

Made in the U.S.S.R.

Of course they copied it. The two airplanes could have been twins. But was the Soviets' Tu-4 truly an exact duplicate of the Boeing B-29?

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View, from slightly above, of several Boeing B-29 Superfortresses flying in formation, 1945. (NASM)

Looking skyward on a June day in 1945, Muscovites saw a huge four-engine aircraft enter a shallow bank for a landing at Izmailovo, a restricted sector in the northeast quadrant of Moscow where the Soviet navy's flight test facility was located. Startled onlookers watched the behemoth aircraft lower its landing gear for final approach. Red stars on the wings and fuselage signified that the intruder was friendly, though eagle-eyed observers might have noticed the English words "Ramp Tramp" on the nose section.

At the controls was one of the Soviet navy's top test pilots, Semyon Reidel, along with a skeleton crew of only two airmen: a copilot and an engineer. Once Reidel crossed the tree-lined outer perimeter of Izmailovo, he guided the aircraft to a smooth landing, completing an aerial trek that began in Vladivostok and crossed 11 time zones.

If Ramp Tramp appeared to Muscovites as a mysterious craft that summer day, the aircraft would not have been a stranger to Captain Howard R. Jarrell and his bomber crew. This was

the same B-29 Superfortress they had flown to Vladivostok for an emergency landing on July 29, 1944, where it became the first of three B-29s to be interned by the Soviets that year. Workers at Boeing's Wichita, Kansas plant could have identified it as B-29-5-BW (U.S. Army Air Forces serial no. 42-6256), part of an early production run of Superfortresses assigned to the 20th Air Force in Chengtu, China, for operations against Japan. But this B-29 would never return to U.S. soil.

Ramp Tramp was flown to Izmailovo because Soviet leader Joseph Stalin wanted a B-29 to serve as a template for a new heavy bomber to be produced in massive numbers in just two years: the Tu-4. Such a high-stakes scheme in technology transfer, if successful, would recast the Soviet air force into a strategic air arm and pave the way for military parity with the West in the uneasy peace that followed World War II. By copying the B-29, the Soviets would have an intercontinental bomber capable of striking New York City and the industrial heartland of the United States—and in a fraction of the time it would take them to develop their own design.

Ramp Tramp first entered Soviet territory while returning from a raid in Manchuria. Jarrell's crew experienced electrical system problems and were saddled with a radio that would receive but not transmit, so Jarrell headed toward Vladivostok, where he naively assumed that he and his crew would be allowed to fly home as soon as the bomber could be repaired and refueled. Like many U.S. airmen, he thought the Soviets, then allies in the war against Germany, would welcome him and his crew.

But Vladivostok proved to be hostile territory. Ever since Edward York landed his B-25 at Vladivostok after the Doolittle Raid on Tokyo in April 1942, all U.S. aircraft penetrating Soviet airspace in the Far East had been confiscated. After landing in Vladivostok, Jarrell never saw the airplane again. He and his crew members joined other interned airmen in a camp in central Asia, where they remained for months, prior to being repatriated through Iran.

The Soviet decision to retain the American B-29s reflected one of Stalin's wartime priorities: the maintenance of a tenuous peace with Japan. Moscow could ill afford a war on two fronts with Axis powers. When Jarrell's crew landed at Vladivostok in the summer of 1944, the Red Army was still engaged in a titanic struggle with Nazi Germany. Stalin feared that any overt cooperation with the United States in the Pacific War would be viewed by Tokyo as a military provocation, and the poorly defended Soviet garrison at Vladivostok was in easy reach of Japanese armies in Korea and Manchuria. Stalin would not enter the war against Japan until he could do it on his own terms, and not until August 1945, after the defeat of Germany.

During 1944 and 1945 deep differences and conflicting interests began to surface among the Allies, and these would shape the character of the war. Washington quietly acquiesced to the confiscation of the B-29s and kept the matter under wraps. There was no concerted diplomatic effort to gain their return, as maintaining cordial relations with Moscow was a high priority for the United States throughout World War II. The War Department even asked returning interned airmen to keep silent about their sojourn in the Soviet Union. Ramp Tramp

landed in Vladivostok at the very time in the war when friction between the Soviets and the Allies first emerged.

If relations with Moscow were difficult in 1944, they deteriorated further as the Allies advanced into Nazi Germany in 1945. Ramp Tramp's appearance at Vladivostok coincided with Operation Frantic, during which U.S. bombers landed in the Soviet Ukraine after raids deep in Nazi territory. This joint operation aroused Soviet suspicions about U.S. motives, and the Allied conferences at Yalta and Potsdam in 1945 only sharpened a growing estrangement between the United States and the Soviet Union. Consequently, the "transfer" of three B-29s to the Soviets at Vladivostok became a *fait accompli*. No one in Washington could have anticipated that these same aircraft would play a critical role in the transformation of Soviet air power within two years.

The first time the Soviets got any public word of the B-29 was on the occasion of a visit by famed American ace Eddie Rickenbacker in 1942. Rickenbacker, who spoke openly about the new bomber, only confirmed what Soviet intelligence already knew from its own collection of manuals, photographs, and purloined technical materials.

Stalin had made three overtures to the United States under the Lend-Lease Act, a U.S. program launched in 1941 to provide materiel to friendly nations, to get B-29s as part of a general initiative to obtain heavy bombers. Washington rejected all requests for the heavies, but was generous with medium bombers, fighters, and transports. The Soviets even attempted a ruse in 1943, adding the B-29 to a long list of aircraft it wanted, but amused Lend-Lease officials denied the request.

Soviet air power surpassed the Luftwaffe to become the most lethal tactical air arm of World War II, employing fighters and ground attack craft organized into vast air armies as part of the general offensive against Germany in 1944 and 1945. By spring 1945, the Soviet air force had amassed enormous striking power, with as many as 15,000 operational aircraft. But the Soviets were utterly lacking in strategic capability: Estimates said they could muster only 32 serviceable four-engine bombers—the outmoded and highly unreliable Pe-8. They therefore viewed the unexpected arrival of three B-29s on their soil as an extraordinary windfall, described as a *dar Bozhii*, or "gift from God," by bomber pilot Vasiliy Reshetnikov in his memoirs.

Soviet air planners, and Stalin himself, had been impressed with the Allied bombing of Germany, and the B-29 pointed to the importance of strategic aviation in any future war. Now the interned aircraft offered the Soviets their first opportunity to examine the most advanced U.S. bomber first hand. Stalin ordered Admiral Nikolai G. Kuznetsov, People's Commissar for Naval Affairs and Commander of the Soviet navy, to begin flight tests. (The Superfortresses had landed at *Tsentrāl'naya uglovaya*, a Pacific Fleet air base, hence the navy's jurisdiction.)

Kuznetsov appointed Lieutenant Colonel Semyon Borisovich Reidel to spearhead the test program. Throughout 1944 and 1945, Reidel, a pilot and engineer, had amassed an impressive number of hours ferrying Lend-Lease aircraft to the front, and he gained wide respect as the

deputy director of the naval flight test program during the war. His knowledge of English became useful when he and his team studied U.S. technical literature, including several manuals found aboard the interned B-29s.

Reidel had only a few weeks to study Ramp Tramp, its instruments, and its anticipated flying characteristics. Using an English dictionary, he and a group of technicians made a detailed inspection of the Superfortress, re-labeling each switch and system. On January 9, 1945, Reidel, with A.F. Chernov in the right seat, flew the airplane to a base near Romanovka. Two days later, V.P. Marunov, another understudy, made a short flight. For days the three test pilots, taking turns in the left seat, perfected their skills at the controls. Romanovka, with its long runway and flat, unobstructed terrain, was a forgiving environment in which to cope with an emergency, but the tests were completed without incident.

Kuznetsov, awestruck, sent Moscow an enthusiastic report. The lavish use of lightweight aluminum alloys, pressurized crew compartments, remote-controlled guns, powerful supercharged engines, Norden bombsight, radar, electronics, and instrumentation—all represented an advanced level of technology beyond Soviet industry's reach.

Such reports only strengthened Stalin's resolve to create a strategic air arm, and he called for the transfer of Ramp Tramp to Moscow. Accordingly, on June 22, 1945, the Soviets formally launched the B-4 program—a "bomber with four engines." The B-4 (soon to be renamed the Tu-4) was to be an exact copy of the B-29 Superfortress.

Stalin simultaneously cancelled the Samolet 64 ("Airplane 64") program, a new long-range-bomber project that had been launched in January 1945 with Andrei Tupolev as lead designer. Stalin had jailed Tupolev in the late 1930s on the improbable charge of aiding the Nazis in the design of the Messerschmitt Bf 110, but now Tupolev found himself elevated to a position of prominence as the head of a crash program. He accepted the assignment reluctantly, but he had no choice: Stalin had spoken.

Stalin launched the project with a purge, which always preceded a change and most often victimized the most loyal figures. So it would be in this case, as he removed A.I. Shakurin, wartime head of the aviation industry, and Air Commander Alexander Novikov, a war hero, accusing them of sabotage for the criminal failure to provide the technical means for a long-range bomber. Shakurin and Novikov were exiled and humiliated, but neither endured a public trial or faced the prospect of execution. Novikov's fate struck many within the Soviet air force as both ironic and cruel. A champion of both tactical and strategic aviation, he had emphasized the former because of the contingencies of the war. But Novikov had made some enemies. The once proud fleet of the bomber force shrank to only one unit: the 18th Air Army. This earned him the enmity of Air Marshal Alexander Golovanov, soon to be appointed by Stalin to head the expanding strategic air arm.

Stalin's personal interest in aviation could be traced to the early 1930s, when he first patronized the aviation industry with huge government subsidies. In 1940 he reorganized military aviation from top to bottom, calling for a new generation of fighters and ground attack

aircraft. Their development was already in motion on the eve of Operation Barbarossa, the 1941 Nazi invasion of Russia, and the head start allowed the Soviet air force to rebound from the disasters of that year, when most of its air arm was destroyed in place. In the final year of the war, Stalin again mobilized his beleaguered aircraft designers, plant managers, and air force with a new goal: strategic aviation.

Stalin himself was afraid to fly. In fact, he preferred not to travel at all, and when he did, it was aboard a carefully inspected limousine or special train. The Teheran conference in 1943 posed a problem for his train because Iran's track gauge was different. Two Lend-Lease C-47s were flown from Baku to Moscow for the impending flight, one piloted by Air Marshal Golovanov, the other by Lieutenant Colonel M. Grachev. After greeting the pilots, Stalin said, "So, who will fly me to Teheran? Perhaps it would be better for me to fly with Colonel Grachev. Air marshals do more work behind desks than in the cockpit." Stalin shook Grachev's hand after the flight, and a promotion quickly followed.

What we know about the building of the Tu-4 is based largely on the writings of the late Leonid Kerber, whom I first interviewed in 1991. Kerber specialized in radios and navigation instruments, and he worked at Tupolev's side throughout the 1930s. Kerber wrote a first-hand account of the Tu-4 project, a story he told in an unofficial biography of his boss, *Tupolevskaya sharaga* ("Tupolev's Prison Workshop," reprinted as *Stalin's Aviation Gulag*, Smithsonian Institution Press, 1996).

Kerber's work first appeared in the early 1970s as part of the dissident underground press, or samizdat. Kerber's account of Tupolev's career included a candid recollection of the B-4 program: Tupolev initially thought the effort to copy the B-29 would be foolhardy. He was more confident that his own *Samolet 64* had greater potential to surpass the B-29 in critical categories of range and payload, and his ego resisted the slavish copying of some foreign design. Tupolev wanted to incorporate the West's latest technology in an airplane that would represent the maturing technological expertise of the Soviet system. On this crucial matter he did not prevail, although the new B-4 bomber eventually bore the name Tupolev.

Stalin demanded that his new bomber be an exact copy of the B-29 because he wisely understood that even one concession would lead to a cascade of modifications, and any request to depart from this discipline would slow the process. Eager to maintain formal compliance with Stalin's order, Tupolev chose not to take the mandate literally despite the presence of the secret police and the possibility of denunciation, reasoning that Stalin's order pointed more toward ends than means. Throughout the first year of the Tu-4 program, Tupolev walked a tightrope between Stalin's requirements and practical concessions.

Tupolev chose not Ramp Tramp but the General H. H. Arnold Special (serial no. 42-6365) for disassembly. The work took place at the legendary Central Airfield at Moscow, in the only hangar large enough to hold it. A second B-29, the Ding How (no. 42-6358), was ordered grounded to serve as a reference. Only Ramp Tramp would continue to fly, and Tupolev sent it to the air force flight test center at Zhukovskiy.

Ramp Tramp was transferred to the Soviet air force on July 1, 1945, and, on orders from Air Marshal Alexander Golovanov, assigned to the elite 890th Air Regiment at Orsha. This special unit boasted the greatest number of pilots with flight experience in U.S. aircraft, and its fleet included 19 B-25s, 12 B-17s (F and G models), and one B-24.

Many of the airplanes had the customary U.S.-style nose art, and political commissars attached to the 890th often criticized this sign of decadence—images of scantily clad women were considered vulgar. Several of the airplanes' noses were painted over, though one Soviet pilot, I. Ikonnikov, who flew a B-17F in the 890th, remembered that a nose art image of a rabbit with a bomb had struck the commissars as uncontroversial and had been spared. At Orsha, the nickname "Ramp Tramp" puzzled many Soviet pilots and engineers, even those familiar with English. One rough translation offered was "Unshaven Vagabond," which still baffled Soviet airmen.

Later that summer, two prominent Soviet test pilots, Mark Gallai and N.A. Ischenko, flew a series of demonstration flights in Ramp Tramp. Gallai, along with another pilot, N.S. Rybko, enjoyed enormous prestige with the elite Soviet test pilot fraternity. Gallai came from a Jewish family, which might have been a problem for career advancement under the Soviet system, but his manifest skills as a pilot and engaging personality won him respect everywhere. His flight log included some of the most important aircraft of the period after World War II: He flew the initial flight of the MiG-9, the first Soviet jet fighter, and he participated in the acceptance program for the MiG-15 jet fighter. Gallai flew more than 200 types of aircraft, even taking the controls of the Luftwaffe's dangerous Me 163 interceptor.

Gallai flew these demonstration flights at the air force flight test facility at Zhukovsky, some 20 miles east of Moscow, where experts made a close inspection of the Wright R-3350 engines. Later they would refit Ramp Tramp with Shvetsov ASh-73TK engines, the Soviet clone of earlier Wright engine designs that had been acquired under license and for which parts were available.

Tupolev's first inspection of the General H.H. Arnold Special occurred on the night of July 10, 1945, marking the formal start of the B-4 project. During the inspection the hefty Tupolev got stuck in the duct between the forward and aft pressurized compartments of the bomber. He joked later that the Americans apparently did not feed their airmen properly.

Teams of engineers, technicians, and rigging specialists, swarming like worker bees, descended on the airplane. The process was slow and systematic. Each component was measured and photographed for replication. Instruments and controls were carefully removed and the placement of hydraulic lines and wiring marked. Every part and subassembly was numbered, labeled, and recorded. The components were then assigned to a design team for reproduction.

During this process, Kerber discovered a plaque next to the bombardier's seat that read: "At the request of the workers of the Boeing plant in Wichita, Kansas, this B-29 is named the General H.H. Arnold." The plaque commemorated an inspection tour Arnold made of the Wichita plant in 1942, and it prompted some debate among the technicians at the Central Aerodrome. They marveled at the apparent solidarity of the workers with a high-ranking American officer, which ran counter to Soviet propaganda on the nature of class struggle in the United States. Kerber eventually gave the plaque to the son of a colleague, Boris Saukke, and the Saukke family still has this sole surviving artifact from the three B-29s at Vladivostok.

Stalin maintained control over the Tu-4 program through Lavrentiy Beria. The fellow Georgians would often break into their native dialect, with devastating effect on intimidated officials. Beria fully embraced the regime's cruelty and headed Stalin's most critical programs, including the atomic bomb. Beria came to Moscow in 1938 to head the NKVD—the secret police. He presided over purges, expanded the gulag, and moved up once the war began to serve on the Central Committee of the Communist Party and as deputy prime minister. Stalin even made him a marshal of the Soviet Union. But Beria's most important post was inside the State Defense Committee, where he oversaw key programs associated with state security. He would cast a long shadow over the Tu-4 program.

Beria evoked fear in all quarters, even among high-ranking party and military figures, but he displayed no small amount of skill in coordinating secret programs. Toward his peers Beria could be rude and threatening, but he frequently displayed politeness to subordinates, especially Tupolev. For Beria, the bottom line was always accountability. Those who performed their tasks on time and to the standards he expected enjoyed relative safety. His efficiency and loyalty earned Stalin's trust, which endured until the dictator's death in 1953. Only then did Beria become vulnerable, and he was executed that December.

As administrator, Tupolev enjoyed Stalin's imprimatur, which afforded unique access to Soviet industry. Tupolev's return to favor also signalled the decline of his chief rival, Alexander Yakovlev, along with those tied to the expansion of Soviet tactical aviation during the war years. Still, Tupolev found himself at a dangerous crossroads. He understood that success would consolidate his position and could even open up vast opportunities in the postwar aeronautical community. But failure might cast him into yet another uncertain relationship with a ruthless Joseph Stalin and even lead to imprisonment.

In this context, Tupolev's skill as a manager would face its most severe challenge. While flight tests of Ramp Tramp proceeded, he recruited his administrative team for the Tu-4 project, naming Dmitry S. Markov as his chief deputy. A trusted associate of Tupolev, Markov possessed broad technical expertise and had earned a reputation for competence as a designer. Markov had served with Tupolev in the prison design bureau and knew U.S. aircraft technology first-hand, having worked with Soviet adaptations of a Vultee aircraft. Markov later became known in the West for another high-priority cold war project, the design of the supersonic Tu-22M3 "Backfire" bomber.

Where Tupolev could be brusque and often vulgar, Markov was more gentlemanly. He maintained a low-profile role in the Tu-4 project, yet he was a hands-on manager who could motivate everyone to meet cruel deadlines. When it came to manipulating the system to reward workers with consumer goods and housing, Markov could rival his boss in the arts of maneuver and influence peddling. He won the enduring loyalty of all those caught up in the Tu-4 program and emerged in the postwar years as a beloved and respected figure in the Soviet aviation establishment.

Tupolev faced enormous problems setting up his organizational structure. He would rally some 64 design bureaus and over 900 factories, research institutes, and technical entities, keeping everything in motion and assuring quality control. By agreement, Markov handled the day-to-day work of the project. Tupolev focused on mobilizing the war-weary aviation industry, the air force establishment, party officials, and key government ministries.

During the long war with Germany, the Soviet aviation industry had met Stalin's extraordinary demand for volume production. Now it was being asked to master complex systems and manage the copying of over 100,000 components, each of which had to meet weight requirements and arrive on time.

Tupolev devised a clever scheme to delegate responsibility. First, he sought out A. I. Mikoyan, then deputy chairman of the Council of Ministers, to assist with the problem of coordination. Tupolev did not want the parts suppliers to report to him directly. Having the power brokers at the government ministry level order the parts allowed him to have the best of both worlds: the full power of the state behind the ordering of parts, with police sanctions as backup, plus each parts supplier reporting directly to him and responding to his own quality control mandates.

To implement this plan, he asked Mikoyan to appoint a person from each ministry to be responsible for timely delivery. Each project manager would have to explain any missed deadlines or poor workmanship to Beria. Mikoyan quickly agreed, appointing high-ranking bureaucrats—often deputy ministers—to assume responsibility. (Later, Sergei Korolev used this same model for the Soviet space program.)

While Tupolev manipulated the politics, he never abandoned control of critical aspects of the program: He kept the calendar, and he was adept at trouble-shooting. Leonid Kerber remembered Tupolev's uncanny aptitude for anticipating trouble spots, and whenever problems arose, Tupolev would intervene directly. He also hired a talented coordinator in the person of I.M. Sklyanskiy. This choice proved to be inspired, if dangerous in the minds of Tupolev's nervous associates. Sklyanskiy was an engineer, full of energy, attentive to detail, and blessed with a keen memory. No other person was better suited to supervise the timetable, which filled one entire wall of a special exhibition located at Tupolev's design bureau on Radio Street in downtown Moscow. As dispatcher, Sklyanskiy filled out four cards for each

part placed on order: one for Tupolev, one for the aviation ministry, another one for the cooperating ministry, and a final one for the actual manufacturing entity in the field.

Still, Sklyanskiy's past aroused some anxiety. He had once been arrested and spent some time in a police-run workshop not unlike Tupolev's sharaga. This was not unusual, but it did place him in great jeopardy whenever there was a failure or breakdown in the system. Worse, Sklyanskiy's brother had once served as Leon Trotsky's deputy on the Military Revolutionary Committee during the Bolshevik revolution. For reasons still unclear, this link with Trotsky, the regime's premier enemy of the people, never got Sklyanskiy into trouble.

As the first parts and supplies for the Tu-4 began to arrive for inspection, Tupolev devised a special exhibit in Moscow to display progress graphically, noting deadlines met and milestones still to be achieved—along with the name of the responsible manager. Booths for each major component or sub-assembly consumed two floors of his design bureau. Telephone links to the responsible factories provided the latest updates. The exhibit provided a convenient vehicle to showcase the project to visiting officials and alert Tupolev to any potential breakdown. When Stalin learned of this remarkable exhibit, he planned a visit.

Any tour by the boss stirred high anxiety, and Stalin picked a Sunday, when the plant was closed. This was not unusual; he often made late-night phone calls to distant offices, forcing fearful bureaucrats to remain in their offices around the clock. On the afternoon of Stalin's visit, Tupolev and his staff gathered at the plant. Teams of police in civilian clothes arrived, searched the building, locked all the doors, substituted their own guards for the plant security force, and set up their own sentry posts. For these critical briefings, there were precise instructions. All briefings should be short and comprehensible. At no time should a briefer look away from Stalin's eyes, put his hands in his pockets or jacket, or ever position himself behind the leader.

The police instructed everyone to stand in place and not move without permission. Armed guards would escort anyone to the restroom. Outside, the streets had been cleared except for policemen dressed in civilian clothes, who strolled around to create the atmosphere of a normal Sunday afternoon. Hours passed, but after all these preparations, Tupolev announced to his exhausted staff at 2 a.m. Monday morning that Stalin had cancelled the tour. Everyone returned home in the black ZiS cars of the police.

The documentation required for the new bomber had been enormous. Retro-engineering dictated the analysis and photographing of some 105,000 parts. Tupolev's team generated 40,000 detailed drawings, completed by a force of a thousand draftsmen. Exacting quality standards and the threat of police sanctions made the whole enterprise an exhausting experience. During the most critical phases of the program, workers were sometimes allowed only one day off each month. Any deviation raised the fear that someone, for personal benefit or revenge, might complain to the police.

One immense challenge was the difference between English measurements used by U.S. manufacturers and the metric system, which the Soviets used. Early on, Tupolev decided not to convert the U.S. units to the metric system, which would have been time consuming. The manufacture of aluminum panels exemplified the problem. The standard thickness of the aluminum skin on the B-29 was 1/16 of an inch (1.5875 millimeters). It was impossible for Soviet plants to fabricate metal sheets to that dimension. Tupolev opted to vary the thickness of the Tu-4's skin between .8 and 1.8 millimeters, which actually had the effect of strengthening the aircraft's structure in some areas. Despite such changes, the weight of the Tu-4 would turn out to be only one percent greater than the B-29. No less critical were other compromises made on electrical wiring as well as hydraulic pressure and fuel consumption.

While Tupolev remained attentive to certain external cosmetic flourishes to suggest strict compliance with Stalin's order for an exact copy (a repair patch in the fuselage was included and the interior paint scheme duplicated exactly), he often went his own way on the more critical, less obvious components. Stalin's acquiescence on the matter of using the metric system had been a major concession. Other concessions followed in engines, radar, and armament. Leonid Kerber aptly described the Tu-4 as an "analog" or, in this context, a facsimile of the B-29. If the airplane can be thought of as having a genetic code, the dominant genes were Boeing's, and the recessive genes were Tupolev's.

Among all the concessions, the choice of engines for the new Tu-4 became critical. Arkadiy Shvetsov, a Soviet engine designer, learned from Tupolev that he would not have to replicate the B-29's powerful 2,200-horsepower Wright R-3350 engine. Instead, Tupolev approved Shvetsov's request to fit the Tu-4 with a variant of the M-71 design (a Wright engine clone). The resulting ASh-73TK engine would boast 2,300 horsepower, but the Shvetsov design proved inadequate, at least in the initial production run, to match the performance of the Wright R-3350. There were constant problems with overheating and frequent propeller failures. The ASh-73TK design, however, was a sound one, and subsequent refinements eliminated problems.

Some duplication efforts led to surprising successes. One of the more complex units on a B-29 was the Central Station Fire Control System, the computerized remote firing system. Gunsights and controls were located with the gunners in Plexiglas blisters and were linked electronically to remote turrets housing the guns. The system incorporated complex circuitry and switches that enabled any B-29 gunner to control any of the gun turrets that he could aim properly. I.I. Toropov devoted his considerable talent and energy to this system. He succeeded, to the amazement of Tupolev and the consternation of observers in the West, who believed this advanced system was beyond the capacity of the Soviets.

No less important was the decision to substitute the Soviet NS-23 cannon for the original .50-caliber machine guns, another concession approved by Stalin. Tupolev also contended with a bomb bay that was larger than any produced in the Soviet Union. And there were enormous problems with the system that actuated the undercarriage, along with the inability of the

Soviet aviation industry to produce the oversize tires for the landing gear. When faced with the task of copying the B-29's large tires and complex gear, the Soviets used a unique approach: Agents were sent to the West to purchase them on the war surplus market.

Many myths have arisen in the West about how the Soviets built the Tu-4. Over the decades stories have circulated that the B-29 was copied in exacting and often ludicrous ways. These tales suggest that Tupolev and his team mindlessly replicated every aspect of the Boeing design. As noted, Tupolev did approve the precise copying of such details as a fuselage patch and the exact hue of the interior paint scheme found on Ramp Tramp. Some rumors circulated that even flak damage on the wings had been carefully copied, but such stories exaggerate what actually happened.

When I interviewed Leonid Kerber in 1991, he told me that these stories were partially true, although he felt Westerners did not understand the historical context or Tupolev's motives. All these minor details in copying, according to Kerber, were a way to prevent Beria's police from accusing the Tupolev team of ignoring Stalin's precise instructions. No one wanted to risk arrest.

Aside from the threat of imprisonment, Tupolev had to contend with the legendary bureaucratic inertia associated with the aviation industry. For decades, Soviet designers had come up with excellent aircraft designs, even prototypes, only to see serial production fall short of the design standards. Soviet aviation plants had trouble sustaining quality control in the mass production of aircraft. The more complex the aircraft, the more disappointing the result. It was easier in the war years to build huge numbers of military aircraft of simple design, such as 33,000 Ilyushin Il-2 Shturmovik ground attack aircraft known for their sturdiness and austere instrumentation. Such aircraft could be built using a largely unskilled labor force. The Tu-4 demanded a level of sophistication at odds with decades of industrial practice, and to a degree no Westerner might have expected, the Soviets succeeded. The first batch of Tu-4s rolled off the assembly line on schedule in 1947, less than two years after the project was launched—an incredible feat. As production expanded, additional plants were mobilized.

Tupolev selected three prominent test pilots to fly the first operational Tu-4s off the assembly line—Nikolai S. Rybko, Mark Gallai, and A.G. Vasil'chenko—and Rybko received the nod to make the maiden flight, scheduled for May 1947. Police security was tight, but once word of the flight leaked, workers streamed to the edge of the airstrip near the plant. The workers had made enormous sacrifices, and no one wanted to miss the first flight. Thousands crowded the roads and the outer boundary of the plant's airfield to get a glimpse. When Rybko lifted the new Tu-4 into the air, the workers cheered.

Kerber tells of being the passenger on a later flight in which Mark Gallai flew a new Tu-4 from Kazan to Moscow. During the flight, hot air filled the pressurized compartments, and no one could get the air conditioning to work. Kerber remembered the embarrassment of

cancelling the welcoming reception because the sweat-soaked passengers looked as “if they had just walked in from the Sochi beaches.”

The Tu-4 made its public debut on Aviation Day in August 1947, at Moscow's Tushino airfield. Foreign observers, including the Western powers—particularly their military attaches—were all invited. Three Tu-4s, followed by a Tu-70 passenger version, flew by at 600 feet. At the controls of one of the Tu-4s was Air Marshal Golovanov. When the Western observers counted three bombers, they assumed the Soviets were flying the long-lost interned B-29s. But the appearance of the Tu-70 clearly indicated that the Soviets were flying freshly cloned B-29s. This carefully staged event became a headline story in Western newspapers, though few realized how narrow the margin had been to get these four airplanes airborne. The Tu-70 had been fitted with cannibalized parts from the disassembled General H. H. Arnold Special to make it airworthy.

Operational deployment of the Tu-4 brought a series of breakdowns and near disasters as the airplane encountered teething problems such as engine overheating, a glitch that mirrored the U.S. experience with the first generation of B-29s. Soviet engineers fretted over numerous other problems such as runaway props, deicing system failures, and chronic failures of the landing gear.

Rafael I. Kapreylan, one of the first to fly the new bomber, could not get his landing gear to extend fully on one flight but managed to make a successful landing on his starboard main gear, saving himself, his crew, and the aircraft. Vasil'chenko, the test pilot, faced an engine fire. Fearing the worst, he ordered his crew to parachute to safety; after nine of the 11-man crew bailed out, the fire died and he was able to land the bomber safely. In time, these problems would be corrected, but in the early days of the program the Tu-4 inspired little confidence.

The Tu-4 became truly operational in 1948 and 1949, as production reached full capacity. By 1950 Soviet Long Range Aviation had deployed nine Tu-4 regiments, each with 32 bombers. NATO assigned the Tu-4 the code name “Bull.” In the early 1950s the Soviet Union sent a batch of Tu-4As to the People's Republic of China. This move gave the Chinese a credible bomber force for the first time. A contingent of about 32 Tu-4s was deployed in the Soviet Far East to serve in the reconnaissance role, and during the Korean War the number of Tu-4 bombers increased dramatically; recently uncovered archives number the fleet at 845 aircraft.

The Soviets detonated their first nuclear device from a tower on August 29, 1949. As soon as they perfected the bomb, Stalin approved high-priority experiments to adapt the Tu-4 as its airborne delivery system. On October 18, 1951, a Tu-4 bomber dropped an atomic bomb near Semipalatinsk. It would not be until November 1955 that a Soviet bomber, in this case a Tu-16, dropped the first Soviet H-Bomb. For NATO observers, these events confirmed the Soviet Union's enhanced capabilities in strategic aviation.

The West reacted with increasing alarm. The Tu-4 never possessed the range to pose a real threat to the United States—only a one-way mission could threaten Chicago or New York City—but the very existence of the Tu-4 and its jet-powered successors prompted the United States to set up an array of defensive systems, including the Nike surface-to-air missiles and the Skysweep radar-guided anti-aircraft guns of the 1950s.

The Soviets also experimented with the Tu-4 as a tanker for aerial refueling, and several systems were tried before the perfection of a probe-and-drogue system in October 1952. Eventually this system was used for refueling MiG-15 jet fighters in an effort to expand the striking range of the Soviet air force. With the advent of the Jet Age, the Soviets realized that the Tu-4 was obsolete, a perception reinforced by the losses in combat of American B-29s in the Korean War.

Only once in the cold war years of the 1950s did the Soviets threaten to deploy the Tu-4 in combat, although the details are unclear. In the first hours of the Hungarian Revolution of 1956, at a time when party secretary Nikita Khrushchev and the Soviet military were debating the options to counter a revolt in Hungary, several Tu-4 bombers were ordered to drop conventional bombs on Budapest. Saner minds prevailed, and the flight was called back while en route to the Hungarian capital, leaving Soviet ground forces and tanks to resolve the problem. This aborted flight remains one of the more controversial episodes associated with the history of the Tu-4.

Ramp Tramp flew for nearly a decade, and soon acquired a legendary status among bomber crews as the progenitor of the Soviet strategic air arm in the early years of the cold war. Many Soviet bomber pilots in the early stages of the Tu-4 program took enormous pride in the fact that their flight log included hours on the Superfortress from Wichita.

There had even been one brief period when Ramp Tramp was employed as an airborne carrier for a Soviet X-plane, the rocket-powered *Samolet 346*. In May 1947, former German test pilot Wolfgang Ziese took off in the bomber with the 346 attached to its starboard wing. At high altitude, he released the 346, which achieved an estimated speed of Mach 0.93—at that time the most serious effort by the Soviets to break the sound barrier.

But despite a refitting with Shvetsov engines and numerous upgrades, Ramp Tramp was becoming increasingly difficult to maintain. By 1954, the Tu-4 fleet was gradually being dismantled, and the U.S. bomber was scrapped along with it. Today, at the Monino air museum outside Moscow, a lone Tu-4 bomber stands outside on display, the sole reminder of a turbulent time.

Stalin's decision to copy the B-29 allowed the Soviet Union to acquire an interim long-range bomber, if not a true intercontinental strategic weapon. The Tu-4 enabled the Soviets to project power credibly on the front side of the Cold War, at a time when the worsening relations with the United States and the advent of nuclear weapons posed what they perceived as serious threats to their national survival.

There was a second aspect to these events, one less visible to many in the West. The Tu-4 project became the pathway for the rapid modernization of the Soviet aviation industry and gave expression to Stalin's larger purpose: providing for Soviet national security, even military parity with the West. In the Tu-4 program, Stalin demonstrated a certain truth about the Bolsheviks: Personal ruthlessness did not necessarily preclude shrewdness or a disciplined flair for survival. While his instincts were not always perfect, Stalin nevertheless possessed a remarkable strategic sense—including an eye for the right airplanes—that shaped all his policies.

Stalin reorganized Soviet aviation for the post-war environment, compelling it to adopt a range of new technologies, materials, and techniques of manufacture. Technological inferiority persisted, but the baseline for a more sophisticated aviation sector had been established.

The success of the Tu-4 program cannot be separated from Tupolev's persona—a rare blend of design and administrative talents. His leadership demonstrated that the relatively primitive aviation industry could be recast to build modern aircraft on a par with those of the West. His success with the Tu-4 program, as many Russian historians acknowledge today, provided a model and an inspiration for Sergei Korolev in the missile and rocket program that was to follow. In its own way, Ramp Tramp had offered the Soviet Union a trajectory to the future.