GA-4/9 Legal Weight Truck Cask Systems Review and Status

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Status of GA-4/9 LWT Cask Systems

- Background
- Significant milestones
- Future events
- Half-scale model fabrication
- Half-scale model testing
Background—Cask System Development Program (CSDP)

- Five contracts awarded in 1988
  - Two legal-weight truck (LWT) casks
  - Three rail/barge (R/B) casks
- As a result of program redirection (i.e., MPC system development), CSDP focused on GA-4/9 cask system
- GA-4/9 LWT cask proceeding to certification
- LWT casks needed for truck cask reactor sites
Significant Milestones—GA-4/9 LWT Cask Systems

- Released fabrication of half-scale model Mar 93
- SARs submitted to NRC Jul/Aug 94
- LWT trailer durability test completed Feb 95
- DOE accepted LWT trailer Apr 95
- Received SAR Round 1 questions May 95
Future Events—GA-4/9 LWT Cask Systems

- LWT performance & operational testing  May 95 - Jun 96
- Fabrication of half-scale model  Aug 95
- Perform regulatory tests on cask model  Sep 95
- Submit test report to NRC  Nov 95
- Receive NRC certification of compliance  Jul/Aug 96
- Deliver GA LWT prototype cask per Program Plan  Sep 97
GA-4 Legal Weight Truck Cask

- Stainless-Steel Closure
- Inconel Closure Bolts (12)
- Lifting and Tiedown Trunnions
- Spent PWR Elements (4)
- Stainless-Steel Liner
- Stainless-Steel Skin
- Polypropylene Neutron Shield
- Stainless-Steel Body
- Holes for Inconel Impact Limiter Bolts (8)
- Removable Aluminum Honeycomb Impact Limiter
- Depleted Uranium Gamma Shield
GA-4/9 Cask Cross Sections

- Fuel Support Structure (Stainless-Steel)
- Gamma Shield (Depleted Uranium)
- Containment Boundary (Stainless-Steel)
- Neutron Shield (Polypropylene)
- Outer Skin (Stainless-Steel and Copper)

GA-4 Cask

GA-9 Cask

Civilian Radioactive Waste Management System
Management & Operating Contractor
Key Design Features

- Four PWR or nine BWR spent fuel assemblies
- Stainless steel cruciform spent fuel support structure
- Stainless steel liner
- Depleted uranium (DU) gamma shield
- Stainless steel outer shell
Key Design Features

- Polypropylene neutron shield
- Forged bottom head
- Bolted lid closure
- Aluminum honeycomb impact limiters
- Access ports for draining, drying, and venting for in-plant operations
GA-4 Half-Scale Cask Model Body

Material: XM-19
Shielding: DU
Weight: 3,175 kg (7,000 lbs.)
Length: 240 cm (94.5 in.)
Max. Dia.: 50 cm (19.7 in.)

IMPACT LIMITER
OUTER SHELL
19mm THICK

SUPPORT STRUCTURE

FUEL SUPPORT STRUCTURE

INNER LINER
5mm THICK

SIMULATED NEUTRON SHIELDING
DEPLETED URANIUM
35mm THICK

FINS
GA-4 Impact Limiter Half-Scale Test Model

- ROUND UPPER ASSEMBLY
- UPPER WEDGE ASSEMBLY
- LOWER WEDGE ASSEMBLY
- IMPACT Limiter HOUSING
Half-Scale Model Fabrication

- Outer shell
- Shell (XM-19) cold forming
- Hot forming of shell
  - Heated to 2000°F
  - Vertical press bending shell
  - Plate reoriented for second bend
  - Final shape after bending
Fuel Support Structure

- Four wings welded to center piece
- Dimensions 4.5 x 83 x 5/16 inches
- Drilled holes for $\text{B}_4\text{C}$ pellets
- Approximately 300 holes per wing
Insertion of Fuel Support Structure

- Inner liner fixtured for alignment
- Fuel support structure slides into keyways
- Lateral guides and vertical supports
Depleted Uranium (DU) Assembly

- First ring placed over inner liner
- Inflatable bladder used to guide rings
- DU ring tapered
- Last ring being lowered over inner liner
- Completed assembly of DU rings
Placement of Outer Shell

- Lifted by impact limiter bolt attachment lugs
- Start to slide outer shell over DU rings
- Impact limiter bolt attachment lugs
- Weld preparations on outer shell and bottom head
Impact Limiter Support Structure Ribs

• Thirty-six ribs welded to both ends
• Different length to transition from square to round
• Fixture used hold and rotate model for welding on ribs
• Fixture to keep alignment of ribs during welding
Enclosure Shell for Impact Limiter Support Structure

- Ten slots per rib
- Plug welds attach shell to ribs
- Tapered at edge to match impact limiters
Impact Limiter Housing

- Inner structure for attaching honeycomb
- Tubes for impact limiter attachment bolts
- Gussets to reinforce during impact
Neutron Shield (Not Part of Model)

- Outer shell
- Neutron shield blocks
- Neutron closure shell
- Aluminum tubes (not shown) transfer heat through neutron shield
GA-4 Half-Scale Cask Model Regulatory (Drop) Testing

- Awarded contract to Maxwell Laboratories Mar 95
- Construct drop pad May 95
- Review GA test procedures Jul 95
- Perform benchmark tests with dummy cask Aug 95
- Perform drop tests Sep 95
- Complete test report Oct 95
- Submit test report to NRC Nov 95
Drop tests (in Accordance with 10CFR 71.73)

- Three 30-foot drops
  - Side horizontal
  - Side slapdown
  - Corner over center of gravity
- Three puncture drops
  - Into damaged impact limiter at lid
  - Into center of model horizontal
  - Into damaged impact limiter at lid closure seals