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FOR SCIENCE AND INTERNATIONAL AFFAIRS

Preventing Nuclear War in a Multipolar Era of Great-Power Hostility and Evolving Technology

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Nuclear dangers are changing...

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❑ Geopolitics:

- ⌘ Radically increased U.S.-Russian and U.S.-Chinese hostility
- ⌘ Dramatic worsening from the war in Ukraine
- ⌘ Substantially increased Chinese power – including nuclear forces
- ⌘ Increased doubts over U.S. leadership, constancy → increased allied anxiety
- ⌘ Weakened arms control regime, uncertain future prospects
- ⌘ Dramatic expansions of North Korean nuclear, missile capabilities
- ⌘ Expanded Iranian nuclear bomb material production capacity

❑ Technology:

- ⌘ Missile defense, precision conventional, cyber, counter-space, hypersonics, artificial intelligence, disinformation, weapons autonomy...

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Russia's war on Ukraine has upended much of the international order

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- ❑ A UNSC member – charged with ensuring international peace and security – is waging large-scale aggressive war
 - ⌘ Russia using nuclear threats to protect its offensive war
 - ⌘ Weakened conventional forces likely to increase Russia's nuclear reliance
- ❑ A state that gave up the nuclear weapons on its soil in return for security assurances is being torn apart
- ❑ Impacts on security, food, energy are reverberating around the world



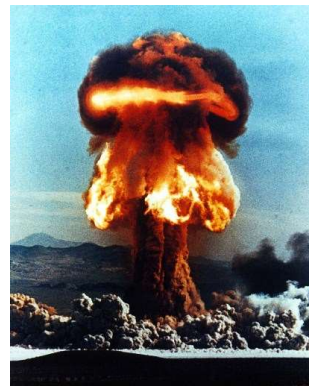
Source: Reuters

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Little real data on the dangers of nuclear war

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- ❑ Many assume the fearsome power of nuclear weapons will prevent anyone from using them
 - ⌘ Risk of nuclear war vanishingly small
- ❑ But crises of the nuclear age – and wars of the pre-nuclear age – suggest events can spin out of control
- ❑ What data or analysis could help us understand the most important dangers and how to reduce them?



Source: DOE

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Scenario 1: A Russian attack, and further threats against, Ukraine

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□ Imagine:

- ⌘ Ukrainian forces strike deep into lands Russia has annexed (just what Putin has warned he would “certainly use all weapons available to us” to prevent); Russian forces reeling
- ⌘ U.S. intelligence receives information that Putin is considering – but has not yet decided on – using nuclear weapons to reverse the momentum:
 - Use 1-5 nuclear weapons on military targets, few civilian casualties
 - Then threaten to destroy Kharkiv, then other cities, unless Ukraine agrees to Russia’s terms

□ Attack purpose: tactical advantage and strategic coercion in offensive war

□ Escalation risk: uncertain (use against non-allied non-nuclear-weapon state – but with the West heavily concerned, explicit U.S. threats of “catastrophic” response)

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Scenario 2: Conflict on the Korean peninsula

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□ Imagine:

- ⌘ A major North Korean provocation
- ⌘ South Korea insists on striking back harder, to reestablish deterrence
- ⌘ North Korea uses ~6 conventional missiles against a U.S. airbase
- ⌘ ROK, U.S., begin an air campaign to destroy the DPRK’s missiles
- ⌘ DPRK faces “use them or lose them” pressures – and an air campaign they might mistake for a prelude to invasion



Source: Reuters

□ Purpose of possible use (say, against U.S. airbases and ports): defensive, regime survival

□ Escalation risk: high

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Scenario 3: Escalation in South Asia

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Imagine:

- ⌘ Major terrorist attack in India – India blames Pakistani-supported group
- ⌘ India launches air strikes in response
- ⌘ Pakistan replies with air strikes
- ⌘ India launches limited conventional invasion
- ⌘ Pakistani forces with short-range nuclear missiles are about to be overrun – do commanders fire?



Source: Wikimedia Commons

- Purpose of potential use: avoiding defeat, avoiding seizure of nuclear weapons
- Escalation risk: high

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Scenario 4: “Entanglement” in a U.S.-China conflict over Taiwan

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Imagine:

- ⌘ China launches blockade of Taiwan
- ⌘ U.S. sends ships to supply the island and get supplies
- ⌘ China attacks the U.S. ships – 1000s killed
- ⌘ U.S. responds against Chinese ships
- ⌘ China begins attacking all U.S. naval forces in the region with ballistic and hypersonic missiles
- ⌘ U.S. attacks missile bases – also bases for nuclear missiles
- ⌘ China perceives the United States is trying to destroy its nuclear deterrent



Source: PopSci

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Scenario 4: “Entanglement” in a U.S.-China conflict over Taiwan (II)

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- ❑ In that circumstance, does China use some nuclear weapons – to damage U.S. forces and deter further U.S. attacks?
- ❑ Potential use purpose: “use them or lose them,” deter attacks
- ❑ Escalation risk: medium



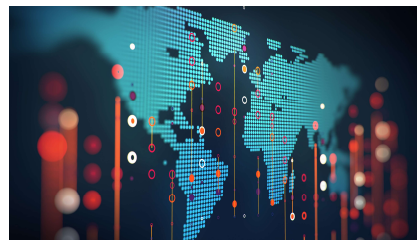
Source: US Navy via ReutersW

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All such conflicts likely to be complex, multi-domain affairs -- possibly multi-player

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- ❑ Future conflicts likely to involve many domains – land, air, sea, space, cyber
 - ⌘ “Integrated,” “multi-domain” deterrence still poorly understood
 - ⌘ Will asymmetric responses – e.g., conventional strikes in response to devastating cyber – increase escalation risks?
 - ⌘ A lesson of past crises: fog of crisis, misperception, events no leader intended...
- ❑ In multi-polar nuclear world, will others join in, or stay out?



Source: CSIS

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What are U.S. nuclear planners worrying about?

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- ❑ Deterring two nuclear peer adversaries – Russia and China – at the same time (as well as North Korea)
 - ⌘ Does the United States need capability to “deter and defeat” both at once?
 - ⌘ World is more threatening than in 2010, when U.S. designed modernization
- ❑ Many potential enemy actions to be deterred, and if necessary responded to – need to provide many options to the President
 - ⌘ Perceived need to “tailor” options to particular leaders, circumstances
- ❑ U.S. is committed to helping to defend far-flung allies and partners – in Europe, in Asia...
 - ⌘ Russia already waging aggressive war in Ukraine – threats to NATO?
 - ⌘ China might move on Taiwan
 - ⌘ North Korea might move on South Korea
- ❑ Adversaries might believe they could deter the United States from responding seriously to limited nuclear use

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How might deliberate leadership decisions to use nuclear weapons happen?

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- ❑ Leaders might reach for the nuclear button when they believed they or their country would be better off after nuclear use
 - ⌘ Use against a non-nuclear state without a nuclear ally
 - ⌘ Use against a state whose forces were so vulnerable the leader believed a damage-limiting strike was possible
 - ⌘ Use believing that the adversary would be deterred from a devastating response (e.g., “escalate to deescalate”)



Source: USAF

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Categories of incentives for leaders to use nuclear weapons first

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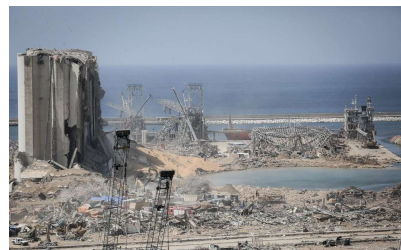
- ❑ Preemptive – leader believes an attack is coming, strikes first
 - ❑ Preventive – leader believes adversary is getting dangerous capabilities, strikes to prevent that
 - ❑ Defensive – leader believes nuclear use is needed to protect the survival of the state/regime, or another vital interest (such as an important ally)
 - ❑ Offensive – leader believes nuclear use will help secure an offensive victory
 - ❑ Coercive – leader believes nuclear use will force an adversary to take a desired action
 - ❑ Force protective – leader faces “use them or lose them” pressure
- Actions in each category have been planned or considered in the nuclear age...*

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Beyond deliberate leadership decisions...

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- ❑ Unauthorized use
 - ⌘ Field commanders might believe use was essential
 - ⌘ Authority or capability might be pre-delegated to them
- ❑ False alarm
 - ⌘ Deliberate decision, but mistake
- ❑ Escalation from accident
 - ⌘ E.g., accidental detonation, accidental launch
 - ⌘ More likely to lead to escalation if occurs in a major crisis or conflict – and more likely to occur then (Sagan, “Limits of Safety”)



Damage from accidental explosion in Beirut, 2020

Source: Mehr News Agency

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A story to highlight the risks: Cuban Missile Crisis, sub B59

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- ❑ Unbeknownst to the U.S. Navy enforcing the “quarantine,” Soviet *Foxtrot* subs were carrying nuclear weapons
- ❑ U.S. Navy began dropping “signalling” depth charges to force them to the surface
- ❑ On Sub B59, officers thought war had begun
 - ⌘ No ability to communicate to Moscow, thought war had begun
 - ⌘ Temperature >>100 degrees, men passing out from lack of oxygen...
 - ⌘ Captain ordered nuclear torpedo prepared for launch – Captain Vasili Arkhipov stopped it



Source: Olga Arkhipova

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A current Russian nuclear debate

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- ❑ Sergei Karaganov, a senior Russian analyst and Putin advisor, has provoked a debate with articles advocating steps to lower Russia's nuclear threshold – and if that doesn't work, nuclear strikes on “several” NATO countries
 - ⌘ Many Russian articles disagreeing; Putin told Karaganov he'd read his ideas
- ❑ Karaganov argues this would reduce the risk of all-out nuclear war
 - ⌘ The “unhinged” elites of the West are bent on defeating Russia, weapons to Ukraine only accelerate a long-term trend
 - ⌘ If this continues, a Third World War is “inevitable”
 - ⌘ Only way to prevent such a war is to renew the West's fear of Russia's nuclear weapons
 - ⌘ So: lower stated threshold; pull out of CTBT; put forces on alert; carry out “demonstration” nuclear explosion
 - ⌘ If West still doesn't back off, launch limited nuclear strikes
 - ⌘ Russia can deter the U.S. from striking back – U.S. promises are a “bluff”

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We need risk-reduction action on each step on the pathway to nuclear war

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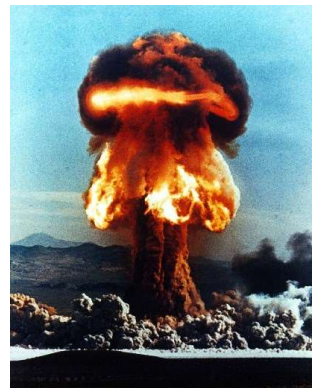
- ❑ Key step: preventing crises. Any militarized crisis between nuclear-armed states is dangerous – “fog of crisis” raises risks
 - ⌘ Avoiding crises is partly deterrence – but mainly foreign policy
 - ⌘ A more modest foreign policy for a dangerous nuclear era?
- ❑ Preventing escalation from crisis to conflict
 - ⌘ Partly deterrence – partly de-escalation, reassurance
- ❑ Preventing escalation to nuclear use
 - ⌘ Similar issues – but heavier emphasis on deterrence
- ❑ How to reassure, reach resolutions, in the midst of crisis or conflict?

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Need to consider what adversary responses U.S. actions will provoke

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- ❑ Bismarck: very dangerous to play chess one move at a time
 - ⌘ Need to think through plausible adversary responses, what they mean for security
- ❑ Example: What the ROK and the United States see as deterrent and defensive, North Korea may see as an offensive threat – provoking a dangerous North Korean response
- ❑ To maximize security, for each weapon purchase, military plan, action in crisis, need to assess (a) defense-deterrent value; and (b) provocation risks



Source: DOE

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The difficulties of de-escalation

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- ❑ Clausewitz: Conflict tends to escalate
 - ⌘ Winning: victories create new opportunities that may lead a party to escalate
 - ⌘ Losing: Defeats may lead a party to escalate to defend its interests
 - ⌘ Stalemate: This may also lead a party to escalate to break the deadlock
- ❑ Offering reassurance, compromise may be seen as a sign of weakness
 - ⌘ Adversaries may exploit, escalate their demands or their steadfastness
 - ⌘ Domestic audiences may oppose
 - ⌘ Allies and others may adjust view of a country's strength, determination
- ❑ De-escalation efforts will happen in an environment of fear, hatred, misperception, disinformation, time pressure...
 - ⌘ And in democracies, there will be many voices calling for blood

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The difficulties of de-escalation (II)

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- ❑ How to credibly reassure – signal that you do not intend to challenge an adversary's vital interests?
 - ⌘ Hostility, mistrust, vulnerability to attack, pace of events, environment of disinformation, make it difficult for reassurance to be believed
- ❑ How to reach credible accords that permit an end to fighting?
- ❑ Between nuclear-armed states with survivable forces:
 - ⌘ Total victory – one path to war termination – is not an option
 - ⌘ Greater fear of catastrophe may intensify search for ways out
- ❑ Despite the obstacles to de-escalation, many militarized crises end without war, many wars end with some form of compromise
- ❑ What approaches can maximize the chance of de-escalation? What preparatory steps in peacetime are important? Can “peace games” – exercises to explore de-escalation – help?
 - ⌘ Rich area for research – understudied

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We have very little data...

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“General, I have fought just as many nuclear wars as you have.”

-- Alain Enthoven

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Some data could be collected, analyzed

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- ❑ Frequency of militarized crises between nuclear-armed powers, and between them and non-nuclear-armed powers
- ❑ Frequency, given militarized crisis, of escalation to conflict
- ❑ Key items without much real-world data:
 - ⌘ Probability, given conflict between nuclear-armed powers, of escalation to nuclear use
 - ⌘ Probability, given an initially limited use of nuclear weapons, of escalation to major strategic nuclear conflict
 - ⌘ Probability, given conflict between nuclear-armed and non-nuclear-armed powers, of nuclear-armed power using nuclear weapons

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“Data for deterrence” – some sources

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- ❑ “Near-miss” data – past incidents
 - ⌘ What factors made an incident more or less dangerous? How have those factors changed, how might they change in the future?
 - ⌘ What policies might change these factors toward greater safety?
- ❑ “Synthetic data” – war games
 - ⌘ Many important games classified, some unclassified
- ❑ Non-nuclear historical data
 - ⌘ Past failures of deterrence – causes
 - ⌘ Past escalation to high levels of violence – causes
 - ⌘ Risks, benefits, of multipolar vs. bipolar orders
 - ⌘ Need to be very careful in considering how these non-nuclear analogies apply with nuclear weapons in the picture

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Another source of insight: Psychology and decision science

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- ❑ Psychology and decision science have advanced substantially in recent decades, and can surely offer some insight
 - ⌘ What factors likely to be present during a crisis or conflict would increase or decrease the danger of rash gambles?
 - ⌘ How will speed of decisions, torrent of information, suggestions from AI systems, other elements of the modern decision environment, affect the decisions that might be made – including at conflict levels well below “pushing the button”?
- ❑ Example: Loss aversion
 - ⌘ Military leaders sometimes take desperate gambles to avoid a defeat
 - ⌘ But how would “loss of country” aversion play into decisions?
- ❑ Can we design experiments that realistically capture key elements of the likely decision environment, or not?

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In short: we'll never really know, but there is potential to make some progress

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- ❑ Combination of all these methods can help build understanding of where the greatest dangers lie, how they might be reduced
- ❑ Pathway analysis and applied history, in combination, are likely the most important contributions
- ❑ But need to take insights and use them to better inform explorations of the implications of changing technologies and changing geopolitics

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But -- good news about nuclear weapons

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- ❑ No nuclear attacks for 78 years – remarkable success
- ❑ >80% of the world's nuclear weapons have been dismantled
- ❑ <5% of world's states have nuclear weapons – same as 35 years ago
 - ⌘ No net increase in 3.5 turbulent decades – amazing success
- ❑ >50% of the states that started nuclear weapons programs gave them up
 - ⌘ Efforts to prevent proliferation succeed more often than they fail
- ❑ >50% of the states that once had potential nuclear bomb material on their soil have eliminated it
- ❑ Nuclear material around the world is far more secure than it was 25 years ago – harder for terrorists to get
 - ⌘ Most egregious weaknesses fixed – but more to be done

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The importance of presidential judgment

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- ❑ Cuban Missile Crisis:
 - ⌘ Initially, Kennedy's advisors called for air strikes followed by an invasion
 - ⌘ Kennedy pushed back, asking for another option
 - ⌘ The recommended course might well have led to nuclear war
- ❑ Kennedy: Key lesson was always to offer the adversary a face-saving way to back down
- ❑ The world relies on sober judgment by the leaders of nuclear states



Source: JFK Library

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Further reading...

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- ❑ Full text of Managing the Atom publications:
<http://belfercenter.org/mta>
- ❑ Full text of Bunn publications and presentations, by topic:
https://scholar.harvard.edu/matthew_bunn
- ❑ "Pathways to Disaster: How Might a Nuclear War Start?" presentation, Oak Ridge National Laboratory, 2022
<https://tinyurl.com/ypz7osd8>
- ❑ *The Iran Nuclear Archive: Impressions and Implications*, 2019
<https://tinyurl.com/2o7gqcm3>
- ❑ *Revitalizing Nuclear Security in an Era of Uncertainty*, 2019
<https://www.belfercenter.org/NuclearSecurity2019>
- ❑ "For Security's Sake: Saving U.S.-Russian Arms Control," presentation, Oak Ridge National Laboratory, 2018
<https://tinyurl.com/y5u4p7xh>

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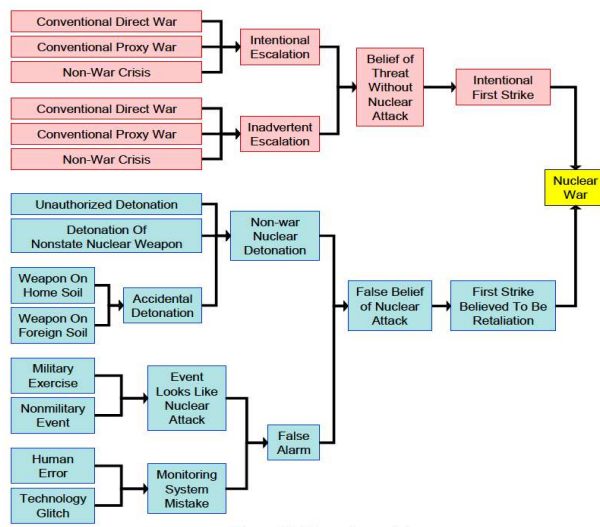
Backup slides if needed...

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Using pathway analysis to structure our thinking...

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Seth D. Baum, Robert de Neufville, and Anthony Barrett, "A Model for the Probability of Nuclear War," Global Catastrophic Risk Institute, 2018

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Questions we'd like data to help answer

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- ❑ What are the most dangerous pathways by which a nuclear war might start? What could we do to reduce their dangers?
- ❑ What characteristics of nuclear forces and policies (alert rates, command approaches, policies on when and how nuclear weapons would be used...) can provide deterrence with minimum risk of nuclear war?
- ❑ How can nuclear deterrence be “extended” to allies while maintaining minimum risk of nuclear use?
- ❑ What actions, done for deterrence or defense, might actually PROVOKE an adversary to use nuclear weapons?
- ❑ How will changing technologies, geopolitics, and a more multipolar world affect the various potential pathways to nuclear war?

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Another story highlighting the risks: 1961 Berlin Crisis, 1st Strike Plan

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- ❑ Khrushchev threatened to seize West Berlin
- ❑ Berlin could not be defended with conventional weapons alone
- ❑ If nuclear weapons were used, it seemed likely to escalate to strategic nuclear war – and the U.S. would be much less damaged if it struck first
- ❑ Carl Kaysen and Henry Rowen drafted a plan for a nuclear first strike – could destroy most Soviet nuclear forces with a limited strike, try to deter any retaliation
 - ⌘ Discussed with Kennedy, JCS
 - ⌘ “Fair probability” of a “substantial measure of success”



Sources: MIT, New York Times

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First-use threats are not just an abstract issue – U.S. has used repeatedly

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U.S. Nuclear Threats, 1945-2019

1945: Hiroshima and Nagasaki	1969-70: Deterring Soviet attack on China
1948: Nuclear bombers to UK over Berlin	1969-72: Threats to North Vietnam
1950: Threat to respond to China in Korea	1971: Threats in Indian-Pakistani war
1953: Threat to force deal in Korea	1973: Nuclear alert in Arab-Israeli war
1954: Offer to French for Dien Bien Phu	1976: Threats to DPRK over fatal incident
1954-55: Threats to Chinese over Quemoy	1980: "Carter Doctrine" incl. nuclear threat
1956: Threat to deter Soviet action in Suez	1980: Threat to deter Soviet move into Iran
1958: Preparation to protect Kuwait oil	1981: Reagan reaffirms ME nuclear threat
1958-59: Threats over Berlin crisis	1991: Threats to Iraq
1961-62: Threats over Berlin crisis	1994: Threat to N. Korea
1962: Cuban missile crisis	1996: Public threat to Libya over CW
1968: Discussion of using for Khe Sanh	2017: "Fire and fury" threats to DPRK

Source: Ellsberg, *The Doomsday Machine*

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A first cut: 2 dangerous pathways

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- ❑ In a moment of intense crisis or conflict:
 - ⌘ False alarm or major accident suggests nuclear war already underway
 - ⌘ Conflict creates pressures to escalate to nuclear use
- ❑ The danger of escalation to nuclear use is higher if:
 - ⌘ Leaders believe nuclear war is nearly inevitable
 - ⌘ Leaders believe their country would be better off if they struck first
 - ⌘ Leaders believe survival/sovereignty of their country (or their alliance system) is at stake in the conflict (even without nuclear use)
 - ⌘ Leaders believe nuclear use could be controlled, all-out war avoided
 - ⌘ Many fingers are potentially on the button
 - ⌘ The conflict creates "use them or lose them" pressures
 - ⌘ Decisions are made under extreme stress, with little time, with confusing (or wrong) information, by an individual or very small group

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