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Open-ended Working Group taking forward multilateral nuclear disarmament negotiations¹

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Item 5 of the agenda

Taking forward multilateral nuclear disarmament negotiations

Nuclear risks

Submitted by the People for Nuclear Disarmament/Human Survival Project

Ambit – nuclear risk and the Open-ended Working Group

1. The Open-ended Working Group is mandated to consider not only a path to the complete elimination of nuclear weapons – a goal of existential importance – but another closely related goal also of existential importance, namely measures to reduce and eliminate the risk of accidental, mistaken, unauthorized, or intentional nuclear detonations. (Panel 2 (b)) Particularly in the current context, the actual RISK of not just one or two nuclear explosions, but of a major nuclear conflict is arguably as great as it was during some of the tensest periods of the cold war. This makes the work of Panel 2(b) of critical importance. In addition, it is important to note that measures taken to reduce the risk of accidental (or deliberate, but based on misinformation or miscalculation) use of nuclear weapons take the world to a position in which the elimination of nuclear weapons become much easier. Interim steps of short-term nuclear risk reduction are in themselves steps to abolition.

The time factor

2. Six minutes (varying from zero minutes to 10) is around the time that a commander of missile forces, a defense minister, or a President, has to decide, after a 30 second briefing (for US and Russian Presidents,) whether or not to launch about 2000 nuclear warheads, as early warning systems indicate – likely incorrectly – that the other 'side' has launched.

3. It is thus unsurprising that a major factor in considering the likelihood of an inadvertent nuclear 'exchange' is the extremely compressed time-frames within which decisions have to be made by senior military and/or heads of state or government. Indeed,

¹ Established pursuant to resolution 70/33 of the General Assembly of the United Nations.



much of the discussion on the likelihood or otherwise of an accidental 'apocalypse', and of measures to make such an event less likely turn around giving decision-makers more time to think over decisions involving the launch of large numbers of nuclear weapons.

4. Given the in-minutes/seconds time-frames currently involved, it is hard to see how rational decision-making can be achieved at all. This factor alone ought to be enough to make nonsense out of theories of deterrence, which assume, without any factual foundation whatsoever, that 'rational' decision-making is always possible, and that decision makers always have access to correct data. In fact neither is likely ever to be the case.

5. Simply giving decision-makers more time to take decisions whose consequences are likely to be apocalyptic would achieve a major reduction in the risk of inadvertent nuclear conflict. Hence recommendations for lowering the risks of accidental nuclear war frequently revolve around this question of decision-making time.

6. In the US and Russia, around 900 missile-mounted warheads are on-alert in silos or mobile launchers and able to be fired, in some cases in less than a minute. In addition there are submarine-based warheads that can be launched in less than 10 minutes. China, which has traditionally kept its missiles off high alert, relying on dispersion and concealment in the 'underground great wall' for survival, is now talking about placing its modest nuclear forces on high alert.

7. Just how the compressed time-frames put decision-makers under impossible pressures is illustrated by the following anecdote concerning a 1979 false alarm, told by former Carter national security adviser Mr. Zbigniew Brzezinski at the Council of Foreign Relations in April 2012:

“..... I remember being woken up one night at 3:00 a.m. to be told by my military assistant that we are under nuclear attack. It obviously didn't happen, since we're all here. (Laughter.) There would have been... 85 million Americans and Soviets dead six hours later....

"Part of my job was to coordinate the response, if something like that happened, to notify the President. I had three minutes in which to notify him. During those three minutes, I had to confirm it in a variety of ways. And then he would have four minutes to decide how to respond. And then 28 minutes later, some of us would be dead and we'd be living in a different age...

I got a message from my military assistant, a general, who simply woke me up at 3:00 a.m. at night on the red phone and said, "Sorry to wake you up. We're under nuclear attack." (Scattered laughter.) That kind of wakes you up.... And, he adds, 30 seconds ago 200 Soviet missiles have been fired at the United States...

8. But there were subsequent confirmations and clearly within – well, within actually almost two minutes prior to me calling him on the third minute--it was clear that this was a false alarm. So I did nothing. I went back to sleep. (Laughter)"

9. But then came the real punch line. The interviewer asked, "And if the confirmation had been a little late, could we have had a problem?" Brzezinski's answer: "We might have had."

...Oops!

10. If it is indeed true that the other 'side' (Soviet Union in the '70s and '80s, Russian now, Indian or Pakistani) actually has launched, then it is indeed the end of what 'we' know as 'the world'.

11. If (as is quite probable) the incoming missiles are merely a computer glitch (as in Brzezinski's anecdote above) and 'our' side launches anyway, it will just as surely be the "end of the world" as the 'other side' (if acting in accordance with "deterrence" theory) will launch in response, making 'our' belief (whether 'we' are USA or Russian Federation, India or Pakistan) that the 'end of the world' has arrived, self-fulfilling. (It is noteworthy that at the conclusion of the war-game, filmed by the BBC, participants in fact violated the 'rules' of deterrence by refusing to instruct United Kingdom trident submarine crews to incinerate Russia).[Inside the War Room, BBC]

Consequences – human survival

12. Even if the 'other' side does NOT launch in response the smoke from 'their' burning cities (incinerated by 'us') will still make 'our' country (and the rest of the world) uninhabitable, potentially inducing global famine lasting up to decades. Toon and Robock note in 'Self Assured Destruction', in the Bulletin of the Atomic Scientists 68/5, 2012, that:

13. "A nuclear war between Russia and the United States, even after the arsenal reductions planned under New START, could produce a nuclear winter. Hence, an attack by either side could be suicidal, resulting in self assured destruction. Even a 'small' nuclear war between India and Pakistan, with each country detonating 50 Hiroshima-size atom bombs--only about 0.03 percent of the global nuclear arsenal's explosive power--as air bursts in urban areas, could produce so much smoke that temperatures would fall below those of the Little Ice Age of the fourteenth to nineteenth centuries, shortening the growing season around the world and threatening the global food supply. Furthermore, there would be massive ozone depletion, allowing more ultraviolet radiation to reach Earth's surface. Recent studies predict that agricultural production in parts of the United States and China would decline by about 20 percent for four years, and by 10 percent for a decade."

14. A conflagration involving USA/NATO forces and those of Russian federation would most likely cause the deaths of most/nearly all/all humans (and severely impact/extinguish other species) as well as destroying the delicate interwoven techno-structure on which latter-day 'civilization' has come to depend. Temperatures would drop to below those of the last ice-age for up to 30 years as a result of the lofting of up to 180 million tonnes of very black soot into the stratosphere where it would remain for decades.

15. Though human ingenuity and resilience shouldn't be underestimated, human survival itself is arguably problematic, to put it mildly, under a 2000+ warhead USA/Russian federation scenario.

16. The Joint Statement on Catastrophic Humanitarian Consequences signed October 2013 by 146 governments mentioned 'Human Survival' no less than 5 times. The most recent (December 2014) one gives it a highly prominent place. Gareth Evans' ICNND (International Commission on Nuclear Non-proliferation and Disarmament) Report made it clear that it saw the threat posed by nuclear weapons use as one that at least threatens what we now call 'civilization' and that potentially threatens human survival with an immediacy that even climate change does not, though we can see the results of climate change here and now—and of course the immediate post-nuclear results for Hiroshima and Nagasaki as well.

17. A seminal BAS (Bulletin of the Atomic Scientists) article of October 2008 entitled 'Minimizing the Risk of Human Extinction' places two nuclear-weapons-related actions at the very top of its rather consequential 'to-do' list. It gives topmost ranking to lowering the alert level of nuclear weapons systems, and next to top ranking to the abolition of nuclear weapons.

Consequences – electromagnetic pulse

18. The 'mere' destruction of the information-based techno-structure and the complete disappearance of the global financial system (and just about everything else technologically dependent) could be accomplished with a very few large warheads (such as the Chinese DF5, of 5Mt) exploded in space, with the effects of Electromagnetic Pulse. (In fact results of EMP can also be duplicated by a very large coronal mass ejection such as the 'Carrington Event' that took place in 1859.

19. Studies by the US Congress (2004, 2008) indicate that in either event (High altitude/outer space nuclear explosion(s) or 'Carrington Event') up to 90% of US citizens could starve to death, as all delivery systems failed. This, without the destruction of a single city. Most studies (including the 2004 and 2008 Congressional ones) say that electronic systems in the entire continental US could be crippled by a single large warhead exploded about 100-400Km out in space. 5 x 5Mt warheads exploded in space above continental landmasses would be enough to take global civilization back to medieval times.

20. The drastic effects of EMP, even without a single city being directly destroyed, show just how vulnerable civilization now is, not only to nuclear weapons use, but potentially to geomagnetic phenomena also. This is quite independently a civilizational risk that warrants both study and action.

The apocalypse 'lite' – South Asia

21. Even a 'mini' India/Pakistan nuclear exchange, involving 100-200 Hiroshima-sized warheads, could put up to 2 billion people worldwide at risk from famine, in part as a result of drastic declines in production of corn, winter wheat, rice, and soy production in the US, India, and China. [Mr. Ira Helfand – 'Nuclear Famine- A Billion People at Risk']

22. Such scenario-building depends critically on what assumptions are input to the study. Critical assumptions in Mr. Ira's Helfand's study are how many warheads get to be used (he chose 50 on each side – a number that is probably too low by a factor of two), and targeting – he assumed, probably correctly, that cities would be primary targets. Ira's assumptions, if anything, probably underestimate, rather than overestimate, the impact, as at least double the numbers of warheads he assumes, look most likely to be used.

Nuclear risk factors

23. So just how likely really is such a scenario? Is it just science fiction with which NGOs frighten roomfuls of diplomats? How likely really is a completely catastrophic event-sequence, between India and Pakistan or between NATO and the Russian Federation?

24. Some common-sense things can be said about catastrophic nuclear risk, without too much mathematical complexity. I have depended very much on the highly numerate risk analysis provided by Seth Baum of the GCRI (Global Catastrophic Risk Institute) and Martin Hellman of Stanford.

25. Seth Baum in a NY 2015 NPT presentation, and a subsequent masterly presentation at the Vienna Conference on Humanitarian Consequences, noted that nuclear risks have been drastically underestimated. Prof Martin Hellman at Stanford, using quite different statistical techniques, came to similar conclusions. Hellman called for a US National Academy of Science study to be carried out on the risk of accidental nuclear war.

26. Risk is not simply a function of the probability of a given event, but is a function of probability times consequences, or 'r= p X c'.

27. This means that even if the probability of a global nuclear exchange is relatively low, the potential consequences are so grave (as we see from the above) that only a probability of zero or very close thereto, can be acceptable.
28. Even if the probability of an accidental apocalypse seems reasonably low (say, 0.1 per cent-1 per cent) in any given year, if this is taken over an indefinitely large number of years, the risk approaches asymptotically to 100 per cent.
29. Nuclear risk has palpably increased in the last two-three years, with the most obvious signs being the movement of the hands of the Bulletin of the Atomic Scientists 'Doomsday Clock' from five minutes to three minutes to midnight.
30. Most recently, the annual Bulletin Doomsday Clock Symposium has retained the position of the hands at three minutes to midnight, amid a spate of dire warnings by everyone from former defense secretaries to former heads of nuclear missile forces of the United States of America and the Russian Federation as to the danger of inadvertent nuclear war.
31. In the Doomsday Clock's own words: "Three minutes is too close. Far too close. We, the members of the Science and Security Board of the Bulletin of the Atomic Scientists, want to be clear about our decision not to move the hands of the Doomsday Clock in 2016: That decision is not good news, but an expression of dismay that world leaders continue to fail to focus their efforts and the world's attention on reducing the extreme danger posed by nuclear weapons and climate change. When we call these dangers existential, that is exactly what we mean: They threaten the very existence of civilization and therefore should be the first order of business for leaders who care about their constituents and their countries." [Doomsday Clock/BAS announcement of 22 Jan 2016]
32. There has been a series of articles on nuclear war risks and nuclear deterrence in *Der Spiegel* (arguing that nuclear war risks now are actually higher than during the cold war), *The Guardian*, *Foreign Affairs*, *The Economist*, and others. Most recently there have been warnings from former Russian foreign minister Mr. Sergei Lavrov.
33. The Open-ended Working Group delegates should also, if they have not already seen it, view the aforementioned BBC's recent documentary in which cameras are placed in a normally classified NATO war-game involving prominent decision-makers, some of whom may even be right here. The results are chilling as a crisis in the Baltic States escalates by what one might call a 'WW-I type escalation sequence', into WW-III. [Google 'Inside the War Room BBC'].
34. The clearest driver of increased risk (as *Inside the War Room* illustrates) is of course, the current crisis in Ukraine, with the associated nuclear threats, and the wider deterioration in NATO-Russian Federation relationships. Even to make nuclear threats in and of itself considerably increases risk.
35. Part of this increased risk has been a rising incidence of confrontations between NATO and Russian military forces. Snap Russian (and NATO) exercises, notably in the Baltics (around which the BBC war-game doco revolved) with nuclear-armed forces in close proximity increase the risks hair-raisingly.
36. According to the European Leadership Network: "Since the Russian Federation annexation of Crimea, the intensity and gravity of incidents involving Russian and Western militaries and security agencies has visibly increased. This ELN Policy Brief provides details of almost 40 specific incidents that have occurred over the last eight months... These events add up to a highly disturbing picture of violations of national airspace, emergency scrambles, narrowly avoided mid-air collisions, close encounters at sea, simulated attack runs and other dangerous actions happening on a regular basis over a very wide geographical area." And "To perpetuate a volatile stand-off between a nuclear armed state

and a nuclear armed alliance and its partners in the circumstances described in this paper is risky at best. It could prove catastrophic at worst.”

37. A 'mock' attack on what seems to have been a peace festival(!!) on the Danish island of Bornholm underlines this ELN statement.

38. Even more worrying is a recent (1April) statement by NATO's Philip Breedlove: “We are prepared to fight and win if we have to... our focus will expand from assurance to deterrence, including measures that vastly improve our overall readiness,”

39. A statement that will surely simply invite a Russian counter- escalation. According to Russian Federation's NATO representative, Aleksandr Grushko: “We are not passive observers, we consistently take all the military measures we consider necessary in order to counterbalance this reinforced presence that is not justified by anything...Certainly, we'll respond totally asymmetrically.”

40. Grushko did not elaborate on his statement, but said Russia Federation's actions would correspond to its “understanding of the extent of the military threat, would not be extremely expensive, but also highly effective”

41. All this ratchets up both the likelihood and the consequences, of a European, NATO/Russia clash, now being openly spoken of by Breedlove.

42. Meanwhile, minuteman missile forces and Russian Federation strategic rocket forces (as well as Indian and Pakistani nuclear forces) rehearse the 'apocalypse' on a regular basis. It's not imaginary for them. It's what they do.

43. Missiles are fired from test sites, from missile silos, and from mobile launchers and submarines, a number of times a year by both the USA and the Russian federation. In the past these exercises have been routine. Most recently, they have become increasingly public and threatening: almost a form of political theater. The most recent USA firings from Vandenberg airbase, done in the immediate aftermath of a DPRK space launch that was condemned as ICBM development, involved two launches of what did not pretend to be anything other than an ICBM, in a single week.

44. According to Ian Kearns (himself a participant in Inside the War Room) of the European Leadership Network: "A dangerous game of military brinkmanship is now being played in Europe." “If one commander or one pilot makes a mistake or a bad decision in this situation, we may have casualties and a high-stakes cycle of escalation that is difficult to stop.”

45. Most recently, (1 April) Ian Kearns wrote: ‘...(a) Between March 2014 and March 2015 alone, we logged over 60 dangerous incidents in the Euro-Atlantic area. We are pleased that this work is profiled in the newly released Munich Security Conference Report 2016, (b) because our contention has been and remains that, against the backdrop of wider mistrust and tension in the NATO-Russian Federation relationship, the ongoing incidents have the potential to trigger a major crisis between a nuclear armed state and a nuclear armed alliance. More specifically, if additional crisis avoidance mechanisms are not put in place, more recent assertive Russian military activities, coupled with reassurance measures adopted by NATO in response, will increase the risks to stability in Europe.’

46. A somewhat different story to that of purely Russian aggression is recounted by Mr Christoff Lehman of Global Research, according to whom on 7 April 2015, a NATO (USA) reconnaissance plane was intercepted approaching Russian territory over the Baltic Sea and forced to turn back by SU27's. It seems that (as NATO accuses Russia of doing) the planes transponder had been turned off. It seems both sides, (not just Russia), play these risky games.

47. Mr. Theodore Postol, a USA physicist, recently warned at a conference on nuclear risk last February in NY that Russian and USA nuclear forces have now created a danger of accidental nuclear war that is 'comparable to that of some of the most tense periods during the Cold War.'

48. It is clear from this that nuclear risks right now are at an absolutely unacceptable level. And, whether Russia, the USA/NATO or both (most likely) are to 'blame', those rights and wrongs and mutual blaming pale into insignificance in comparison to what, potentially, is at stake.

Absurdities of deterrence

49. It is a fatal paradox of deterrence as routinely conceived – that in order to maintain 'strategic stability' we have to (incredibly but really) threaten the 'end of the world'. In order to keep the end of the world 'off' the agenda (i.e., to frighten our potential adversaries into not doing anything we don't like) we have to keep the end of the world 'on' the agenda (so they are frightened enough). But that means that the end of the world is indeed, really, 'on' the agenda...an absurd and fatal paradox. These NATO and Russian exercises along the borders of the Baltic States should give rise to very deep concern.

50. There have already been too many 'near misses'. Deterrence depends on the absolute impossibility of mistakes. Under deterrence theory, decision-making is presumed to be absolutely rational and informed by perfect data and mistakes and malfunctions never happen. Yet precisely the opposite is what we in fact observe to be the case. Mistake, miscalculation and malfunction seem to be the rule not the exception. Indeed with the compressed decision-making time-frames earlier referred to, rational decision-making would seem to be all but impossible.

When does the miracle supply run out?

51. Statistically speaking we probably already shouldn't be here. A study of those near misses leads one to conclude that the only reason we are here is by what General Lee Butler terms 'Divine Providence'. Without committing to any particular theology, we might well profitably ask, 'just when does our miracle supply run out?'

52. Are we, right now, tempting fate or the Deity just a little too much? Or is 'Divine Intervention' infinite and never-ending? Should we find out? If so, this is an experiment that can be done only once (especially if it fails!)

53. Obvious 'near miss' incidents include a number of sub-incidents during the Cuban Missile Crisis, in one of which WW-III was nearly initiated by a wandering bear that activated a B-52 scramble-alarm; incidents with computer tapes for 'doomsday' in 1979 (resulting in what a Congressional committee who happened to be present at the time called 'blind panic') and with a malfunctioning computer chip in 1980 and 1981 (it happened three times). On the Russian side there was the famous incident involving Col. Stan Petrov of September 26, 1983; the Able Archer war scare just over a month later, and the Norwegian Weather Research Rocket incident of 1995, in which we are reputed to owe our existence to an unknown adviser who said 'excuse me Mr President, let's wait another minute'.

54. Some of these incidents are described in greater detail in the Chatham House publication 'Too Close for Comfort', as well as in a number of my own NPT panel presentations. Chatham House lists in some detail incident after incident in which a nuclear exchange is narrowly averted. From time to time further incidents keep surfacing, notably one in which cruise missile operators in Okinawa during the Cuban Missile Crisis (the

cruise missiles were equipped with 5Mt warheads) were inadvertently (it seems) ordered to launch, and an incident in which an order to launch was inadvertently and unknowingly sent out to all US nuclear forces by someone who literally didn't realize what they were doing.(!)

Cyberspace

55. In recent years, greater attention has been given to the possibility of cyberspace attacks on nuclear command and control systems. The Vienna conference was addressed on that subject by Camille Francoise, and Jason Fritz addresses the problem in Hacking Nuclear Command and Control, written for the International Commission on Nuclear Nonproliferation and Disarmament (ICNND). The issue of cyberspace risks is addressed by a resolution adopted by the Inter-Parliamentary Union (IPU), whose membership includes members of parliaments of both nuclear-armed states and those involved in 'extended deterrence' relationships.

56. The IPU Assembly adopted a final resolution, which, among other things: Noted that: "...military ICT systems for the deployment and use of force are susceptible to acts of cyber warfare that could lead to third parties intercepting and deploying such systems to cause unauthorized, illegal and destructive use of force...and was especially concerned that the hacking of nuclear weapon command-and-control systems could result in the unauthorized launch and detonation of nuclear weapons and cause unparalleled catastrophes;'

57. The IPU also expressed concern about: the suggestion by military planners that nuclear deterrence be maintained as an option for dealing with the existential threat of a cyberattack,

58. The IPU recommended that: '...Parliaments from nuclear-weapon States call on their governments to rescind launch-on-warning policies, stand down nuclear weapons from high operational readiness and extend the decision-making time for nuclear-weapon use in order to prevent unauthorized activation and deployment of nuclear weapon systems, pursuant to the negotiation of agreements to prohibit the use of nuclear weapons and achieve their elimination.'

59. In the current context of nuclear risk this IPU resolution could be literally world-saving.

Eliminating/reducing nuclear risk

60. A number of things can be done to eliminate or reduce nuclear risk.

61. It is astonishing that none of these commonsense measures were discussed or raised at the recent Washington conference on nuclear security. Indeed, surreally, the risk of nuclear weapon USE, except as an act of terrorism, was not canvassed. It is commendable that some of these measures are being talked about here and now.

62. In addition to the below, you are particularly referred to the IALANA paper on 'Nuclear Disarmament – The Road Ahead', and in particular to its recommendation one, calling for an immediate worldwide moratorium on exercises and war-games involving nuclear forces, and on the testing of nuclear delivery systems and on making statements that make or imply a threat to use nuclear weapons in any circumstances. Russian and NATO decision-makers please take note!

63. First of all nuclear weapons can and should be eliminated 'yesterday'.

64. If nuclear weapons no longer exist then the risk of a catastrophic nuclear conflict, deliberate or inadvertent, can only be zero, at least in the short to medium term. This does not mean that all conflict will cease or that nirvana will instantly ensue. They won't. It merely means that lesser conflicts, however appalling in and of themselves, will no longer pose the risk of spiraling into an event sequence that risks human survival itself.

65. Nuclear weapons are an existential threat to all humans including those not directly involved in any conflict. These weapons must be treated as such and outlawed.

66. Secondly, various interim risk reduction measures can be taken on the understanding that they are way-stations in a rapid movement to the complete elimination of nuclear weapons.

67. These include (but are not confined to:

- No longer targeting cities. Cities if targeted are the source of the bulk of the 180million tonnes of dark black smoke that will blot out the sun for decades after a large scale nuclear exchange. Mayors For Peace has detailed proposals about this contained in the Ypres Declaration.
- Taking nuclear weapons off high alert. I mentioned the six minutes of decision-making time. This is an artifact of quick-launch, high-alert procedures that leave no time to ascertain whether or not an indication that the other has launched is really the end of the world approaching at three times the speed of sound, or merely a malfunctioning chip someplace.

68. Much discussion has already taken place about increasing decision-making time. Both the 2010 US Nuclear Posture Review and (from an entirely different angle) the Swiss/NZ study 'Re-Framing De-Alert' focus on increasing decision-making time. Even thoughtful opponents of de-alerting such as former ambassador Chris Ford acknowledge its desirability. Lowering alert status is precisely about increasing decision-making time. Once more, in the current atmosphere of US/NATO vs Russia military confrontation, adequate decision-making time – a whole lot longer than six minutes – will absolutely be required to assure the avoidance of catastrophe.

69. Two highly worthy United Nations General Assembly resolutions urging a lowering in alert status, and thus an increase in decision-making time, are India's Reducing Nuclear Dangers resolution, and the De-Alerting Group's Operational Readiness of Nuclear Weapons Systems, itself a major result of this author's efforts. Operational Readiness has steadily increased its support. Reducing Nuclear Danger deserves much more support than it gets. 'Out-of-bloc' support (ie from countries other than NAM) for Reducing Nuclear Dangers would send a helpful message. In the context of a possible placing of some of China's strategic nuclear forces on high alert, these United Nations General Assembly resolutions are of especial importance.

70. Establishing the Joint Data Exchange Center (JDEC) that the US and Russian Governments have now agreed to set up three if not four times (first agreed in 1998 in the aftermath of the 1995 Norwegian research rocket incident), but which still has not been established. JDEC, if it existed, would do much to remove misunderstandings that could prove terminal for civilization.

71. Moving the patrol areas of SLBMs further away from potential targets.(Mosher, Schwartz and Howell, 2003) This would certainly increase warning times and make fingers on triggers less itchy.

72. No First Use agreements/declarations. Also of especial importance in view of a possible Chinese move to high alert.

73. In addition, India regularly puts up a resolution urging a convention to forbid nuclear weapons use, a potentially useful risk- reduction step.

74. Whatever we do – and some action is always better than none in this department though ALL of the above and more should be implemented as part of a quick path to zero – the catastrophic risk posed by nuclear weapons has always been non-zero, and has recently grown, probably by orders of magnitude.

75. Immediate action to reduce the risk of inadvertent (or advertent for that matter) nuclear conflict is, truly, of existential importance.

76. Sooner or later the 'miracle supply' really will run dry...Unless we act.
