A Comment by General Starry

"We are behind the Soviets in both armor and bullets. That simple declarative sentence is what makes the ratification of the Intermediate-range Nuclear Force (INF) treaty a provocative action. It is the raison d'etre for the new national interest in armor and anti-armor technologies. And it was the principal finding of the 1985 Defense Science Board Task Force on Armor/Anti-Armor, of which I was the chairman.

"Our Task Force study reported that, in armor and anti-armor systems, the U.S. has been behind the Soviets for perhaps fifteen to twenty years, and we are falling further behind at an alarming rate (see Figure). Back in 1985, we considered the problem as one 'approaching a matter of national urgency.' Today we have crossed the threshold; the situation is now a matter for urgent national priority.

"The problem is not a lack of technology or intelligence data. Scientific journals and other open literature collectively provide a fairly substantial body of data from which we can determine, at least by inference, what they are doing in research and development.

"However, over time, we find information concerning a given technology declining in volume or even disappearing from their literature, Does this mean that the Soviets have given up on a technology? The U.S. has a tendency to believe so. That may be true, but it is equally possible that they have moved the technology into full-scale engineering development. Eight to ten years may pass. Then, all too frequently, we identify what we would call a new weapon system on a test track or, in some cases, being issued to the troops—a system that fields the so-called disappeared technology.

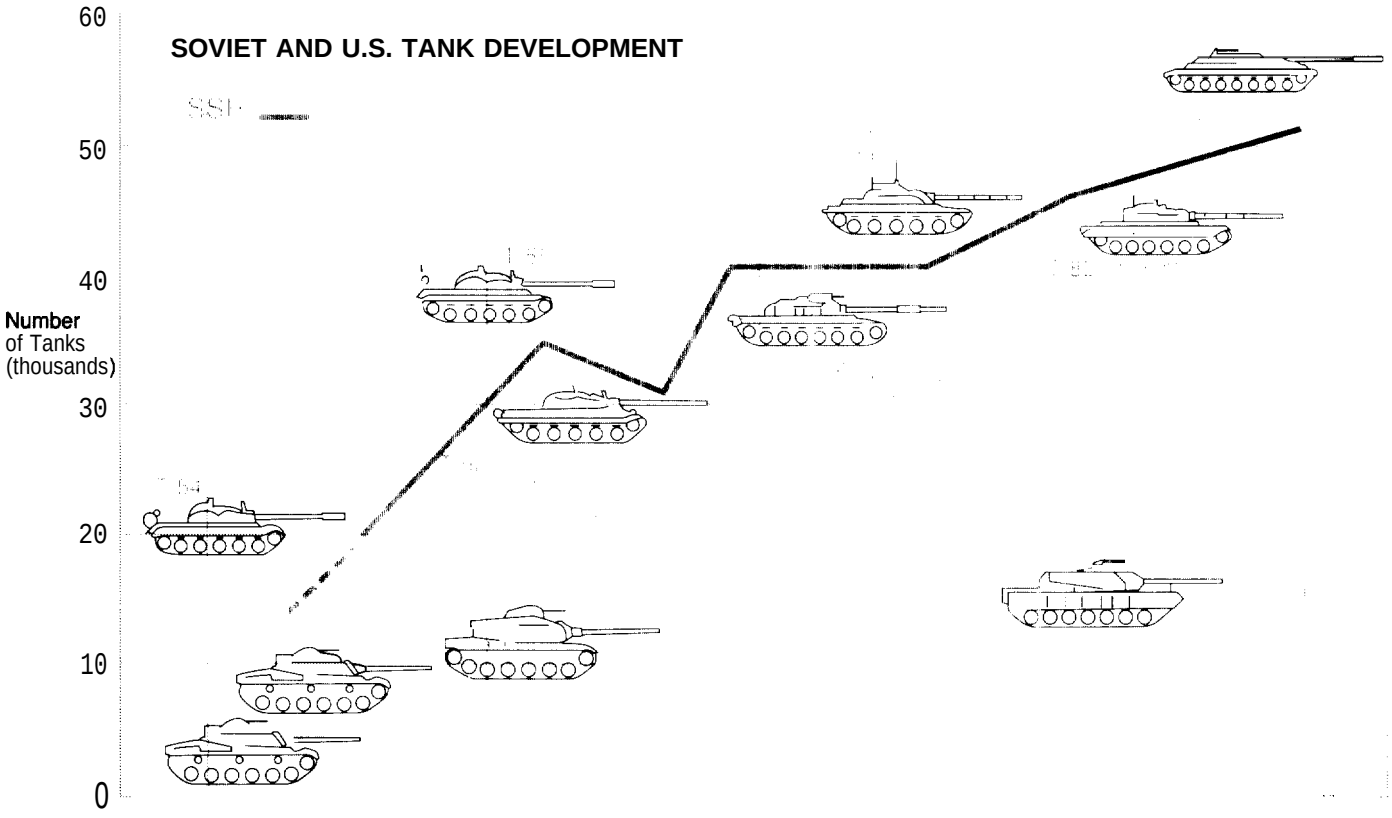
"The Task Force called this decline of information during full-scale engineering *the Bathtub of Ignorance,* Historically, it has taken us at least five years to catch up and frequently as long as fifteen years to apply the same technology in our fielded systems.

"This is not an indictment of our intelligence system. We do gather sufficient information on which to make fairly reliable estimates. In fact, three years ago we had the intelligence community make some estimates of what was in the 'bathtub;' to no one's surprise, those developments are now beginning to appear.

"The flaw, instead, is in our decision-making process. Our system reacts positively only when confronted with hard evidence—a photograph of fielded equipment—and negatively to an intelligence community 'bathtub' projection. No one in Washington is willing to make a decision until shown a picture of a fielded system incorporating new technology; then there will be all sorts of doomsday and 'how could this have happened' reactions.

"So the first problem our country has is how we look at the threat. The second problem is one of technology fielding. We are fighting against a natural tendency of laboratory scientists-even at places like Los Alamos—to keep the technology at the workbench too long. Of course, they want to keep improving the capabilities, But if you allow the scientists more and more time and funds, you may end up with a wait of five to ten years, an expenditure of millions or billions of dollars, and only a marginal improvement in performance, In other words, a laboratory has no incentive to get the technology out.

"It is vital to have a decision-making mechanism to drive the technology off the workbench and into the field. The Soviets have such a mechanism: the five-year planning process. Relentlessly, every five years the Soviets transfer technology from the bench to the field. We have-no similar system. In fact, the Task Force examined thirty of our technology developments and found at least



* Classified or unknown

U.S./SOVIET	T-54	M-47	M-48	M-60	T-55	T-62	T-64	T-72	M-1	T-80	FST-I
Crew	4	5	4	4	4	4	3	3	4	3	*
Combat Weight (metric ton)	36	46	45	53	36	37	35	41	57	42	*
Power/Weight Ratio (horsepower/rnetric ton)	14.4	17.5	18.0	14.2	16.1	14.5	18.4	19	26.2	higher	*
Maximum Road Speed (kilometer/hour)	48'	48	42	48	50	50	80	60	66	90	*
Main Gun Diameter (millimeter)	100	90	90	105	100	115	125	125	105	125	*
Turret Front Armor Thickness (millimeters)	203	115	110	*	203	242	*	280	'	*	*

Soviet tank development outpaces that of the U.S. both in total numbers and in the introduction of modern technology. The Soviets regard the tank as the primary element of their ground combat power, and Soviet military theory emphaslzes the Importance of the tank in the combined-arms team. As a result, the Soviets commit a major portion of their resources to their tank industry, achieving an Integrated, evolutionary program of tank development that produces thousands of main battle tanks each year. Long-term improvement can be seen In all three Soviet armor subsystems-firepower, protection, and mobility. Modern tanks (T-64, T-72, and 1-60) now make up approximately forty per cent of the Soviet force in the field. (The information for this figure was compiled by the International Technology Division of the Los Alamos National Laboratory.)

a dozen that had been funded at entry levels of developments for twelve to fifteen years. I believe this situation illustrates that while we may be ahead of the Soviets technically, more and more the advantage may only be on the laboratory bench.

"The third problem we identified is our programming system—this is a function of the way we build budgets. For most programs, except for a few R&D programs, the budget is a one-year cycle. That means each year we have to renegotiate the budget, and priorities may be different. Some people call that 'an up and down' budget; I describe it as a zigzag process. It takes time and money, most of which is wasted as you zig and zag. Connected to the one-year budget problem is the fact we have no orderly system for block modifying our big weapon systems. Historically, the Soviets have been able to modernize a whole fleet with new technology every ten years; because of our programming system, it takes twenty to twenty-five years. That is the basic, fundamental problem.

"The final problem identified by the Task Force was the lack of an effective acquisition management system. Activities were going on all over the country in armor and anti-armor with no one in charge. No one was tasked with the mission of bringing it all together and implementing it. Let me give you an example of an effective acquisition system. In Israel, a man named Israel Tal—a retired Major General and a great hero of the Israeli Armed Forces—is the Deputy Minister of Defense for Armor Vehicle Programs and the czar of tank and other vehicle development. His establishment literally tests something every week, immediately looks at the results, and decides what to test the following week. Thus, they are forever narrowing their options, and, as a result, field new technology on new vehicles at a rate we simply cannot match. An additional benefit is that General Tal—who is driving the program to completion—was not only an ultimate user in the past, but he is also still closely affiliated with the Israeli Armor Corps. We need that tight symbiotic relationship as well.

"The Task Force concluded that, historically, we have always been in a catch-up mode. Yet, by the time we supposedly catch up, momentum on the other side has put the threat ahead of us once more. Moreover, we are unable to achieve and sustain a modernization rate that can match or better that of the Soviets. The end result is that the Soviets are outmodernizing us at a rate of about four to one. For example, every year they modernize a force the size of the total U.S. heavy force, and every two years they modernize a force the size of the total NATO heavy force. Our modernization rate is dramatically less robust.

"These conclusions led the Task Force to make several recommendations to the Secretary of Defense. One of our strongest was to ask DARPA to set up a program that would address the problems. That was the origin of the national Armor/Anti-Armor Program—a program in which the Advanced Technology Assessment Center (ATAC) at Los Alamos National Laboratory plays a significant role."

—Donn A. Starry, General of the U.S. Army (retired) and Executive Vice President of Ford Aerospace Corporation

continued from page 53

THE TOW MISSILE

Fig. 1. A soldier, almost completely hidden by his ground launcher, fires a Hughes TOW missile during training. As the missile flies toward the target, the soldier tracks it optically, guiding it with signals transmitted through the wires seen spiralling out of the back of the missile.

gun-fired kinetic-energy penetrators by a factor of at least two to one. Also, the destructiveness of the chemical-energy penetrator is not dependent on the energy of the delivery system because the penetrator is formed and driven by explosives in the warhead. No barrel is required to direct the penetrator, and no particular velocity needs to be attained to make the weapon effective. Unlike kinetic-energy penetrators, chemical-energy weapons are light enough to be carried by a soldier or transported by unmechanized forces. Finally, the deployment of highly accurate weapons in the early 1970s—such as the TOW missile, which is tube launched, optically tracked, and wire guided (Fig. 1)—nearly doubled the effective engagement range of chemical-energy penetrators.