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(b)(3)-P.L. 86-36

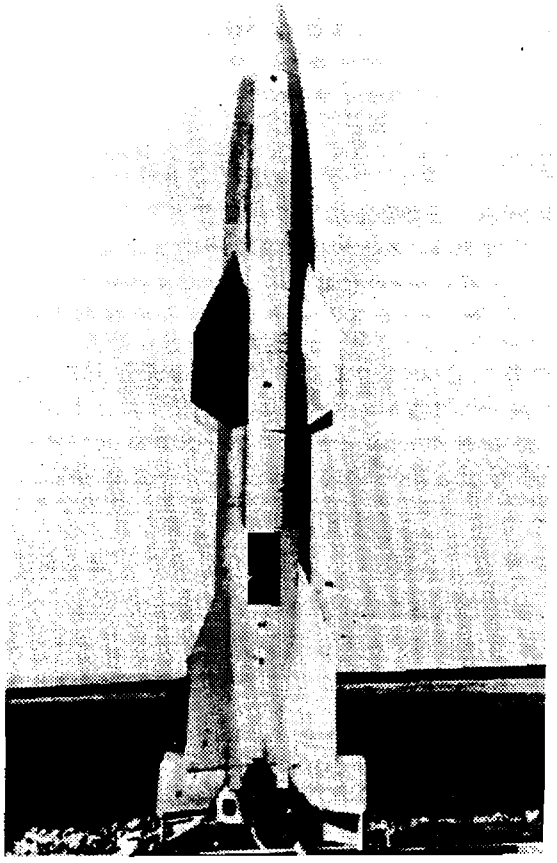
Early History of the Soviet Missile Program (1945–1953)

How it evolved, initial German influence

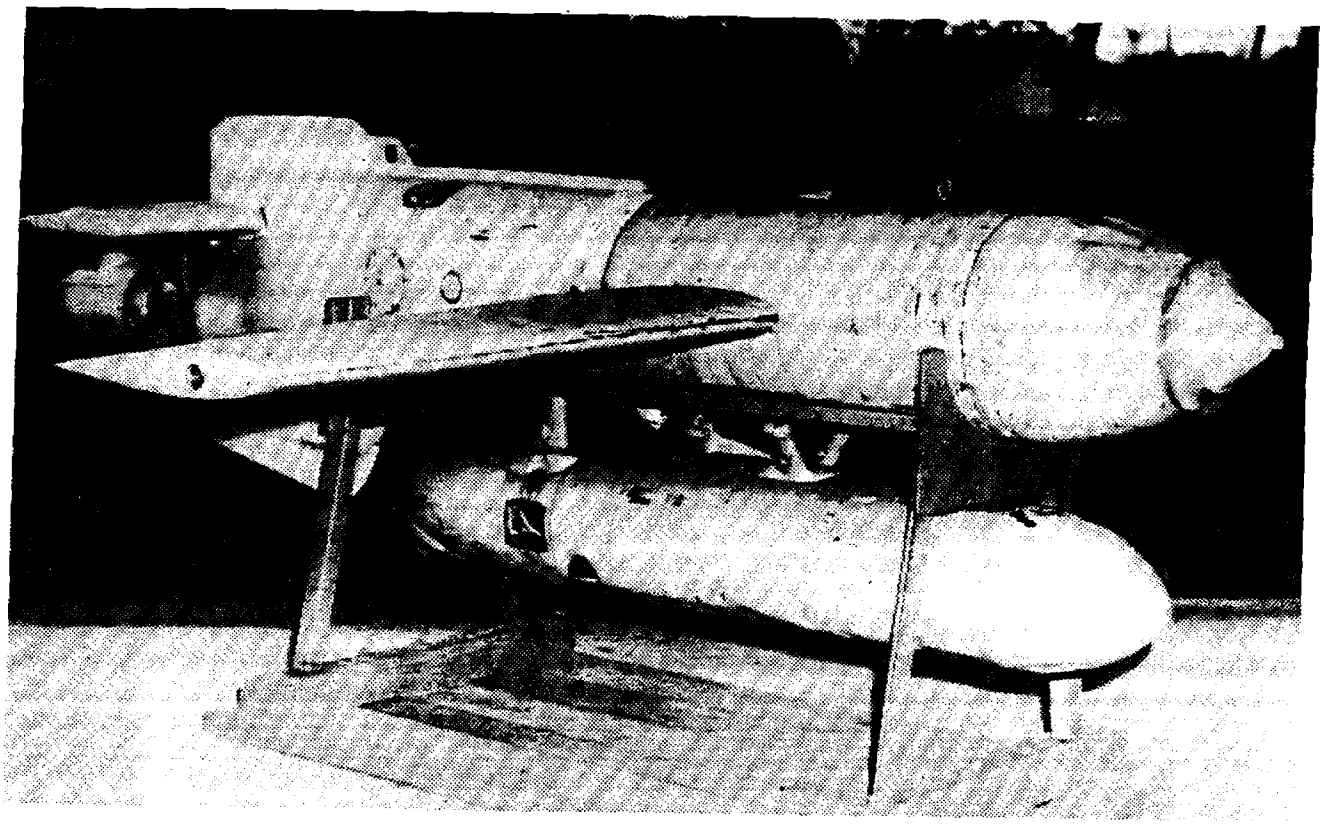
Near the end of World War II, the Red Army moved into eastern Germany and captured V–1 and V–2 missile sites, rockets, supporting systems and facilities, and many of the German scientists who had developed these and other special weapons systems. With the acquisition of these facilities, the weapons themselves, and the scientists and engineers who had developed them, the USSR quickly acquired the nucleus of its own missile program.

First used against London in June 1944, the V–1 was an effective weapon system. It inflicted severe damage and casualties on Great Britain, and particularly London, in the latter part of the war, at the same time significantly curtailing war-time production in the London area. It also posed a serious problem to the Allied invasion of Europe. The Allies found it necessary to place high priorities on countering this threat, diverting aircraft from support of their invading armies to attacks on V–1 sites and supporting facilities. The V–1— and the V–2—were also used effectively against cities and port facilities on the continent after liberation by Allied forces. Antwerp, in particular, suffered severe damage from massive attacks by these missiles, and the V–1 in particular.

(b)(3)-P.L. 86-36



The *Wasserfall*, a German surface-to-air missile, was captured by the Soviets at the end of World War II.



The German HS 293 air-to-surface missile was used effectively against Allied ships. Over 2,000 were produced by the Germans during the war, of which about 200 were used operationally.

Thousands of these V–1 "buzz bombs" were subsequently launched against Britain, and against targets in Europe as well, until Allied forces on the continent forced it back out of range. A cigar-shaped monoplane, the V–1 flew at subsonic speeds, and was designed for cheap and fast production, some even using wooden wings. It could be launched from either ground sites or aircraft. Being subsonic and subject to interception by anti-aircraft guns and aircraft (though its high speeds taxed capabilities of the interceptors to their limits), thousands were destroyed before reaching their targets. Many others malfunctioned and crashed. But several thousand got through.

The V–2[1] presented a far more serious problem than the V–1. Being a ballistic weapon, it could not be intercepted. Nor could its guidance system be jammed, as it was electronically guided only during ascent. Deployed against Great Britain three months after the V–1 was first used, it caused grave concern among Allied leaders. With a warhead weighing 2,000 pounds, a range of about 200 miles, speeds in excess of one mile a second, and invulnerability to interception or jamming, it was

[1] Named *Aggregate* 4 (A 4) in 1941, it was the fourth in a series of tests of this type of missile begun in Germany in the early 1930s. During the War, it became known as the V–2, the second in the series of Hitler's "reprisal" weapons.

truly a formidable weapon. It, and the V–1, were aptly named: the "V" stemming from the word *Vergeltungswaffe,* or "reprisal weapon."

When the Soviets captured German test facilities toward the end of the war, their main interest was understandably in the V–2. But they also gained knowledge of a number of other German weapons systems either under development or operational. In addition to the V–1 and V–2, the Soviets captured weapons for air-to-air, air-to-surface, and surface-to-air use.

Two of these, both air-to-surface missiles, had been developed by the Germans in the late 1930s and were used successfully against ships during the war. One, the FX–1400 (called the FRITZ–X), in 1943 sank the 35,000-ton Italian battleship *Roma.* It went down within a half-hour of two direct hits by FRITZ–X missiles. During the same year, in the Dodecanese Islands campaign in the Aegean Sea, the Germans sank seven Allied destroyers in two days using an air-to-surface missile called the HS 293. Both were captured by the Soviets at the end of the war.

Information about other German research-and-development projects was also obtained by the Soviets, along with some of the equipment. For example, during the war the Germans had developed a submarine-towed barge for launching V–2s. Although never operationally tested, its purpose was the towing of a V–2 in a barge to a predetermined stop for firing. Both the submarine and the barge were to travel to the launching site submerged, and once there, the barge would be floated to the surface and upended, by flooding, into a vertical firing position. Vulnerability of the submarine while towing the barge, possible rough seas disrupting fueling and launch, and design limitations of the V–2, made this concept a risky one at best. But it proved to be the forerunner of Soviet—as well as U.S.—submarine-missile systems of the future, and the U.S. and the USSR proved the feasibility of the concept when they launched V–1s from surfaced submarines soon after the war.

Thus, by the end of the war, the Germans had made impressive progress in the special weapons area, and in research and development of advance concepts. This fact was not lost on the Soviets—nor on the Allies—and the USSR quickly took advantage of the availability of these men and equipment, even before hostilities had ended. Everything available—men, missiles, supporting systems, associated electronics, factories, and everything else of value—quickly found their way into Soviet hands.

Soviet Exploitation of World War II Acquisitions

Initial Efforts in Germany

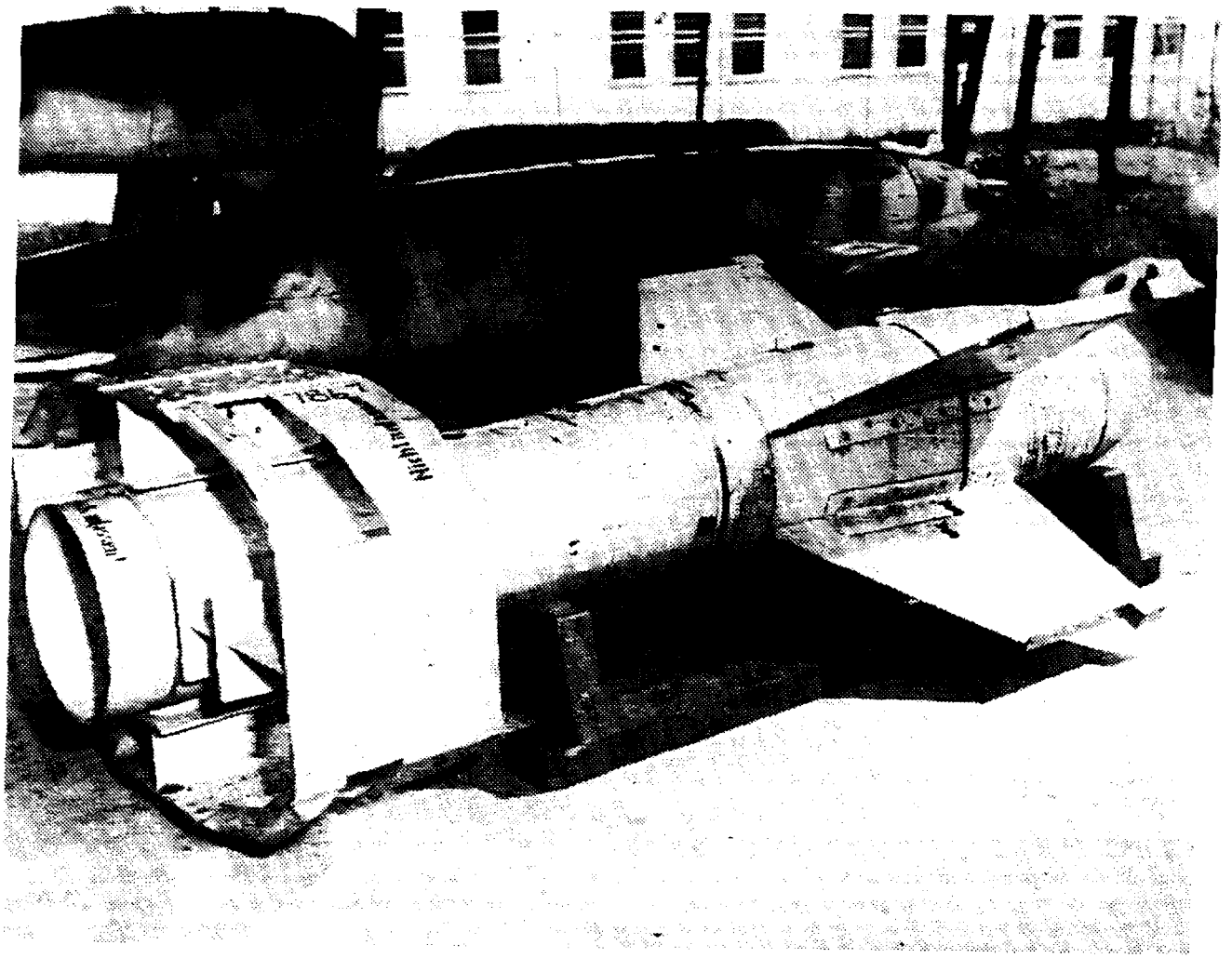
After the war, the Soviets at first tried to salvage the remainder of Hitler's missile organizations and facilities, and, more or less, to keep them intact on German soil. This approach was first noted in 1945, when they established Institute Rabe in Bleicherode, East Germany. Included in this organization were many of the scientists who had developed the V-weapons, and it was here that the Germans were given the primary task of documenting the V–2 program for the USSR. This effort produced detailed studies on such subjects as stability theory, ballistics and aerodynamics, acceptance specifications, manufacturing directions and procedures, operational deployment and use by military units, and evaluations and applications of test instruments for use in the manufacturing process.

In addition to documenting the V–2 program, the Soviets investigated and exploited other facets of the German war-time missile effort. Sites and factories were carefully studied, some of which were also utilized by the Soviets in a number of missile-related functions, corresponding closely to their missions during the war. One, for example, was involved with air-to-surface missiles, such as the previously mentioned HS 293. Another, a former German V–2 repair facility, was converted by the Soviets into a V–2 assembly area. Still another, containing test stands for V–2 power units, was used for the same purpose by the Soviets. And another was used to study and evaluate surface-to-air missile-guidance systems worked on there during the war.

Forced Exodus from Germany to the USSR

In October 1946, some of the German missile specialists departed for the USSR, most against their will. This group of Germans was told they would be living in the Soviet Union for periods up to five years, but some were to stay at least eight years. With their departure, missile installations and factories were disassembled and shipped to the Soviet Union. This was done despite the fact that the Soviets had carefully organized, repaired, and, in some cases, rebuilt these facilities after the war.

This first group, estimated to be about 50 in number, was sent to the Scientific Research Institute (NII) 88, located at Kaliningrad. They were subsequently organized into four groups. These groups, each with a



The FX-1400 (or FRITZ-X) was a German air-to-surface missile. It sank the Italian battleship *Roma* during the war.

Soviet chief, were named (1) the Guidance and Control Group, the Power Plant Group, (3) the Design and Drafting Group, and (4) the *Schmetterling* Group.[2] The man in charge of the Germans as a group was himself a German named Groettrup, whose specialty was high-frequency electronics. He had established a close working relationship with the chief Soviet engineer at NII 88.

For their first six months in the Soviet Union, the Germans continued documenting their war-time programs, a continuation of the studies begun at Bleicherode. Again, primary emphasis was placed on the V-2. But no significant modifications were apparently made to the missile during this period, nor previous to its first launch on Soviet soil in October 1947.

Final preparations for these initial tests had begun a month earlier at Kapustin Yar, the first missile-test range in the Soviet Union. Located about 100 kilometers east of Stalingrad (later renamed Volgograd), Kapustin Yar was used for these and subsequent tests of the V-2s. This initial series was completed by December 1947, during which period 12 missiles were fired to distances of approximately 225 kilometers. Some of these V-2s had been assembled at Bleicherode by the Germans from

[2] The *Schmetterling* was a German surface-to-air missile. Approximately 50 were reconstructed and subsequently tested in the USSR in the summer of 1948.

parts left over after the war; others used newly manufactured parts and were assembled by the Soviets.

The Soviet Union had apparently acquired about 25 V–2s from the Germans. Exactly how many they themselves manufactured later on cannot be precisely determined. But a German specialist named Muennich, who had seen production parts for a pilot series of V–2s at a research facility at Novaya (NII 885), estimated that as many as 100 of these missiles were scheduled for production there. Also, the Soviets apparently manufactured V–2 components until at least 1951.

By the early 1950s, the Soviets had exploited the Germans to the fullest possible extent, while at the same time satisfying themselves that they could continue the effort on their own; only then did the Germans begin departing the Soviet Union. By 1953, most had returned to Germany, except for a few who had been involved with missile-guidance systems, an area that was apparently giving the Soviets special problems. This group was detained until at least 1956. And long after the Germans departed the Soviet Union, reflections of their efforts were seen in the evolving Soviet missile program.

The Expanding Soviet Missile Program

By the time the Germans had left the Soviet Union, the USSR had developed a highly significant capability of its own, staffed by competent personnel. Although small in numbers when the Germans first arrived in the USSR, and possessing almost no practical experience, these Soviet scientists and engineers steadily acquired awareness of, and knowledge about, inherent problems and detail. Overlap with the Germans also afforded them the necessary on-the-job exposure, and, as the Germans themselves later noted, "this group advanced with astonishing rapidity" thereafter.[3]

Following the initial V–2 tests at Kapustin Yar in late 1947, the 50 or so Germans at NII 88 again moved. This time they went to Gorodomlya Island in Lake Seliger, near Ostashkov. Located about midway between Moscow and Leningrad, the Gorodomlya Island facility was known as Branch 1 of NII 88. The island's isolation afforded an excellent location for classified operations. The move to Gorodomlya Island ended direct German involvement at NII 88 in Kaliningrad; apparently the Soviets believed they could continue work there on their own.

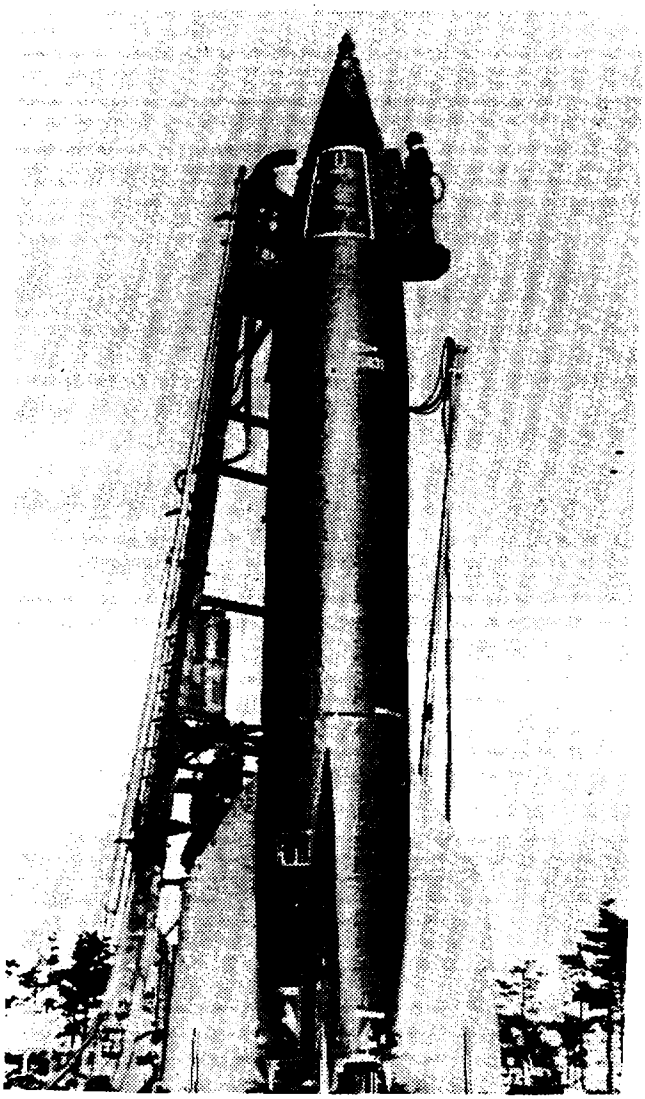
By 1948, it is estimated that between 350 and 400 German missile specialists were working in the Soviet Union, a significant increase over the 50 scientists who had first arrived in late 1946. About half of this German work force was located at Branch 1 of NII 88. It was here that the Germans became deeply involved in designing and developing a successor to the V–2—called the R–10—and in other programs that were to follow, the R–11 through R–15.

Following some initial organizational and design problems, the R–10 project was approved by the Soviets in 1948. They already had a head start on development of this missile, for the Germans had done some preliminary research and development on an improved version of the V–2 during the latter part of the war. But this work was interrupted by Soviet armies before it had progressed very far. Points to be stressed in designing and developing the R–10 missile were (1) improved accuracy, (2) a less complicated propulsion system, (3) increased range, and (4) cheaper production techniques.

The R–10 project was slow to evolve. Although its design stages occupied the Germans for most of two years, in 1949 it remained a "paper project." Even in 1951, when German involvement in this and other projects ended because of suddenly imposed security restrictions, it was still estimated to be years away from actual deployment. At that time, Dr. Magnus, a top German scientist, estimated that lengthy periods of testing would be required before the missile could be mass-produced and operationally deployed. Nevertheless, the R–10 project yielded a missile—at least in design—that was much improved over the V–2. It was capable of longer range, carried a heavier payload, was lighter, and incorporated a number of other technical refinements that enhanced its overall performance—particularly in the missile-guidance area. But so far as the Germans were aware, this missile did not progress beyond the "work project" phase.[4]

[3] The Germans, while in the USSR, were isolated to the maximum extent possible from parallel or evolving Soviet programs, and, indeed, from projects outside their areas of responsibility worked by other German groups. Thus, precisely when, and to what extent, the Soviets themselves developed certain weapons systems in these early years is not always possible to discern. Nor can lines be finely drawn separating Soviet and German involvement in particular projects during these early years, independent of or in conjunction with each other.

[4] Stages in these missile-design projects were clearly defined and labeled. They were designated as preliminary, sketch, and work projects. The preliminary work project required a brief report of 10 to 20 pages, outlining the overall project in very general terms and describing what it was expected to accomplish. The sketch, or intermediate, project, usually evolved into a study of several hundred pages and called for fairly specific descriptions and drawings of the overall missile configuration, showing, in considerable detail, component parts and their applications to the overall system. The work project stage called for detailed descriptions and drawings of the entire system. It was to be in sufficient detail to permit factories to build component parts and assemble the missile in its final form.



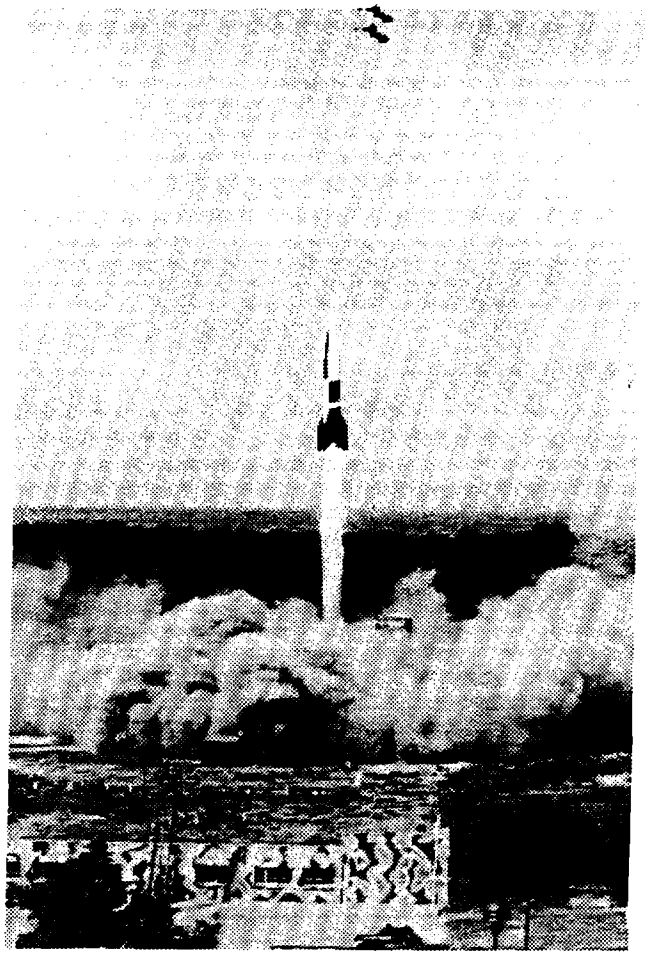
The V–2, developed and used by the Germans in World War II, was the first missile launched in the Soviet Union after the war. It was first fired by the Soviets in October 1947. Its launching inaugurated the opening by the USSR of its first missile test facility at Kapustin Yar.

Several other Soviet missile programs evolved during this period, but these programs, with one exception (the R–14), apparently did not progress beyond intermediate design stages.

Three of these—the R–11, R–12, and R–13—probably incorporated multi-stage design. The first, the R–11 (also called the KOROLEV rocket), was apparently initiated as a parallel Soviet project to the R–10. Another, the R–12, incorporated a variety of designs and innovations, producing a number of widely differing variations. The third, the R–13, was mainly the responsibility of the Germans. But this effort, and, so far as the Germans were aware, the other two as well, had advanced only to the intermediate stage by the time German involvement ended in 1951, when the Soviets implemented their security restrictions.

Although these projects apparently did not produce weapons systems, they nevertheless did provide a foundation upon which the Soviets could base future missile programs. Many troublesome technical problems had been extensively studied, and, to a significant degree, overcome, at least on paper. Also, these efforts afforded the Soviet scientists and technicians the initial experience they sorely needed in these early years of involvement in an unfamiliar field.

Before direct German involvement in specific projects ended in 1951, they had worked on two other Soviet missile systems—the R–14 and R–15. The first of these,



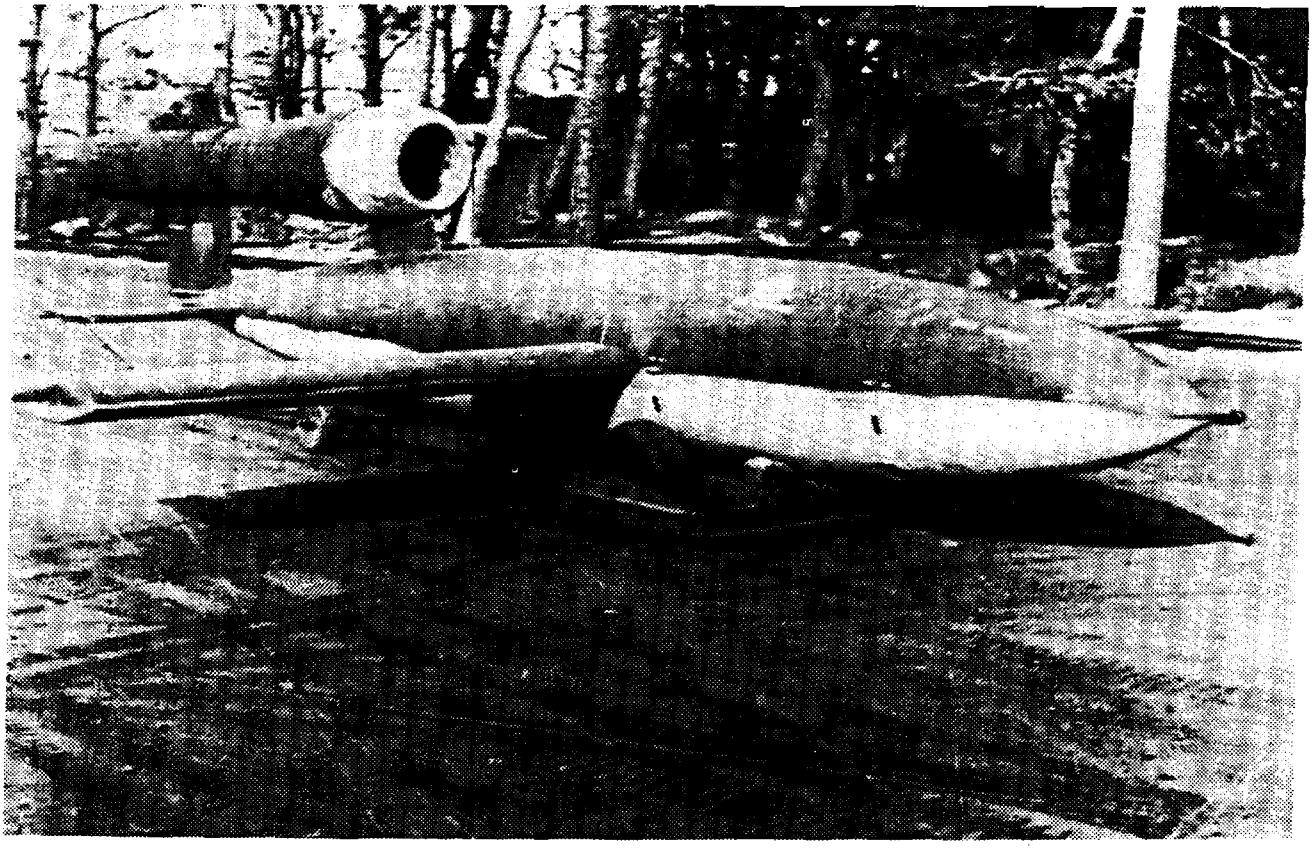
A V–2 rocket being launched at Peenemunde, the major German test facility during World War II.

the R-14, was described in one report as a "scaled-up version of the KOROLEV project/R-10 endeavors." It was designed as a single-stage rocket, 77 feet in length and 12.5 feet in diameter at its base. With a range of 1,600 nautical miles, it was initially designed to carry a payload of 6,600 pounds, but this was later cut by 30 percent, indicating—according to the Germans—a nuclear warhead. Another significant aspect of the R-14 project was the design of these missiles so that they could be launched from silos—the beginning of the USSR's missile-silo programs of the future.

But the R-14 project was marked by haste, and, so far as the Germans were aware, did not progress beyond the work project phase. Work began about late 1949, and concluded with completion of the work phase in the spring of 1950. Thus, as was the case with the R-10, research and development through the work project phase had been completed on paper, but actual production of the R-14 did not materialize, at least while the Germans were involved.

The last Soviet missile project in which the Germans were involved was the R-15. Despite much work on the part of the Germans in designing this missile (which was said to be a project initiated and vigorously supported by Stalin himself), it reached only the intermediate or sketch project stage of development. Labeled a "cruise" missile, it was designed to combine both the V-1 and V-2 missiles into one system, the V-2 carrying a V-1 to an altitude of 12-18 miles, where the V-1 would be launched toward the target. The range was planned to be over 3,700 statute miles, with a speed of 1,300 miles an hour and a warhead of three tons. The Germans doubted the practicality of the system from the beginning, and, as noted previously, it did not develop beyond the intermediate design stage.

With the completion of the Germans' involvement in these projects, their work in the Soviet missile program ended, after nearly a decade of effort. Of the weapons systems the Germans were involved with, not one, so far as the Germans were aware, was actually produced or deployed by the Soviets while they were in the USSR.



The V-1, or "buzz bomb," inflicted severe damage and casualties on Great Britain and other targets during the war. It was first used against London in June 1944, and thousands were launched in the last few months of the war.

But these missile projects, and especially the R–10 and R–14, laid the groundwork for future Soviet programs. The Germans provided the USSR a solid base upon which to expand, and, in so doing, enabled the Soviets to leap years ahead of what otherwise would have been the case. From this early German assistance, and with technology gleaned from Western sources in subsequent years, the Soviet Union progressed rapidly throughout the years in the missile area, culminating in their advanced systems of today.

(b)(3)-P.L. 86-36