

Stewarding a Stockpile of Varying Size

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Optimization Problem

- **Difficult (impossible) to optimize stockpile size**
 - **Multivariable problem**
 - Reliability
 - Safety
 - Ability to Deter
 - Cost to maintain
 - Ability to conduct surveillance
 - Prevent common mode failure
 - Political considerations
 - Etc.
 - **Non-linear dependent variables**
 - **Biases/Unknowns**

This is why seemingly arbitrary round numbers are pursued through a quasi-backward approach.



Optimized Stockpile Size

- Original research effort was to optimize the stockpile by purely focusing on the NWC ability to maintain/surveil.
 - No regard to:
 - Deterrence
 - Hold X number of targets at risk
 - Hold Y types of targets at risk
 - Etc.
 - Military needs
 - Political considerations
 - Etc.



Change in focus

- **Original questions to be answered:**
 - At what levels will safety and reliability begin to be compromised (given current techniques)?
 - X% confidence that Y% of weapons will operate as expected.
 - A% confidence that B% of accidents will not result in nuclear yield.
 - What fundamental changes to maintenance and surveillance will need to take place to continue to lower weapon numbers?
- **Difficulties with the nature of this topic led to changes in the focus of the paper.**



Change in focus

- Survey, interviews and research pointed to a common question: In order to steward a stockpile of any (non-zero) size what elements must be present?
 - Conclusion:
 - Expertise
 - Ability to Surveil
 - Diagnose technical risks
 - Ability to React (Maintain Capability)
 - Overcome unexpected changes



Expertise

- **Why:**
 - **No substitution for those that can ‘do’.**
 - Simulation, Models, Documentation, etc.
 - Underestimate the art/craft behind production.
 - **Impossible to seamlessly turn off and turn on.**
 - Must maintain understanding of Nuclear Weapon unique components where ‘plug and place’ expertise isn’t available or information is classified.
 - Neutron Generators, Physics Package, Batteries, Stronglinks, Gas Transfer systems etc. (Both design and production abilities must be maintained).
 - **Given sufficient expertise (and resources) any problem can be fixed.**
 - Necessary to maintain stockpile surveillance and the ability to react to unforeseen circumstances.



Expertise

- **Questions/Concerns**
 - **How do you attract and retain the best and brightest?**
 - **Production/Maintenance isn't attractive to most experts.**
 - Always tie broad R&D efforts together with the labs.
 - Pursue extensive simulation and modeling advancements.
 - **Maintain design and production capability in the NWC.**
 - **What break points are there?**
 - **Reduction in stockpile doesn't equate to a reduction in personnel.**
 - No problem is small with a small stockpile.



Ability to Surveil

- **Why:**
 - Need to know the health of a stockpile of any size.
 - The stockpile is never completely static.
 - Components need to be replaced or upgraded due to aging or unavailability.
 - Simulations and Models aren't sufficient to understand the unknowns in aging and other effects.



Ability to Surveil

- **Questions:**
 - **How low can stockpile numbers go before surveillance methods must change?**
 - Eliminate destructive testing.
 - Surveil the stockpile into extinction.
 - **When would a new weapon design be necessary to maintain stockpile health?**
 - **At what point do you bring back UGTs?**
 - **How long can we go and how many design changes can be allowed before our confidence in reliability is questioned?**



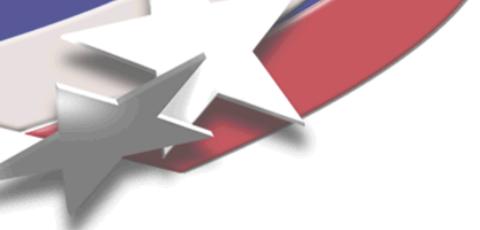
Ability to React (Capability)

- **Why:**
 - Mitigate risk from uncontrollable factors.
 - Global change
 - Nuclear Breakout/Attack.
 - Increase production rate if necessary.
 - Internal technical problems
 - Unexpected reliability/safety issue in the stockpile.
 - Re-deploy or produce new warhead
 - Surprise external technology
 - Next generation weapon
 - Understand, design, build or counter



Ability to React (Capability)

- **Questions:**
 - How can design/production be maintained at low stockpile numbers?
 - Continuous low level production.
 - What is the current/future level of transparency and knowledge of foreign stockpiles/capabilities?
 - High confidence in intelligence can lead to relaxing maintenance on capabilities.



Conclusion

- **A truly optimized stockpile isn't achievable.**
 - It will always be a numbers game.
- **There are certain aspects of any stockpile stewardship program that should never be omitted.**
- **Special care as to the structure of the NWC must be taken to ensure these factors don't slip in effectiveness or fall through the cracks.**