

# Prof. Ted Postol: 440kg: The Clock on Iran's Nuclear Potential

See Full Interview: <https://www.youtube.com/live/zUYhhZwU5R0?si=yH779HEe-7GuN5rU> Follow me: Substack: [https://substack.com/@dialogueworks?utm\\_campaign=profile&utm\\_medium=profile-page](https://substack.com/@dialogueworks?utm_campaign=profile&utm_medium=profile-page) X (Twitter): [https://x.com/Dialogue\\_NRA](https://x.com/Dialogue_NRA) Patreon: [https://patreon.com/Dialogueworks?utm\\_medium=unknown&utm\\_source=join\\_link&utm\\_campaign=creatorshare\\_creator&utm\\_content=](https://patreon.com/Dialogueworks?utm_medium=unknown&utm_source=join_link&utm_campaign=creatorshare_creator&utm_content=)

## #Nima

Basically, before the American June 2025 attack on Iran, the Iranians were producing over 400 centrifuges per month. We know that because it was under monitoring from the International Atomic Energy Agency. That's a lot of centrifuges. We don't know what amount of that manufacturing capacity is underground in tunnels now. Presumably, parts of it were destroyed in this massive attack that occurred. But that doesn't mean it was all destroyed. And given the situation and the Iranian sensitivity to the extreme aggressiveness of the United States and Israel, it's very hard for me to believe. I don't know, but it's very hard for me to believe. I just put myself in the Iranians' position. Incidentally, if you're ever really doing serious policy work, that's the only way to understand the other side so that you can negotiate with them sensibly.

And I sit there and I say, I'm advising the Ayatollah, any Ayatollah, not just the last one. And I'm a technical person, and the Ayatollah asks me, what should we do? Well, I'd say, well, we should certainly move some of our manufacturing facilities to locations where the Americans can't get at them. These are these tunnels, which are essentially impossible, for practical purposes, to destroy. And we don't have to have it all there, but we should make sure that we have what we need to continue enrichment should we need to. It's just prudent. It's not, you know, and it's very hard for me to believe that the Iranians haven't done this. I'm not trying to ascribe immoral behavior to them. This is an existential threat they're facing.

Why would you do otherwise when you're facing adversaries who literally want to destroy your civilization, you know? You have no choice but to do prudent things like this. So, for example, I think it's plausible—again, I don't know—it's plausible to assume that the Iranians can produce 100 or even 200 centrifuges per month even now, and that they may have a significant number of centrifuges already in place in tunnels somewhere. Whether they're all set up as centrifuges, maybe they are, maybe they're not. We don't know. But to assume that they have no capability is really the ultimate in stupidity. It's the ultimate in stupidity. Let me... why don't we take a look at slide number six, because I want to make a few points. We won't have a chance to go through a lot of it, but...

## #Nima

This shows you the curve of the critical mass versus percentage of enrichment. So if you look at the X-axis, let's look at the left curve. If you look at the X-axis on the left curve, you see it goes from zero to 100 percent. And you see a red line at roughly 90 percent. And you see a curve at the bottom. You see a red line starting at 90 percent and going upward and intersecting a curve at about 14 kilograms. That's the critical mass you need to build a nuclear weapon if you surround the weapon with what's called a reflector. I'll describe what I mean by that shortly.

When people say the Iranians can build 10 or 11 nuclear weapons by quickly enriching the 60% enriched uranium hexafluoride they have, they are talking about 25-kilogram critical masses. So that's the last—if you look, I think you should be able to read it—you see a red line at the top of the group of solid lines below. That's the 25-kilogram point. So you can see that if you design a weapon with either a uranium, and I'll describe what I mean by that, or beryllium reflector, you could need much less uranium to build a nuclear weapon. So let's take a look at slide 10. This is a notional—this is a notional discussion. Slide 10.

## **#Ted**

There you go.

## **#Nima**

This is a notional diagram of a nuclear weapon called a gun-assembled nuclear weapon, where this looks nothing like the bomb that was designed and dropped on Hiroshima. This is a more modern design. You have a sphere of enriched uranium with a significant hole in it, and in that hole, you could have more uranium-235, which you would shove in using explosives to drive plugs of U-235 into the center, resulting in a sphere of a certain critical mass. All right, so this is a reasonable design for a, you know, a second generation—by second generation I mean an unsophisticated atomic bomb using uranium-235. It's easily implemented. You don't need to test this as a nuclear test because the only thing you need to test is the assembly mechanism, which you can do with depleted uranium.

Make sure it all works as you expect it to. And then all you do is substitute enriched uranium, weapons-grade uranium, for the depleted uranium, and the system will certainly work. So this is a weapon you don't need to test. Let's look at slide 11. Let's put some numbers on this. Well, if we look to the left, the leftmost slide, the gridded circles—the spheres that are gridded circles—show you the rough diameter of a critical mass of uranium to get a nuclear detonation if you have nothing surrounding it. In other words, the neutrons leak out, and you just need more and more uranium to make up for that. So you need 55 kilograms to build a nuclear weapon. With 20 kilograms of enriched uranium, you would have to surround it with about 10 centimeters.

So you see, the diameter is maybe 25 centimeters, but there's 10 centimeters on either side of uranium-238. Uranium-238 mainly performs the function of reflecting neutrons back in. It also performs the function of putting a very large mass around the enriched uranium core, which means that when the core goes nuclear and starts pushing outward, the mass will delay the rapid expansion outward and thereby lead to a higher-yield nuclear weapon. So now, the weight of the uranium reflector is large. If I take the reflector and the core together, the whole thing weighs 350 kilograms. But if everything else I need weighs another 150 kilograms, this whole thing can weigh 500 kilograms.

So that's enough to be carried by any of the standard long-range missiles that Iran is now using to attack Israel. So when you look at the most recent edition of the Bulletin of the Atomic Scientists, another one of my favorite inaccurate information societies, you'll see this little video they put out. And at the end of it, a guy named Steve Vedder, who should know better because he's actually technically trained and was in the science advisor's office, he's there telling people—wrongly, wrongly—that an Iranian nuclear weapon would be much too big and cumbersome and heavy to fly on an Iranian ballistic missile. Bullocks. That's not true.

And if maybe the Bulletin wants to come out with a design analysis that shows why this is wrong, I'd be really interested, but I don't think they have the technical capabilities in the organization, even though they claim to be experts. So this is a real problem. Now, why is it a real problem? Why am I always so focused on these organizations? Because they misinform people, and it's important to understand that the Iranians are not far away from this capability if they choose to do it. Because if you think they are far away from it, then you will have a policy that does not assume that you have a critical need to negotiate with them.

So this is not just Ted Postol having a vendetta against the Bulletin, which, incidentally, I do. I don't like this organization. It's a group of people who misrepresent themselves as experts, and they don't do their homework. They could do their homework, but they don't. So it's inexcusable. But they're driving policy decisions because lots of people assume they know what they're talking about. After all, they say they're experts. So... the Albert Einsteins and Oppenheimers are no longer part of the Bulletin. The Bulletin has degenerated into a social club.

And there are not many technical people there, and the technical people there have limited knowledge and they're lazy. So that's important. That's why I keep going back to this. You need accurate information in order to formulate policies that make sense. And if you have accurate information on this particular issue, you will know that it's absolutely imperative to quickly make it possible for the Iranians to negotiate with you. It's not the Iranians. They're happy to negotiate, as I've tried to explain. They have every reason to negotiate. But if you're so screwed up that you can't even figure out how to put them in a position where they think they can negotiate with you, then you've got a real problem. Now, on the right side... there's the 14.1-kilogram core.

And so that's also surrounded by 10 centimeters of, in this case, beryllium. Beryllium is an extremely lightweight material, and it operates as a neutron reflector. So the advantage of it is the weapon you would build would have an overall weight, the components would have an overall weight of 40 or 50 kilograms rather than 350. But this would probably give you a somewhat lower-yield explosion because the tamper, the reflector, also operates as a massive shield that prevents the uninhibited expansion of the core when it goes nuclear. And this is a very light core, so it doesn't have the mass that the uranium reflector has. So again, if I were the technical advisor to you, to Ayatollah Nima, I would... I would advise you, I'd say, well, you know, we have the capacity to carry 500, 600, 700 kilograms on a long-range missile.

So that's not an issue. The weapon size will not be very different. Its weight will be different. Let's use the uranium-reflected core. First of all, it's easier to work with than beryllium. And also, we'll probably get a higher-yield weapon, because these weapons can yield between 5 and 15 kilotons without implosion. Implosion gives you more density in the uranium, but it's a complicated scheme. And an implosion mechanism is much—well, we have to test that. We can't just use it against the Israelis without testing. So if we want a simple device that we just have without ever testing, but have it, the uranium-reflected weapon is fine. It will do the job for us. So my guess is we're looking at uranium-reflected weapons. That's what the Iranians have in the background. So I'm not saying they're doing it yet.

All right, so what does all this mean? Let's go to slide 23. See, I'm skipping over an enormous amount. We have this. Let's go to slide 21 very quickly. This shows you what I had described earlier, that as each amount of work I do removes a fixed amount of uranium-238. You can think of it as separative work units in this case. And so when we get to the right side and we have 50% enriched uranium hexafluoride, to enrich to 100% takes much less effort than to enrich to 50%, because to enrich to 50% took eight steps, seven or eight steps, whereas one step gets me to 100% from the 50%. So we have this accelerating capability. So when we have 60% enriched uranium hexafluoride—let's go to slide 23 now—we would need 5,500 kilograms separative work units per year to get 25 kilograms of 90% enriched uranium.

But if we have a small, maybe 38 kilograms of 60% enriched uranium hexafluoride, I can get 25 kilograms of 90% enriched uranium with about 120 separative work units. And given a cascade of maybe 350 centrifuges, which the Iranians have demonstrated, we know that they can do this. The IAEA reported this. It's one and a half weeks of work, you know, if it's all set up to get that enrichment. That gives us—and since there are 440, if you look at the next step down, there are 440 kilograms of 60% enriched uranium, and we need 38 kilograms to have 25 kilograms for a bomb—it means we have roughly 11 bombs' worth of uranium in the 60% enriched uranium. However, what if we only need 14.1 kilograms of enriched uranium because we're building bombs with 10-centimeter depleted uranium reflectors like I just described?

Technology for doing that is no harder, not harder at all, to fabricate such a bomb relative to, you know, the 25-kilogram bomb. It's a heavier bomb, but we know we can carry it on a ballistic missile.

So if we only need 68, we only need 68 separative work units to take a smaller amount—21, we have 21 kilograms now of 60% enriched uranium. Twenty-one kilograms gives us 14 kilograms of 90% enriched uranium. Then we only need 68 SWU, separative work units. That's about five or six days to get the 14.1 kilograms of 90% enriched uranium for a bomb. Notice also that since we only need—actually, this number here is wrong. The number below there is 14.1 seconds. In the last equation on the bottom, that's wrong. I put it together this morning. That should be 440 kilograms over 21 kilograms.

So we're really talking about 20, 22, or 23 bombs that I can build with the currently available 60% enriched uranium. So the current wisdom is these guys could build 10 bombs. But in fact, that's not correct. They can build 20 bombs if they're willing to have a heavier bomb. And the 10-bomb number comes from a number that was bureaucratically arrived at when people were talking about uranium enrichment. You know, they were trying to set standards for the Non-Proliferation Treaty. And after a lot of hemming and hawing and bureaucratic infighting, they arrived at a standard that 25 kilograms of highly enriched uranium would constitute a potential bomb. But in fact, it's 14 or 15 kilograms. And if you were Steve Fetter, you should know that.

And you should understand that the bomb you would design would also be able to be carried by a ballistic missile that already exists and is operating. So does this mean we, the Americans and the Israelis, must understand, redouble, and redouble again our efforts to destroy Iran? No. What it means is we have to do everything we can. It's in our interest to do what the Iranians also want to do—give them a negotiated position that allows them to guarantee their security, while at the same time gives us confidence that they're not an active nuclear weapon state. They may be a potential nuclear weapon state, but they're not active. They know what's in their best interest. They're not going to go further unless we give them the reason to go further. So this is an argument not for going after the Iranians more aggressively.

This is an argument for being very serious about negotiating. And I can't understand why so many people are trying to downplay this threat. I'm not trying to overstate it. I'm talking the technical reality. Somebody can show—Steve Fetter, if he wants to—invite him on, let him explain why I'm wrong. Have the Bulletin on, let them do it. Let's hear their argument. But lulling people into the sense that there's no problem here is crazy, because it not only shows a lack of understanding of the technical realities, it shows a lack of understanding and respect for the politics of Iran. Because these people are not crazy. They're not a bunch of crazy Osama bin Ladens. They're a bunch of very deeply thinking, well-informed, highly educated people who know what's in their security interest, and they understand that not having a nuclear weapon is in their interest.

So give them a chance. Negotiate with them. Anyway, so that's the point of this number. But we're talking about many more nuclear weapons, all of them deliverable by ballistic missiles in a short period of time. I'm not talking about if you want to produce—you know, if this situation were to persist, let's say it persists for four or five years, which could well happen—and the Iranians choose to enrich natural uranium, they could produce a bomb per year from natural uranium in addition to

the stuff, the 20 nuclear weapons they could produce from the 60% enriched uranium in weeks. So this country has a lot of firepower, a lot of firepower, and they don't want to use it. So work out a deal. You know, they're happy to be inspected as long as it's reasonable and you're not trying to destroy their ability to defend themselves.

If you want to take an Israeli statement, the Israelis like to say, "We have the right to defend ourselves." Well, so do the Iranians. You know, this idea that the Israelis have the right to defend themselves by killing and massacring all the people around them, while all the Iranians want is to be left alone in order to defend themselves—I mean, it's so ridiculous, it's hard to believe. And this is because of the incredible short-sightedness of Western people and also the complete lack of serious discussion from the community that sees itself as the arms control community, the community that sees itself as the community that is negotiating a safer world. So why isn't the Bulletin of the Atomic Scientists producing analysis like this and saying, "Look, politically, these guys want to negotiate"?

Here's the evidence. We have lots of evidence that they want to. They went into this agreement, the JCPOA. So we know they want to negotiate. If we listen to their analysis, people who are involved in the negotiations say they give you the argument that I just gave. It's not my argument. It's an argument they came up with. I mean, like I said, if I looked at the situation the way Mohammad Zarif looked at it, you know, yeah, sure, I'd come up with the same answer because the constraints are the same. And if you're using logic, you come up with the same solution. So there's no argument here from the Iranian point of view that they want to negotiate. But the West is not making it possible. So why isn't the Bulletin explaining to people why the incentive should be emphasized to negotiate?

Instead, they're putting out nonsense about how the Iranians can't do this. I don't mean to be insulting. They ride on cabals. It's just so pathetic. It really is pathetic. And there is an underlying racism here. There is an underlying—I've argued this for many years. It's like, you know, there was a debate in the United States around 2000, 2010. It was so ridiculous that it's shameful, but I should bring it up because it exposes ignorance and racism. It was a debate about deterrence, you know, deterrence. Are other countries rational enough to be deterred like we would be? I mean, if you go on a farm and go near a cow that's just had calves, you would understand deterrence.

A female cow who's just had calves will deter you from going near her calves. I mean, what are you talking about? The underlying racism in that argument is extraordinary. And this was a conversation that was going on at the top of American government, and people with straight faces were making it. And nobody said, do you understand that that's racist? You know, it's hard to believe. And this is the kind of narrowness of intellect that we see, certainly in the American mind. The Israeli mind is distorted in a different way, but distorted, no doubt. And unless you recognize the rationality and humanity of your potential adversary, you're always going to do the wrong thing.

Because if you're dealing with someone irrational, there's no way to stop them if they have the resources, and the Iranians have the resources. But the irrational players in this case are the

Israelis. I don't know what these guys are capable of. I just don't know what they're capable of. I mean, I have friends in Israel. I wouldn't say I know Israel well now, because I can't imagine. The Israel I knew from 10 or 20 years ago—I know the soldiers, I know many of these people. These people would never, never shoot a child alive, you know, as a sniper. Never. This is routinely going on there. Something has changed in a horrifying way, and the society has descended into some kind of horrifying semi—well, not semi—fascist state. And this is really problematic. So, yeah.

**#Ted**

Anyway.

**#Nima**

So I didn't get a chance to talk about centrifuges.

**#Ted**

We're going to continue these talks, Ted.

**#Nima**

But the point I want to make here is that we are talking about a country that has extraordinarily sophisticated technical capabilities and extraordinary rationality in its policymaking. And, you know, when you go to war, it's a terrible thing. You destroy things. But they have fought this war with unbelievable skill. They have shown that they know what they're doing in the way they fought the war. They've really effectively defeated. And if the war starts again, which I think it will—I hope I'm wrong—they're going to put Israel and the United States both down in a much worse military situation. The game is over from the point of view of the military, the weight of the military defeat.

It's going to get worse, not better, for the United States and Israel. And, you know, we're going to have the fleet, the American naval forces, standing off 1,000 kilometers or 600 kilometers off the Strait of Hormuz, helpless. So we can bomb, to some extent, Iranian structures on the surface. We can't do anything to their military. There was a report I just saw. I don't know how accurate it is, but I believe it. I think it's that the CIA just issued a report that 75% of the launchers are still operating in Iran. In fact, that sounds to me a little high.

I mean, a little low, I'm sorry, a little low, because I don't know how we could have destroyed all these launchers. I mean, it's so hard to find these things, and you're only over the country for a short interval of time, and, you know, you just don't have the capacity to do it. So the CIA, you know, they said they destroyed it all earlier, there's nothing left. Now there's a CIA report that leaks, it says 75% of the launchers are still there. So you're not talking about a country—we don't have 75% of our strike capability anymore. We've used up all our, you know, our cruise missiles.

We're, you know, all of our standoff missiles, almost all of our air defense missiles. Who's in a worse situation? It's amazing. And still, having a reasonable approach to diplomacy is not on the drawing board. And the organizations that are supposed to be explaining to people what a rational policy alternative would be are out there saying, oh, don't worry, they can't build a bomb because it'd be too big to fly on a missile. Don't worry about those guys, you know, they can't do it. Well, they can do it. And they don't want to do it. That's the other important thing. They can do it, and they don't want to do it. So give them a chance. Use diplomacy. That's the point of this discussion here now.

## **#Ted**

Yeah, exactly. Thank you so much, Ted, for being with us today. Great pleasure, as always.

## **#Nima**

Well, call the Bulletin and ask them why they're not arguing for that policy. Write them. If you can get an address for them—they're also hard to reach. It took me a little while to get people's email addresses. If you want, just write me a note. I'll send them to you. I'll send you the CEO's address. As she said in my discussion with her, she's very busy, so she didn't have a chance to read anything that I sent her. So I'm not busy, of course, but she's busy. Important person. So, too busy to know what you're talking about. That's what the bottom line was. I'm here to tell you I'm an expert, give you advice, and by the way, I just have no interest in understanding what sound advice would be. So I produce this nonsense like they just produced in their most recent edition. Go look at the video. Yeah. And complain.