATION
EFFORT TO INTEGRATE ARMY
SMOKE/OBSCURANTS
ONTO NAVAL BOATS**







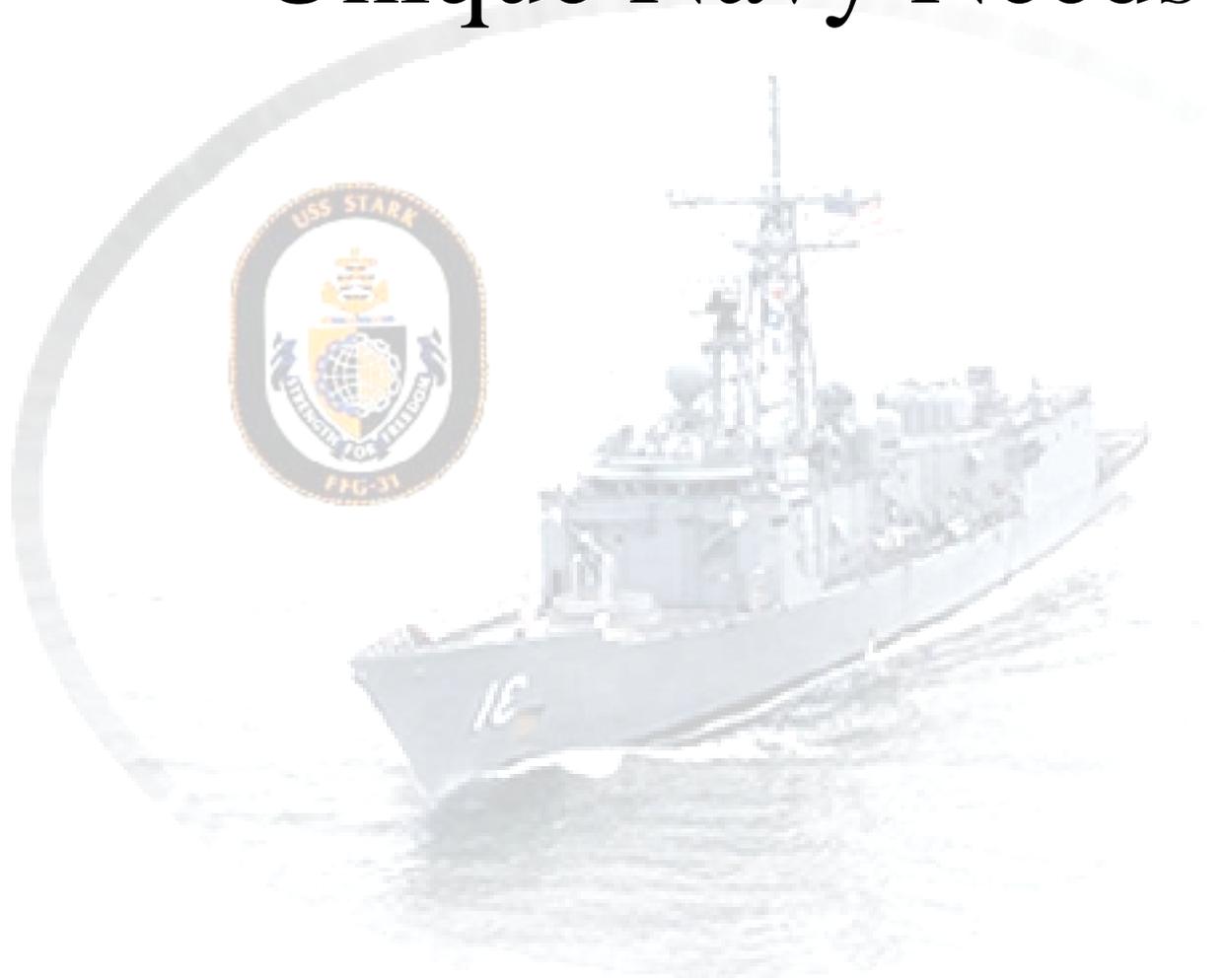
U.S. "Mk V" (SOC)
Special Operations Craft







Unique Navy Needs



Features: Unique to Naval Applications

- **Mission**
 - May not be impaired
- **Environmental conditions**
 - Shock
 - EMI/EMC
- **Power Density and Duty cycle**
 - Extended operation at part load
 - Accels./decels
 - Space and weight constraints.
- **Logistics**
 - Fuel (F-76 cap of 1% S and average of 0.59% [5,900 ppm] and JP-5 cap of 0.4% S and average of 0.047% [470 ppm])
 - Lube oil and other fluids





DoD Emission Reduction Drivers

- **Clean Air Act Amendment (CAAA), 42 U.S.C. 7401**
- **National Environmental Policy Act (NEPA) for all major Federal actions.**
- **CAA conformity for Federal actions in non-attainment and maintenance areas.**
- **EPA/State/Local Regulations**
 - **CARB Risk Reduction Plan**
- **Federal Executive Order 13123**
- **Exemptions for Tactical Equipment**



Why Is Tactical (Combatant) Equipment Exempted from Emission Regulations?

- **Tactical equipment must be capable of:**
 - **Operating in a wide variety of environments.**
 - **Operating with limited logistical and maintenance support.**
 - **Operating on a wide range of fuels including JP-5 (aviation fuel) and MGO (marine gas oil) for shipboard applications and JP-8 for land applications.**
 - **Being deployed from the continental U.S. without substantial modification.**
- **Tactical equipment generally operates fewer hours annually than similar commercial equipment.**
- **In many instances tactical equipment is essential for national security (protection of life and property).**



Introduction of IMO/EPA Compliant Engines

- **New construction**
 - **LPD-17:** Caterpillar & Pielstick; 12 ships
 - **LHD-8:** Pielstick; 1 (+4 possible) ships
 - **T-AKE:** Fairbanks Morse or Pielstick; 12 ships
 - **T-AKR:** Pielstick/Wartsila and Caterpillar); 12 ships
 - **JMLS:** (engine not yet selected); 222 units
 - **LCU:** (engine not yet selected); 70 units
- **Re-power**
 - **FFG-7:** Caterpillar; 60 - 92 units
 - **CAC:** Caterpillar; 6 craft
 - **MCM/MHC:** (engine not yet selected); 153 units



Emission Trends (courtesy of SouthWest Research Institute and ICAO)

