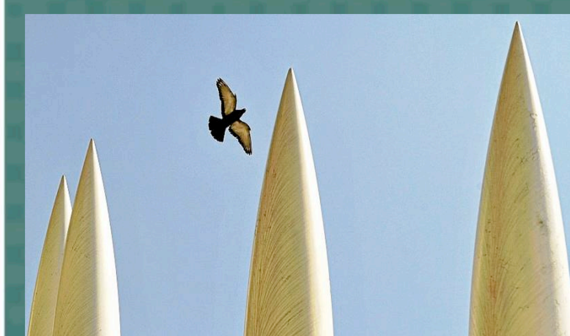
FFI Forsvarets forskningsinstitutt

Norwegian Defence
Research Establishment

NWS and NNWS: Lessons Learned from the UK/Norway/VERTIC Collaboration



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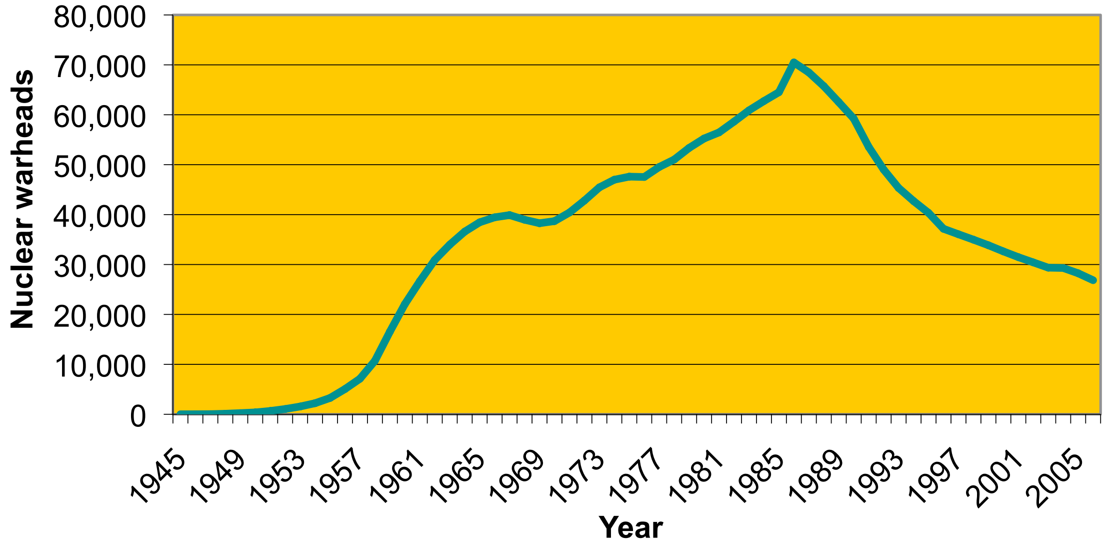
NWS and NNWS: Lessons learned from the UK/ Norway/VERTIC collaboration

- Introduction
- The UK/Norway/VERTIC exercise – “The UK-Norway Initiative”
- Lessons learned
- Next steps

Background

- The number of nuclear weapons in the world has been steadily decreasing after the cold war



- Should we all just trust that the nuclear weapons states disarm?
- Do we have a choice?

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

- Negotiated 1968, entered into force 1970
  - Only five nuclear weapons states (NWS): United States, Russia, United Kingdom, France, China
- NWS must not help NNWS acquire nuclear weapons (Art. I)
- NNWS must not manufacture or otherwise acquire nuclear weapons (Art. II)
- All member states have an inalienable right to research, production and use of nuclear energy for peaceful purposes (Art. IV)

Article VI:

Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.

So, therefore ...

- Nuclear disarmament is the responsibility of ALL member states, NWS and NNWS alike
- Some form of international verification is necessary
  - Verification must not breach NPT obligations under Art. I and II
  - Verification must respect national security concerns

Disarmament verification is therefore not this easy

The United Kingdom-Norway Initiative

- A unique and challenging collaboration
  - The first ever collaboration between an NWS (UK) and an NNWS (Norway) in the field of nuclear warhead dismantlement verification!
- Decided to begin with an exercise verifying the dismantlement of one out of many nuclear warheads
  - Considered the "easiest" task
- In order to observe NPT obligations and protect national security, the verification process would have to make use of
  - Managed access procedures
  - An information barrier system

The UK/Norway/VERTIC collaboration

- Funding:
  - UK Ministry of Defence (active participant as well)
  - Norwegian Ministry of Foreign Affairs
- UK participating institution:
  - Atomic Weapons Establishment
- Norwegian participating institutions:
  - Institute for Energy Technology
  - NORSAR (seismic research)
  - Norwegian Defence Research Establishment
  - Norwegian Radiation Protection Authority
- Independent observer:
  - VERTIC (London-based NGO)

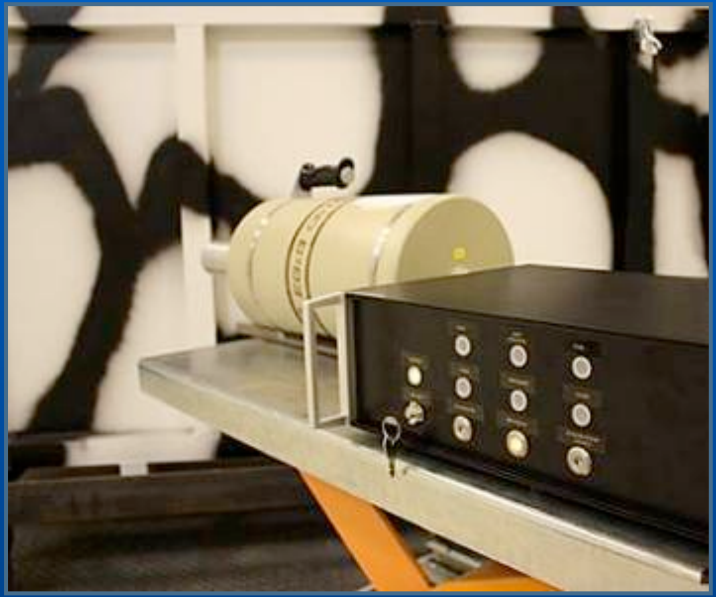
AWE IFE Institutt for energiteknikk NORSAR FFI Forsvarets forskningsinstitutt Norwegian Defence Research Establishment Statens strålevern Norwegian Radiation Protection Authority VERTIC

The Information Barrier system

- Inspectors will be faced with Treaty Accountable Items in sealed containers
- Inspectors will be looking to verify the contents against a declaration made by the host
- Difficult to give enough information to satisfy Inspectors without being proliferative
- An <u>Information Barrier</u> takes data from a measurement device, processes the data and provides a pass/fail answer to predetermined criteria
- The Information Barrier must protect the measurement data from being released to the Inspecting party
- The Information Barrier is only as good as the level of trust placed in it by the parties involved

The Information Barrier system

- Designed to be trusted by both parties
- Features of the jointly developed system:
  - As simple a solution as possible
  - Modular
  - Robust
  - Portable and battery powered
  - Simple to operate
  - Low cost and commercially available components



The Information Barrier system

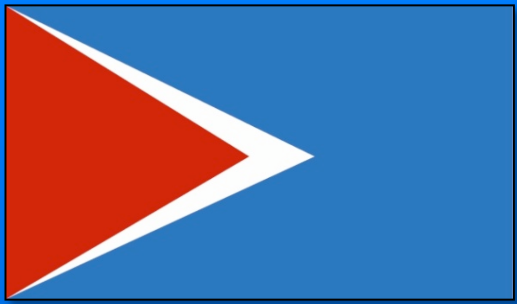
- Two prototypes of the Information Barrier system were built, one in the UK and one in Norway, based on a jointly agreed design
- The system consists of a gamma-ray detector and a control unit containing electronics and software
- The control unit gives a green light if fissile material is present and a red light if not
  - In the exercise, a cobalt-60 source simulated the fissile material

The Managed Access project

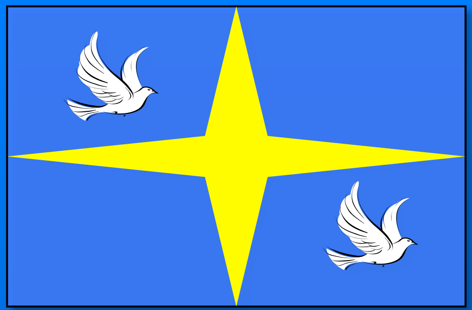
- Managed Access:
  - Permitting ‘uncleared’ personnel access to sensitive facilities under the terms of an agreed protocol
- The project created:
  - A framework for testing verification techniques and methodologies
  - A better understanding of the roles and concerns of NNWS and NWS
  - An opportunity to investigate these issues via an exercise programme

STATENS ATOMVÅPENDIREKTORAT

Exercise – Exercise – Exercise



The Exercise

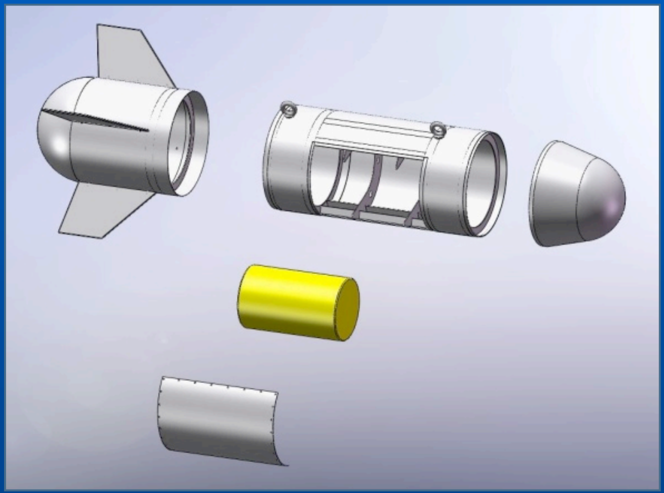


- Scenario:
  The NWS **Torland** (Norway) invites inspectors from the NNWS **Luvania** (UK) to monitor the dismantlement of one of its Odin nuclear gravity bombs under a Bilateral Protocol
- Exercise based on the Bilateral Protocol with verification procedures
  - Initiated via exchange of letters
  - Details worked out by negotiations
  - Reflected a mutual will to succeed with a transparent dismantlement process
- The Exercise comprised two facility visits:
  The Familiarisation Visit and the Monitoring Visit
- Long and involved process to realize the scenario with all necessary documents, facilities and equipment

The Odin “nuclear bomb”

- Mock-up gravity bomb
  - Pretended to be a 30 kt plutonium-based nuclear bomb
  - Plutonium simulated with cobalt-60

- Luvania invited to verify the dismantlement of one of Torland’s arsenal of ten Odin bombs



The Players' objectives

- Key Objectives for the Luvanian Inspectors:
  - To establish confidence in the Declaration made by Torland with regards to the "Treaty Accountable Item" and to demonstrate, to the satisfaction of both Parties, a chain of custody through the dismantlement process
  - To produce an inspection report in accordance with the agreed Verification Procedures
- The key objective for Torland as the Host nation:
  - To demonstrate compliance with its obligations under the Bilateral Protocol whilst protecting national security and proliferation sensitive information

The Monitoring Visit: Host Team

The Torian Host Team deployed a number of Managed Access techniques:

- Identity checks before and during the visit
- Security briefings
- Change of clothing and metal detector checking
- Escorting and guarding
- Shrouding and exclusion zones
- Host control of equipment and measurements
- Documentation and information control including numbered notepads

The Monitoring Visit: Inspectors

The Luvanian Inspectors deployed a number of techniques in a multi-layered strategy:

– Radiation monitoring
– Tags and seals
– Digital photography of the tags and seals
– CCTV cameras (notional)
– Information barrier system for gamma measurements
– Photography of inspection relevant items, in-situ and with Inspectors present
– Review of documentation relating to the Odin device, and visual observations and dimensional measurements of the Odin weapon and containers

The Monitoring Visit:
The dismantling process

Start: Temporary storage

↓ transport

Mechanical dismantlement

↓ transport

Physics package dismantlement

↓ transport

Finish: Monitored storage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DJ58705


MAX 2000 kg


NOT
EXIST

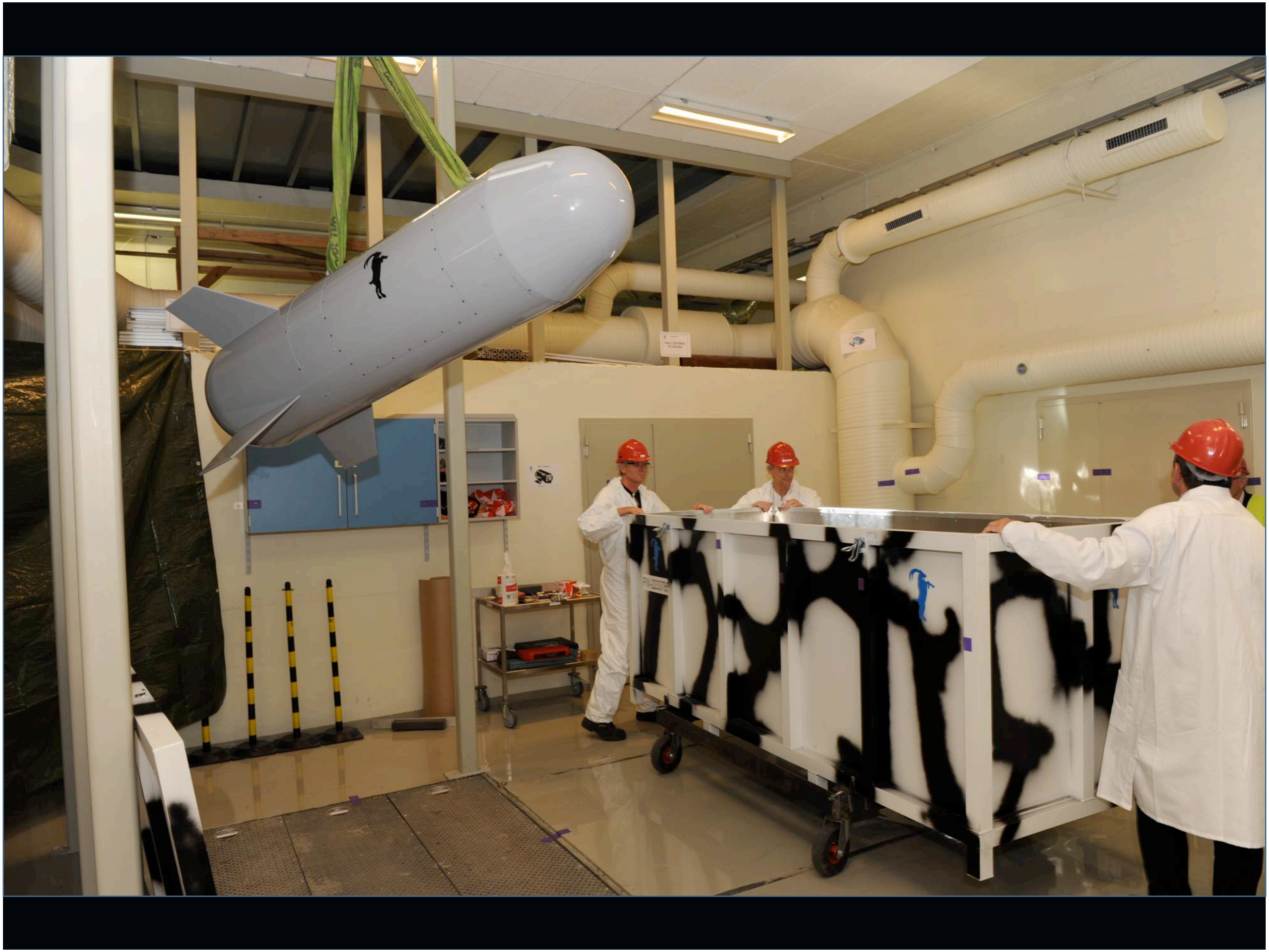

EG&G
Edmo-Lift


AX 500 KG


PW-2233785-A
MAX 500 KG
ZARGES
29


MAX 500 KG
FFI
Forsvarets
POWER


PW-2233785-A

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WALL EXTENDS TO CEILING
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Nikon D3


ORTEC
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VISITOR
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TAVL Camera
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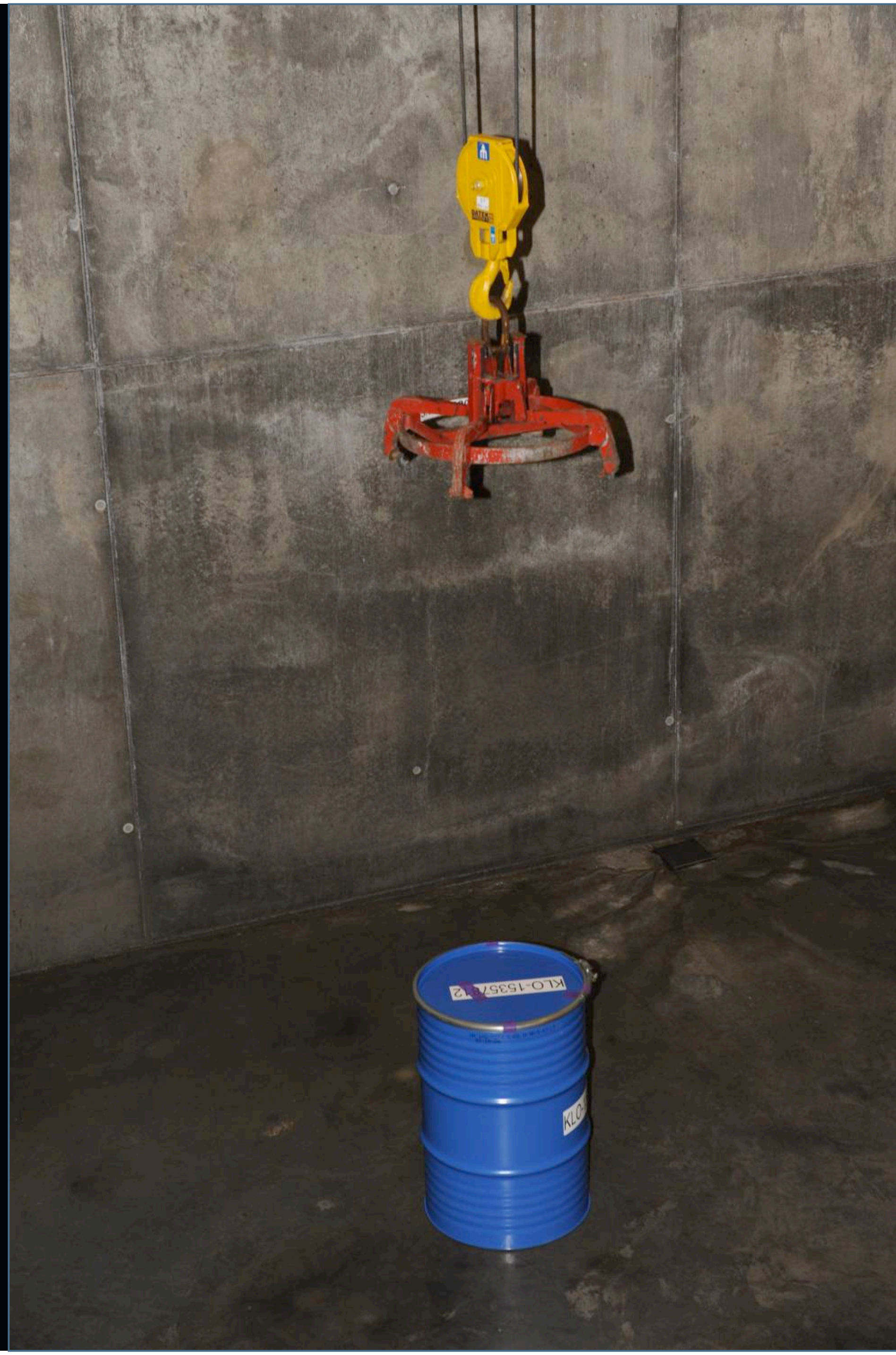


TAVL

Lessons learned: Host Team

- National security and proliferation concerns permeates through everything
  - Knowing where to draw the line
  - Aggregation of information must be considered

- Host Team also responsible for ensuring effective verification regime
  - Proactively facilitate the inspection process
  - Resolve issues in the negotiating room to minimise time spent inside the facility

- Health and Safety regulations must not be underestimated
  - Inspectors should be fully briefed on these well in advance
  - Often the limiting factor on Inspectors' activities

- Large impact on facility operations and resources
  - Preparations required must not be underestimated
  - Normal operations will be significantly disrupted

Lessons learned: Inspectors

- Facilities:
  - Ability to access all relevant areas of the facilities is a key issue
  - Schematic drawings alone are unlikely to contain sufficient information required to plan detailed inspection activities
  - The Exercise highlighted the advantages of CCTV cameras in areas without significant security or proliferation risks (notionally exercised)
  - Shrouded objects which cannot be sealed are a particular issue

- Inspection activities:
  - The deployment was time and resource intensive
  - Certain seal types were not fit for purpose
    - Issues with particular surfaces and vehicles
  - Seals were only relied on for short time periods
    - New ideas are required for extended time periods
  - Radiation monitoring, sealing and surveillance technologies should be considered as a unified, multi-layered strategy for securing an area

Lessons learned: Joint

- The Verification Regime is driven by the Host's Declarations:
  – Inspectors can only verify against the Declarations
  – If they are too limited, there will be a lack of trust and confidence
- Authentication and certification of equipment may be elaborate
- Important to control the movement of information, equipment and personnel across areas of differing security restrictions
- It is possible to maintain a chain of custody through a nuclear weapon dismantlement to a high degree of confidence once the relevant technologies have been developed to the necessary level of functionality
- The "initialisation problem" remains
  – The ability to confirm that the item initially presented is indeed the declared nuclear weapon
  – This ongoing issue requires further consideration

Follow-up Managed Access exercise

- Short Managed Access Familiarisation exercise in UK in Dec. 2010
  - NWS Torland now played by UK and NNWS Luvania by Norway
  - Needed to better understand the impact of more realistic security procedures

- Found that it should be possible for foreign inspectors to access a high-security facility
  - Rigorous and elaborate procedures

Next steps

- Information Barrier system
  - A plutonium version is near completion
  - The IB system should be peer reviewed
- Managed Access
  - Further targeted exercises picking up on specific issues highlighted during previous exercises
- Technical presentations at conferences
  - Welcoming viewpoints from the international community
- The United Kingdom and Norway encourage the international community to engage actively in further research on nuclear dismantlement verification