Nuclear Doctrine Effectiveness Calculator

Approach:

(1) The scenario is that there is a sensor alert that seems to be a high-confidence indicator of an inbound strategic nuclear attack by an enemy.
We need to figure which of these sub-scenarios is the cause:
Scenario[tn/cf] "true nuke / correctly flagged":
The incoming attack has a real nuclear warhead and the country that seems to be responsible for the attack is the only country culpable. They knowingly decided to use nuclear weapons in anger.
Scenario[tn/if] "true nuke / incorrectly flagged":
The incoming attack has a real nuclear warhead but the country that launched it did so unintentionally, by being hacked, compromised by spies, manipulated by disinformation, etc.
Scenario[zn/if] "zero/no nukes / incorrectly flagged":
The incoming attack is illusory; no nuclear warheads are involved.
There is a dangerous, culpable criminal out there, who intentionally created the illusory attack to incite war.
Scenario[zn/cr] "zero/no nukes / completely random":
The incoming attack is illusory and no-one is to blame. The sensor error(s) or incorrect analysis happened entirely at random or through a blameless accident.

Assumptions:

(2) In order to obtain realistic approximate probabilities for each of the above scenarios,
we propose to use LaPlace's solution to the Sunrise Problem; his solution is the Rule of Succession:
https://en.wikipedia.org/wiki/Sunrise_problem#Laplace's_approach
As of this writing (Sept 2022), here are the author's known values for the # of occurances thus far in history of each scenario type:
Count[tn/cf]: 2 occurances: Hiroshima (1945) and Nagasaki (1945) (WWII).
Count[tn/if]: 0 occurances
Count[zn/if]: 0 known occurances
Count[zn/cr]: At least 4 known occurances:
E.g.:
[1] The 1979 NORAD Training Tape Incident, [2] The 1980 NORAD System Malfunction Events, [3] Stanislav Petrov's 1983 Incident, & [4] The 1995 Norwegian Rocket Incident.
[1] https://www.armscontrol.org/act/2019-12/focus/nuclear-false-warnings-risk-catastrophe
[2] https://nsarchive2.gwu.edu/nukevault/ebb371/index.htm
[3] https://en.wikipedia.org/wiki/1983_Soviet_nuclear_false_alarm_incident
[4] https://en.wikipedia.org/wiki/Norwegian_rocket_incident
Count[Total]: 6
Count[(each + 1) for each]: 10 (2+1 + 0+1 + 0+1 + 4+1)
Sunrise Problem Probabilities:
Pr(Scenario[tn/cf]) = (Count[tn/cf] + 1) / Count[(each + 1) for each] = 3/10 (30%)
Pr(Scenario[tn/if]) = (Count[tn/if] + 1) / Count[(each + 1) for each] = 1/10 (10%)
Pr(Scenario[zn/if]) = (Count[zn/if] + 1) / Count[(each + 1) for each] = 1/10 (10%)
Pr(Scenario[zn/cr]) = (Count[zn/cr] + 1) / Count[(each + 1) for each] = 5/10 (50%)

Next Steps:

(3) Using the 4 probabilities above, we can calculate the 1st-order expected utility and
the "tendency toward violence score", for any given Nuclear Retaliation Doctrine which it is of interest to study.
("Tendency Toward Violence" is an important number which is related to **2nd-order utility** which is how the EV changes when the countries start modeling each others' thinking & behavior, e.g. having Theory of Mind.
If "Tendency Toward Violence" is too low (e.g. below 80% or at least 50%) then psychological opponents
may no longer consider there to be a credible violent threat strong enough to buy deterrence.)

(4) We will thus evaluate competing Doctrine alternatives to see which Doctrine is game-theoretically optimal
in the modeled scenario.
LUA Doctrine: Launch Under Attack, a.k.a. Launch on Warning - the current official posture of the US, Russia, and China.
DUA (Decide Under Attack), as proposed by Adm. James Winnefeld.
Specifically:
DUA with Fail-Deadly Capability: Nuclear strike orders can be queued up to be automatically executed in the future
unless recalled in the time limit via a dead-man switch.
DUA without Fail-Deadly Capability,
where nuclear strikes cannot be queued on a preset delay.
Letters of Last Resort - a method of pre-commiting to an unpredictable secret plan of retaliation.
Used by British Navy.

Goal:

(5) Our rough initial "whiteboard" calculations indicate that DUA with Fail-Deadly is shown to have significantly higher EV (Expected Value / Utility) than LUA.
This is despite LUA being the current de-facto global standard doctrine.
By demonstrating the inferiority of LUA compared to DUA with Fail-Deadly, we hope to shine light on the fact that DUA with Fail-Deadly
should be strongly considered immediately by all nuclear nations, every one of whom stands to benefit both from improved personal chances of survival and
improved chances of global peace, simply by adopting DUA with Fail-Deadly today.

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