TRANSPORTATION OPERATIONAL PLANNING

- SYSTEM ENGINEERING
- PLANNING AND CONTROL SUBSYSTEM

OPERATIONS INTERFACE WITH CASK SYSTEM DEVELOPMENT

- TRANSPORTATION CASK SUBSYSTEM
- CARRIAGE SUBSYSTEM
TRANSPORTATION OPERATIONS SYSTEM

TRANSPORTATION OPERATIONS INTERACTS AT DEPTH WITH OTHER AUTHORITIES
SYSTEMS ENGINEERING APPROACH
IDENTIFICATION, DESCRIPTION, ALLOCATION
OF FUNCTIONS

FUNCTIONAL REQUIREMENTS
- OPERATIONAL EXPERIENCE ASSESSMENTS
- FUNCTIONAL REQUIREMENTS AND DESCRIPTIONS

REQUIREMENTS ALLOCATION
- MANAGEMENT STRUCTURE
- FEASIBILITY STUDIES
- ISSUES RESOLUTION

TECHNICAL REQUIREMENTS
- FLEET COMPOSITION
- FLEET SIZE
- FLEET MAINTENANCE REQUIREMENTS
- RELIABILITY, AVAILABILITY, MAINTAINABILITY
- CASK MAINTENANCE REQUIREMENTS

MK3
8/21/89
RESULTS OF OPERATIONS SYSTEM ENGINEERING

- IDENTIFIED AND DESCRIBED TOP LEVEL FUNCTIONS
  - ACCEPT
  - TRANSPORT
  - SUPPORT

- DEFINED LOWER LEVEL SUBFUNCTIONS AND INTERRELATIONSHIPS

- IDENTIFIED SET OF SUBSYSTEMS

- INITIATED PROCESS TO IDENTIFY ISSUES
THE TRANSPORTATION OPERATIONS SYSTEM ELEMENTS

- LONG RANGE PLANNING
- QUALITY ASSURANCE
- OPERATIONS MANAGEMENT

TRANSPORTATION OPERATIONS SYSTEM

PLANNING & CONTROL SUBSYSTEM

SERVICING AND MAINTENANCE SUBSYSTEM

FIELD OPERATIONS SUBSYSTEM

TRANSPORTATION CASKS SUBSYSTEM

CARRIAGE SUBSYSTEM

MK5
8/21/89
LONG RANGE OPERATIONAL PLANNING CONSIDERATIONS

STANDARD UTILITY CONTRACT (10 CFR 961)

- ESTABLISHES THE SHIPMENT SCHEDULE REQUIREMENT
- REQUIRES CASK AND SUPPORT EQUIPMENT SUITABLE FOR USE AT THE UTILITY’S SITE
- REQUIRES APPROPRIATE DOCUMENTATION AND TRAINING TO UTILITIES
LONG RANGE OPERATIONAL PLANNING FRAMEWORK

PURPOSE

• DEFINE OPERATIONAL SYSTEM REQUIREMENTS

METHODOLOGY

• SPECIFY ASSUMPTIONS
• SCREEN UTILITY PICK UP OPTIONS
• IDENTIFY FEASIBLE SCENARIOS
• ITERATE THE PROCESS
ISSUES EMERGING FROM CURRENT WORK

- LOGISTICAL COMPLEXITY OF OPERATIONS
  - OVER 80 INDIVIDUAL CUSTOMERS (DOE CONTRACTS)
  - OVER 75 SITE LOCATIONS NATIONWIDE
  - OVER 125 DIFFERENT FACILITIES
  - MANY INFRASTRUCTURES HAVE MODAL CONSTRAINTS

- VARYING REACTORS ACCESS/CASK HANDLING CAPABILITIES VARY WIDELY

- NO U.S. EXPERIENCE WITH LONG-TERM, CONTINUOUS, MULTIPLE SITE CAMPAIGNS FOR SPENT FUEL SHIPMENT

- LOGISTICAL COMPLEXITY CONSIDERATIONS AFFECT NUMBER OF SITES SHIPPING AT ANY ONE TIME
ISSUE RESOLUTION ACTIVITIES

- DATA ACQUISITION/ANALYSIS
- OVERALL SYSTEM OPERATIONAL PLANNING/INTEGRATION
- DEFINE ALTERNATIVE OPERATIONS SCENARIOS FOR MULTI-SITE CAMPAIGNING BY TIME PERIOD
- USE OPERATING SCENARIOS AS BASIS FOR TOS DEVELOPMENT (EQUIPMENT, FACILITIES, SERVICES, PERSONNEL)
- SITE SPECIFIC REACTOR SERVICING PLANS
- CAMPAIGN PLANNING
CONCLUSION

• OPERATING SYSTEM IS COMPLEX

• REQUIRE INTEGRATION OF A NUMBER OF ELEMENTS

• SYSTEM ENGINEERING AND PLANNING TO BUILD A LOGISTICALLY SOUND SYSTEM
OPERATIONAL COORDINATION WITH CASK SYSTEM DEVELOPMENT

• CHECKLIST FOR OPERATIONAL REVIEW OF CASK DESIGN
  – CASK DESIGN
  – ANCILLARY EQUIPMENT
  – TRANSPORTER DESIGN
  – INTERMODAL TRANSFER EQUIPMENT

• OVERALL SYSTEM ASSESSMENT

• INPUT FOR FINAL DESIGN PERFORMANCE EVALUATION AND FLEET PROCUREMENT

• OPERATIONAL TESTING
CARRIAGE SUBSYSTEM TRANSPORTER COORDINATION

- TARGET WEIGHTS FOR CASK, TRAILER, AND TRACTOR
  54,000 LB - CASK (INCLUDING PAYLOAD AND IMPACT LIMITERS)
  9,000 LB - TRAILER (INCLUDING TIEDOWN AND PERSONNEL BARRIER)
  16,000 LB - TRACTOR (WET AND ROAD READY)

- DEVELOPED PRELIMINARY TRACTOR PERFORMANCE CRITERIA AND WEIGHT

- TRADE-OFF STUDIES ON SYSTEM PERFORMANCE VERSUS WEIGHT LIMITS

- DEMONSTRATE SYSTEM USING DUMMY CASK, PROTOTYPE TRAILER, AND PROTOTYPE TRACTOR
MANUFACTURER SPECIFIED BASE TRACTOR

CAB OVER ENGINE
180" WHEEL BASE
CUMMINS 400
FULLER 12609 TRANSMISSION
46" SLEEPER
AIR SUSPENSION
ALUMINUM WHEELS
POWER STEERING
AIR CONDITIONING
ABS

100 GALLON FUEL TANK
- ALUMINUM
ALUMINUM BELL HOUSING
ALUMINUM REAR AXLE CARRIER
SLIDING FIFTH WHEEL WITH SAVING OPTION
AIR SEATS – DRIVER AND PASSENGER
15-1/2" CERAMIC CLUTCH
DELUXE INTERIOR

Weight – Approximately 14,500 lbs (dry)
<table>
<thead>
<tr>
<th>Feature</th>
<th>Estimated Weight (Lbs.)</th>
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<tbody>
<tr>
<td>BASE TRUCK - MINIMUM ESSENTIAL FEATURES DRY</td>
<td>14,500</td>
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<tr>
<td>FUEL (100 GALLONS)</td>
<td>700</td>
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<tr>
<td>OUTFITTING (DRIVERS, GEAR, TOOLS, ETC.)</td>
<td>1,000</td>
</tr>
<tr>
<td>60&quot; SLEEPER</td>
<td>300</td>
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<tr>
<td>EXTRA FUEL TANK</td>
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<tr>
<td>206&quot; WHEEL Base</td>
<td>200</td>
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<tr>
<td>1-1/2 PERCENT VARIANCE</td>
<td>250</td>
</tr>
<tr>
<td>ALLOWANCE FOR SNOW AND ICE BUILDUP</td>
<td>300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17,350</strong></td>
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MK15
8/21/89
SYSTEM FEATURES AND WEIGHT SAVING OPTIONS FOR TRADEOFF STUDIES

TRACTOR WEIGHT SAVINGS OPTIONS

SMALL BLOCK ENGINE
MIDSIZE SLEEPER
FIXED FIFTH WHEEL
180" WHEEL BASE
ONE FUEL TANK

PROCEDURAL OPTIONS

NO ALLOWANCE FOR ICE BUILDUP
NO CHAINS

OTHERS

SINGLE DRIVER SCENARIOS
INTEGRATED (TRACTOR-TRAILER) TRANSPORTER