In defense of silo-based MIRVed ICBMs

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Silo-based multiple-warhead ICBMs have a consistently bad reputation with the arms control crowd as well as among nuclear hawks. We all know the argument - these are highly vulnerable and very lucrative targets that undermine stability in every possible way. Since a single MIRVed missile can potentially destroy several MIRVed missiles of the opposing force, taking out a lot of warheads, the incentives to strike first seem almost irresistible. As does the urge to "use them or lose them" - if I know that the opponent can destroy my entire ICBM force with only of fraction of his own, I better launch my missiles before he has that chance. Silo-based ICBMs are thought to be the worst since they appear to be of no use unless launched in a preemptive strike or at the first sign of an incoming attack.

This logic has been guiding arms control discussions as well as the actual arms control and disarmament process ever since first MIRVed missiles were deployed in the early 1970s. It became one of those dogmas of the nuclear age that have never been questioned, let alone contested. But it probably should be. The issue with this logic is that it rests on an implicit assumption that both sides build their strategic nuclear forces with warfighting and damage limitation in mind.

Details could be somewhat complicated, and they are rarely spelled out explicitly anyway, but it is fair to say that damage limitation has always been the primary mission of the US nuclear force. In the best tradition of mirror-imaging, it was automatically assumed that the Soviet nuclear force was built around the same idea. Why else would the Soviet Union deploy all those heavy (and heavily MIRVed) ICBMs if not to launch a disarming attack against US silos?

Well, there is precisely zero evidence that the Soviet Union ever contemplated attacking US silo-based missiles, whether as part of a first strike or in an attempt to limit the damage during a nuclear exchange. It built its MIRVed missiles for entirely different reasons.

To understand what happened, we need to go back to the early days of the Soviet program. At the end of the 1960s, when MIRVed missiles became a technical reality, the Soviet Union had a force that included about 1000 light and inexpensive UR-100/SS-11 missiles and about 200 "heavy" R-36/SS-9 ICBMs. It appears that a preemptive strike was indeed the primary option that the Soviet military had in mind at the time, but there is no way the purpose of such a strike was to blunt a US response, limit damage to the Soviet Union, and somehow emerge "victorious" from the nuclear exchange. The missiles were simply not capable of that - the only mission they could accomplish was to deliver a certain number of warheads to the US territory - unacceptable damage and all that. Striking first was the only way to achieve that.

But wasn't the new generation of missiles, with multiple independently targeted re-entry vehicles, developed to do what their predecessors couldn't - limit the damage in a nuclear exchange by launching a first disarming strike against the opponent's ICBMs? Since this is how the United States was planning to use its own MIRVed ICBM force, it seemed like a sensible thing to do.

In reality, building a first strike capability what exactly the opposite of what the Soviet Union was about to do. Even before the Soviet Union embarked on its modernization program that will eventually produce its first MIRVed missiles, it initiated a thorough review of its nuclear posture. This discussion became known as a "small civil war" as it was a rather high-intensity conflict between two factions. The military (Andrey Grechko, the minister of defense, in particular) argued that any change would be too complex and expensive and that simple missiles in relatively soft silos provide reliable deterrence as long as they are deployed in large numbers and a preemptive strike is an option. The military were supported by Sergey Afanasyev, the head of the Ministry of the General Machine Building. They also had Vladimir Chelomey, the designer of the UR-100 missile, on their side. The opposing group argued that relying on a force of vulnerable missiles is not a sustainable (or, indeed, reasonable) option and advocated a move to hardened silos and retaliation as the strategy. Among the prominent members of that group were Yuri Mozzhorin, the head of TsNIIMash, and Leonid Smirnov, the head of the Military-Industrial Commission. Importantly, the group had support of Dmitry Ustinov, a Secretary of the Central Committee.

To examine the issue, the Soviet leadership set up a commission, chaired by Academician Mstislav Keldhysh. The commission, which included scientists (Khariton, Aleksandrov), the military, and representatives of the industry, worked for over a year, apparently around 1968. It concluded its work with a strong recommendation to adopt the retaliatory-strike posture (a.k.a. otvetnyy udar, a "deep second strike," or a "strike after ride-out") and to begin the silo hardening program. This choice was formally confirmed at a special session of the Defense Council that took place in July 1969. The military decided not to fight the decision, even if somewhat reluctantly. Chelomey changed his position as well and joined the winning side.

Note that the 1969 decision was not yet about the choice between MR UR-100 and UR-100N - that would be made a few years later. In 1969, the Defense Council set a general direction for the development of these missiles (as well as of R-36M/SS-18), which began shortly thereafter. The question, of course, is, why would these missiles carry multiple warheads if not to attack the US strategic forces in a counterforce damage-limitation strike? The answer, in fact, is quite simple. If you build your strategy around a deep second strike, you have to assume that a significant number of your ICBMs will be destroyed. Out of, say, 200 or so heavy missiles, only a handful would survive. If that's the case, you would much rather those surviving ICBMs carry ten warheads rather than one - that way you could be reasonably certain that you can retaliate with, well, multiple warheads. This means that MIRVing your ICBMs is, in fact, quite a reasonable strategy for a second-strike option.

As for damage limitation and warfighting, Soviet MIRVed missiles never got anywhere close to that - throughout the 1970s they were not capable of taking out more than

about 20 percent of Minuteman silos and could only hope to take more than a half of them in the 1980s. I would not be surprised if the Soviet Union never targeted US ICBM silos at all. What would be the point?

One interesting detail about the small civil war debate is that missile defense was not a factor in the decision at all. Yes, it was mentioned, but only as something of no particular importance. Which is not surprising since by the end of 1969 it was well understood that missile defense can do little about relatively simple decoys and penetration aids, which all new missiles, of course, would carry. In short, missile defense was never a problem (so much for another arms control dogma, but that would take a separate post).

Even though MIRVed missiles offered more warheads in a retaliatory strike, when it came to practical implementation, the scale of MIRVing was limited by the cost of the silo hardening program. Out of about 1400 silos that the Soviet Union kept after the SALT I freeze on new construction, 580 were the soft silos built in the 1960s. It wasn't much of a problem at the time since the sheer number of these missiles provided a reasonable margin of safety for retaliation.

The move to a deep second strike also spurred the development of mobile intercontinental missiles - the work on the Temp-2S ICBM was authorized in July 1969. The project was not entirely successful, and the missile was never formally accepted for service. It did, however, start a line of solid-propellant mobile missiles that included Pioneer/SS-20, Topol/SS-25, and Yars/SS-27. Mobility, if you do it properly, could be a good way to protect your missiles from being destroyed in an attack. To a point, of course.

Another development set in motion by the 1969 decision was the work on the nuclear command and control system. If you rely on a deep second strike, you need to make sure that the (few) surviving missiles will have the order to leave their silos once the attack is over. The command and control system was developed very much from scratch, which allowed the designers--a team from the Leningrad Polytechnic Institute that won the competition (later Impuls Design Bureau)--to build it around fundamental principles. They would consider, for example, how the number of people that are authorized to make the decision--one or, say, four--would affect the reliability of the system (I don't know what the answer to that was, but if I understand it correctly, they did make sure that the General Secretary does not have the sole authority to launch an attack). The result was the architecture that includes things like a preliminary command and the ability to communicate launch orders directly to silos through a variety of communication channels (one of which, yes, is the command missiles of the Perimeter system). In my view, it is a very effective system that supports guaranteed retaliation, provides insurance against a decapitating strike, and does not rely on launch on warning that puts the leadership under the enormous stress of having to make the decision to launch in a few minutes (the Soviet Union never had these few minutes anyway).

Speaking of launch on warning, that option was not considered at all. Of course, the Soviet Union did not have an early warning system in 1969--the few radars that were deployed at the time were part of various missile defense efforts. The work on early

warning radars and satellites would begin only in the early 1970s. Details of this story are a bit complicated, but there are no indications that this development was aimed at attaining the launch-on-warning capability.

The early-warning system, however, will come in handy later, in the early 1980s. The advances in missile accuracy began undermining the reliance on deep second strike as the primary option for strategic nuclear operations. As I understand it, the Soviet Union was not willing to consider launch on warning--it didn't really have good options there as it could not rely on dual phenomenology to provide a fully reliable detection of an attack. Launch on warning is a highly risky strategy for the United States, and it would be doubly so in the case of the Soviet Union (and Russia, for that matter). Instead, the Soviet Union chose to implement what is known as a launch from under attack or otvetno-vstrechnyy udar. In brief, this option would allow to "protect" (still a small number of) ICBMs by launching them before attacking warheads arrive at their targets. And since the launch order is issued only after the detection of actual nuclear detonations, this option is far less dangerous than launch on warning.

This assumes, of course, that the command-and-control system can support a launch from under attack. Which it can. The basic algorithm remains the same--the preliminary command can now be triggered by the early-warning system, while the actual launch order is transmitted through a variety of communication channels. This is not to say that implementation of launch from under attack was easy--all elements of the command and control as well as the missiles themselves required serious hardening--but if you compare it to the cost of a launch-on-warning error, it was definitely worth it.

Now we come back to the question of silo-based MIRVed ICBMs. As far as multiple warheads are concerned, it is not difficult to see that they still provide a significant advantage. Whether they are launched from under attack or after ride-out, the number of surviving missiles is not expected to be very large. (It is worth noting that this number is unknowable. It could be zero, but it could also be rather large--it is a distribution of probability that is never a delta function. Unless you try an actual attack, you will never know it.) If the surviving/escaping missiles carry multiple warheads, the number of targets hit in a retaliatory strike increases accordingly.

Deploying missiles in silos, as opposed to on mobile launchers, also offers some advantages in the launch from under attack scenario. A launch order can reach the silo almost immediately and the missile can be launched very quickly (silo ICBMs deployed in the 1980s were on combat duty with their gyroscopes spun up). Even if a counterforce strike is well coordinated, it is impossible to hit all target at once--for quite a few silos there will be a window of a few minutes between the first detected nuclear detonation somewhere else and the arrival of "its own" attacking warheads.

Mobile missiles, especially when they are on patrol, are much harder to deliver a launch order to as they cannot rely on a hard-wired connection with the command center. They are also slower to react, even though they could still be launched fairly quickly once they are deployed in a field position (I am not sure about gyroscopes, though--spinning them up may take a few precious minutes). They are harder to locate, of course, but that advantage has been steadily eroding in recent years (as the Soviet Union understood it quite well back in the 1980s). Road-mobile missiles are probably still up to the job as a

deep-second-strike weapon, but they may not provide the same level of confidence in the success of retaliation as their silo-based siblings launched from under attack.

There is another factor to take into account--missile defense. A heavy missile deployed in a silo could carry a very potent countermeasures package in addition to its warheads. If the assumption is that only a handful of ICBMs would survive or escape a counterforce attack, it's better to have missiles of the R-36M2 class among them.

Putting this all together brings us to a conclusion that goes very much against the conventional arms control wisdom. It turns out that if you plan on using them properly, silo-based MIRVed ICBMs actually improve crisis stability and provide protection against catastrophic early-warning or command-and-control errors.

The key factors, of course, are the launch from under attack posture (silo-based missiles are probably not a good choice for the deep second strike option these days) and a command-and-control system that can support it. This is what the Soviet Union built in the 1980s and what Russia most likely preserved to this day. The biggest problem usually associated with silo-based MIRVed missiles--the destabilizing "use them or lose them" pressure that supposedly forces you to launch your missiles first--exists only in warfighting scenarios where opponents are poised to destroy each other's forces in the belief that the key to victory is a throw-weight advantage after the exchange. But if you build your strategy around retaliation, the "use or lose" pressure does not exist--you are, in fact, planning on losing most of your missiles anyway.

None of this, of course, is a call for deploying more MIRVed ICBMs in silos. But it does suggest that the Soviet and Russian silo based MIRVed missiles were not nearly as problematic as they are usually depicted. And they probably play a stabilizing role by providing Russia with confidence that its missile force could deliver a reasonably-sized retaliatory strike if it ever comes to that (there are submarines as well, but that's a separate story). The heavy Sarmat missiles that Russia intends to deploy could even play a positive role in addressing the missile defense issue by helping to build the argument that these missiles would render US missile defense "impotent and obsolete," just as the plans to build "modular missiles" helped calm the nerves around SDI back in the 1980s.

The same logic would probably apply to China. While any increase of the number of warheads is regrettable, China's deploying multiple warheads on its missiles is not necessarily destabilizing. Even those who don't believe China's no-first-use policy would have to admit that there is no way China could pursue a meaningful damage-limitation capability.

It is a tougher call for the United States. On some level, US ICBM force is largely irrelevant. As I mentioned earlier, I doubt that Russia aims its missiles at US silos, so they probably don't even work as a sponge. On the other hand, these missiles do have a non-trivial counterforce capability that would only increase if they were MIRVed (and there are enough warheads in the reserve to do so). And if the GBSD program proceeds as planned, this capability will be maintained for a long time. Add to this that the United States believes in damage limitation and relies on launch on warning that opens it to catastrophic accidents, and you have a picture of a pretty destabilizing and dangerous

force. But is not ICBMs, MIRVed or not, that are the problem, it is the first-strike damage-limitation strategy.

In conclusion, I should note that this is, of course, a very broad-brush treatment of the issue. There were (and still are) many factors in play, political as well as technical (mostly political, I would say). But this take on silo-based MIRVed missiles does suggest that the ways different states look at the same issue could be very different. Unfortunately, the history shows that nobody is particularly interested in what their opponents really think. It is much easier to deploy mirror-imaging or simply make up their views to fit a particular political purpose. There is not much they can do to contest that. And, of course, there is a lot of inertia and quite a bit of lazy thinking. In a way, this is inevitable as it is all part of a normal political process. But we should at least try to be critical about established beliefs, conventional wisdoms, and long-standing dogmas. There are quite a few of those around.