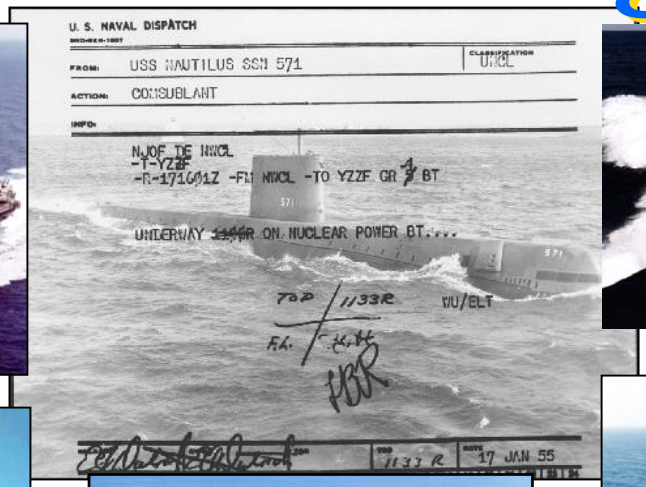
United States Naval Nuclear Propulsion Program



90,000 TONS OF DIPLOMACY
Anytime, Anywhere

NAVAL SPENT FUEL CYCLE

! **Upon refueling/defueling, all naval spent fuel transported by rail to Program's facility in Idaho for examination to:**

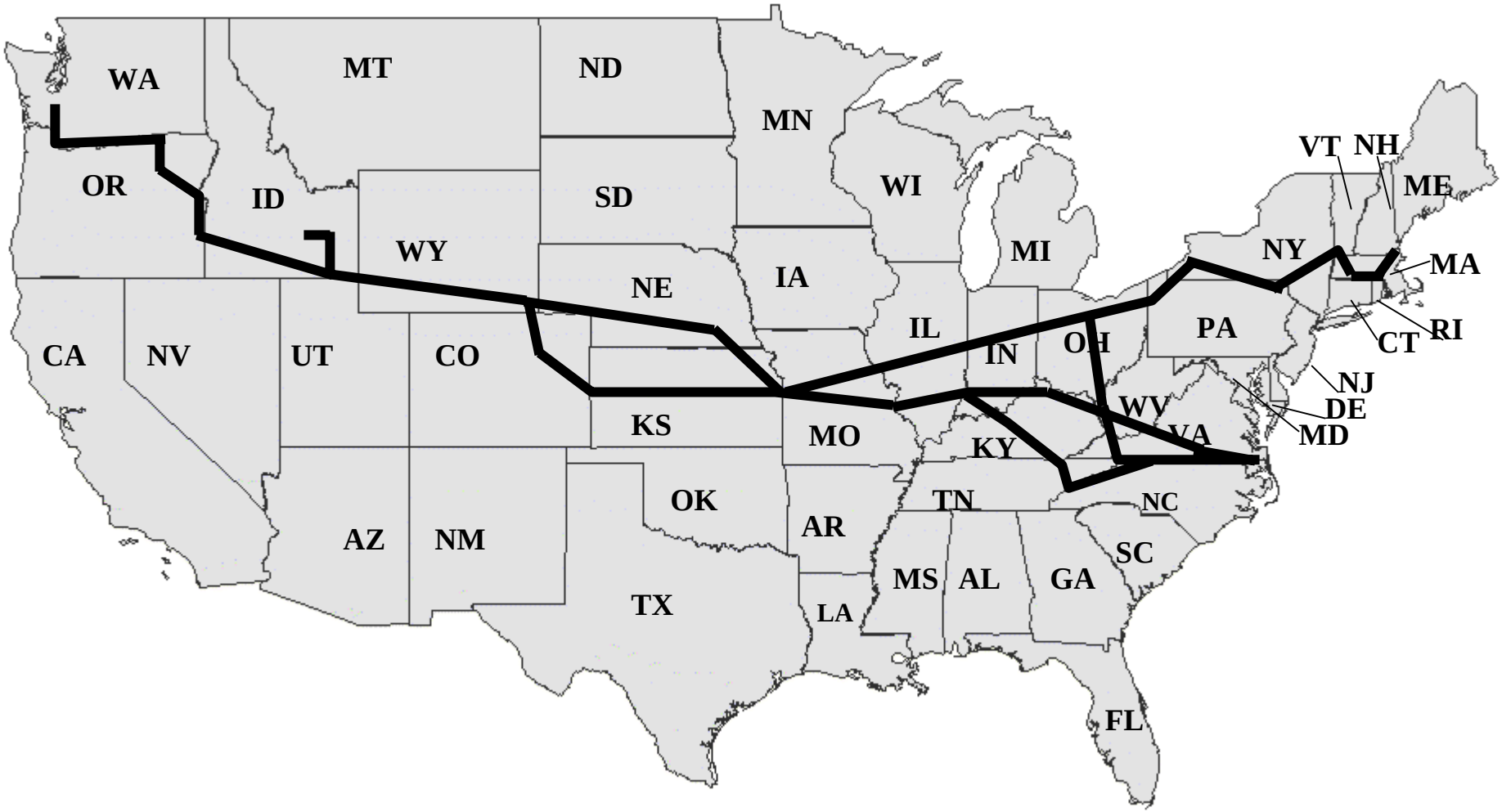
- **ensure maximum performance of current fuel**
- **enable design of new fuel with longer lifetimes**

! **For comparison:**

- **Original NAUTILUS fuel operated 2 years**
- **Current submarine fuel to operate life of ship (33 years)**

! **Ultimate disposal in geologic repository**

TYPICAL NAVAL SPENT FUEL SHIPPING ROUTES



754 CONTAINERS SAFELY SHIPPED
(3/8/57 – 1/20/04)

NAVAL SPENT FUEL SHIPMENTS ARE SAFE

- **Nature of the fuel**
  - ← **Rugged**
- **Shipping containers**
  - ← **Robust**
- **Shipping practices**
  - ← **Escorts**

NAVAL SPENT FUEL CHARACTERISTICS

! **Solid metallic form - not flammable, not explosive**

! **Built for combat - battle shock**

- **well over 50 g's**

! **Contains fully all long-lived radioactivity (fission products)**

! **Safe to operate in close proximity to sailors on warships during combat**

Bottom line: Exceptionally well-suited for safe transport and storage for long periods.

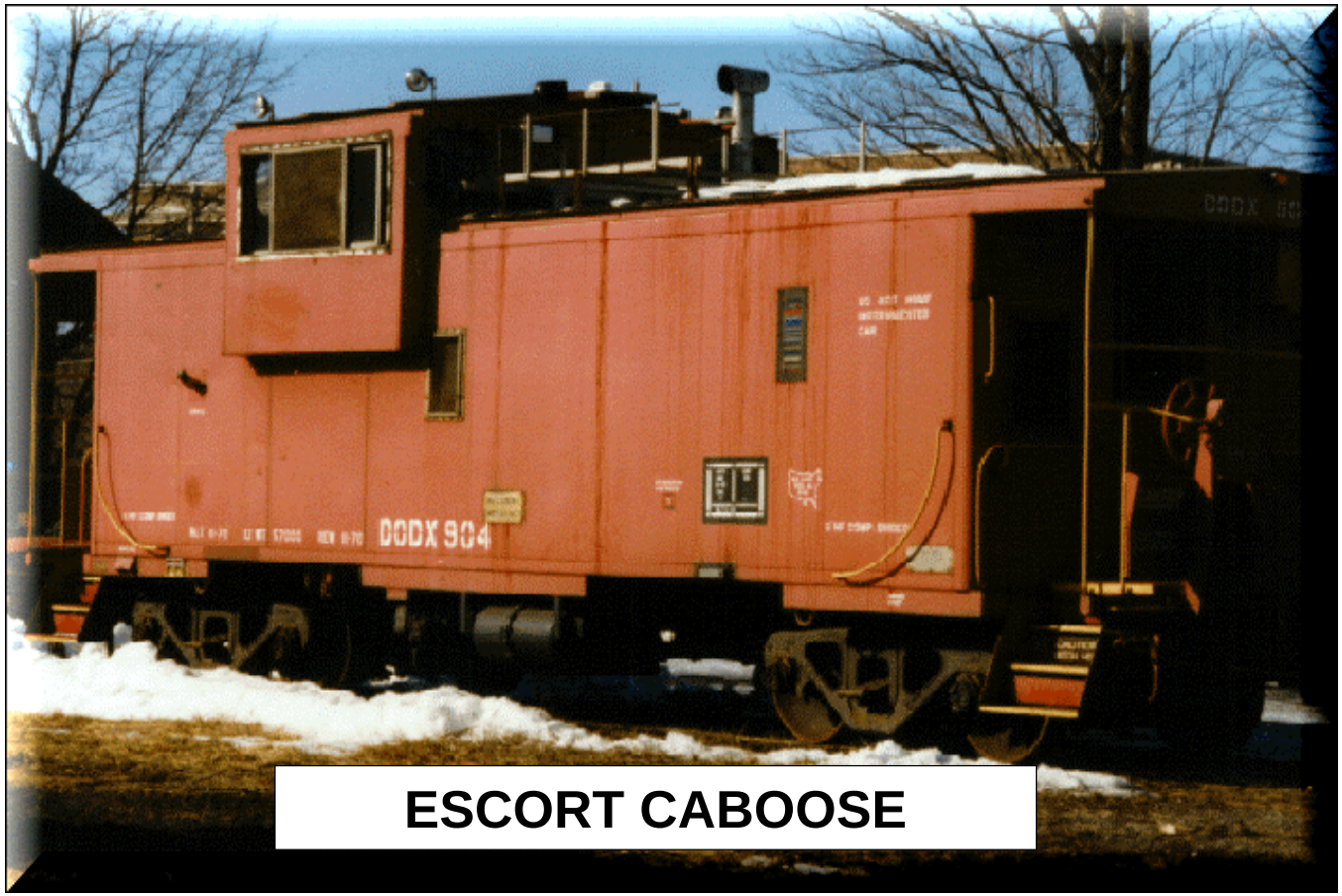
NAVAL SPENT FUEL SHIPPING CONTAINERS

M-140 Transportation Cask

- **14 INCHES SOLID STAINLESS STEEL**
- **350,000 POUNDS**
- **TYPE B NRC CERTIFIED**

NAVAL SPENT FUEL SHIPPING PRACTICES

- Government-owned railcars, inspected and maintained
- Advance arrangements with rail carriers
- Location and status constantly monitored - satellite tracking



ESCORT CABOOSE

➔ Escorted by specially-trained Navy couriers

- □ On-board traffic managers
- □ On-board first responders

EMERGENCY RESPONSE

- **Robust shipping containers provide a formidable barrier to release of radioactive material or significant radiation level increase, therefore courier's *EMERGENCY RESPONSE PRIORITIES ARE*:**
    - **Emergency first-aid**
    - **Summon assistance**
    - **Prevent further injury/damage**
    - **Verify radiological condition**

- **Navy couriers assist Incident Commander in:**
    - **Crowd control**
    - **Communications and public information**
    - **Initial response actions, e.g., safety boundaries.**

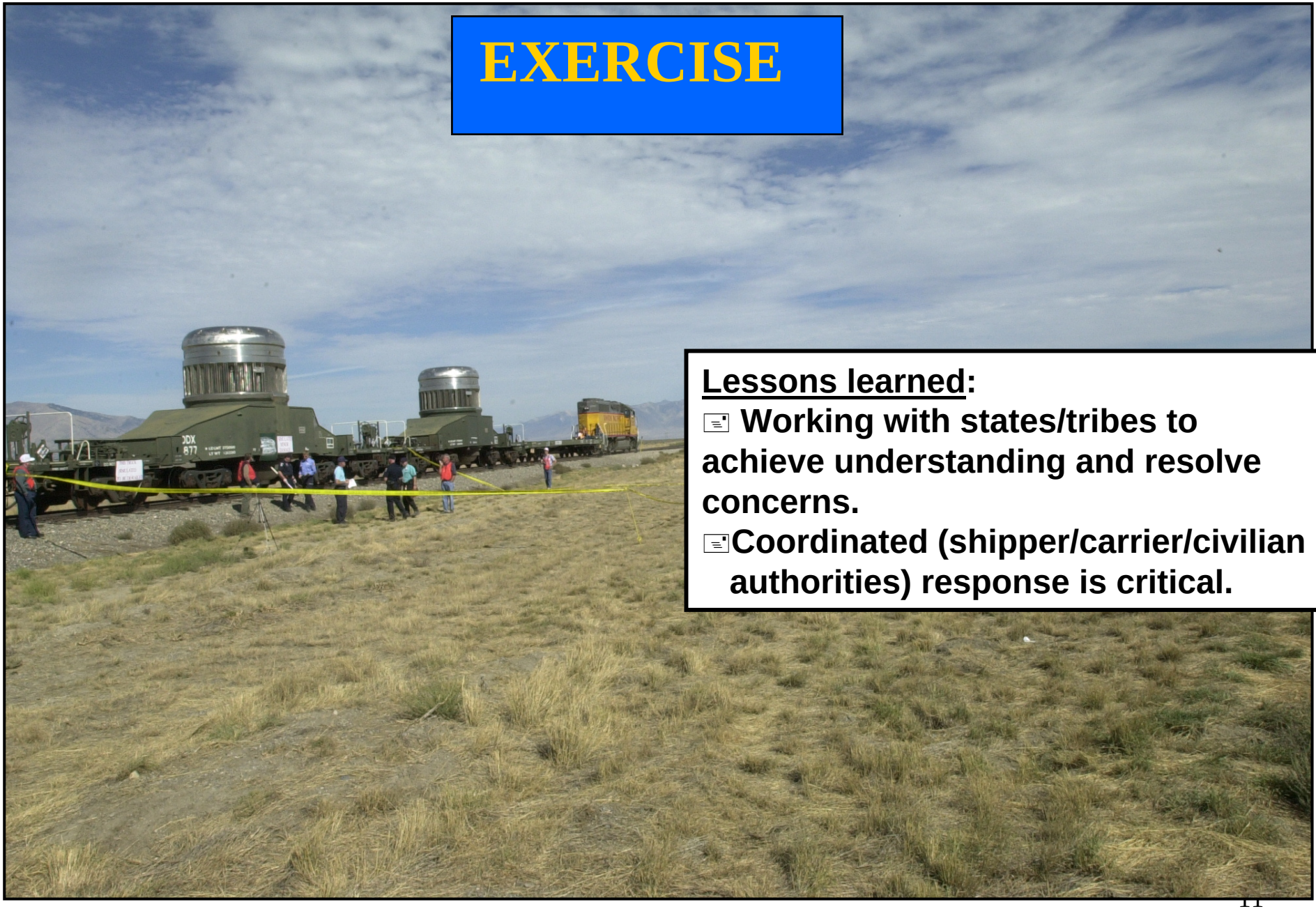
•EXERCISE BACKGROUND

- EXERCISES ON THE EAST AND WEST COASTS AT NAVAL SHIPYARDS AND INEEL SINCE 1996

- OUTREACH AND EMERGENCY PLANNING FOR NAVY SPENT FUEL SHIPMENTS

- OPPORTUNITY TO EXERCISE EMERGENCY RESPONSE, INCLUDING REMOTE COMMUNICATIONS

EXERCISE



<u>Lessons learned</u>:

- **Working with states/tribes to achieve understanding and resolve concerns.**
- **Coordinated (shipper/carrier/civilian authorities) response is critical.**

NNPP SPENT FUEL RAIL TRANSPORTATION EXPERIENCE LESSONS LEARNED

- **SAFETY PROVIDED BY THE FORMIDABLE TYPE B PACKAGING**

- **RAIL SYSTEM DRIVEN TOWARD SAFE OPERATIONS**
  - **Closed system…business incentive is strong**

- **UNENCUMBERED OPERATIONS ENHANCE SAFETY**
  - **Elimination of self-imposed speed restriction**

NNPP
RAIL TRANSPORTATION EXPERIENCE
LESSONS LEARNED

- **TRAIN SERVICE**
  - **Dedicated train service not safer**

- **CAREFUL RAILCAR SELECTION**
  - **Suitable for size, weight, and dynamic stability**
  - **Inspection and maintenance**

- **EXERCISES ARE VALUABLE**
  - **Practice emergency response and exercise communications**

NNPP
RAIL TRANSPORTATION EXPERIENCE
LESSONS LEARNED

- **ROUTING**
  - **Routing flexibility for rail carrier translates to safe movements**

- **RAILROAD SAFETY OVERSIGHT**
  - **Existing industry/FRA oversight adequate**

- **RAILROAD POLICE ENGAGEMENT**

SUMMARY

- 754 containers over 46 years
- Safe shipments
  - Rugged fuel
  - Robust shipping containers
  - Proven shipping practices/escorts
- Lessons Learned
  - Type B package provides safety
  - Closed system drives safe operations
  - Unencumbered operations enhances safety
  - Dedicated service not safer
  - Routing flexibility promotes smooth operations
  - Railroad safety oversight adequate
  - Careful railcar selection/inspection
  - Coordinate security issues with railroad police
  - Exercises are valuable