# The JB-2 and the Dawn of the Sled Track

*By: Mr. Yancy D. Mailes*

Paths to the Present

FLASHBACK

*In the program of research and development ATSC engineers do not leave a stone unturned. We may never need the robot bomb, for the AAF does not go in for indiscriminate bombing attacks. But if we do need it, we've got a good one.*

*Gen Bennet E. Myers, 22 November 1944*
*Deputy Director, ATSC*

The origins of today's modern-day sled track owes its existence to the early guided missile programs of World War II, chiefly the JB-2. With that said, at the time, the military did not view the sled track as a test facility, but rather as a means to quickly accelerate a weapon to a minimum velocity so it could achieve flight and strike the enemy. That would change after the war.

Since the dawn of flight, many countries toyed with the idea of a guided weapon. During World War I, America led the way with its Kettering Bug, and during the Interwar Period, General Hap Arnold again looked to Kettering to design and field an aerial torpedo, what became known as the GMA-1. Arnold wanted that torpedo to travel 100 miles, carry a 2,000-pound payload, at an altitude of 20,000 feet, with men controlling the weapons via a radio from either an airplane or a ground station. In addition to the aerial torpedo, General Arnold also directed the creation of several other guided munitions including the AZON, RAZON, the GB-1, and the War Weary remotely controlled B-17s and B-24s. The GMA-1 got underway just as Germany invaded Poland while the other programs became a response to the conflict. In most cases these advanced weapons did little to turn the tide of war, but they did serve as a beginning for evolutionary innovation.1

Parallel to the American efforts, and during the Interwar period, the Germans began developing their own wonder weapons. By 1943 they introduced their first visually guided gravity bomb along with a liquid-fueled glide bomb. For years, German scientists and engineers investigated supersonic flow using several indigenously designed and built wind tunnels, so they understood propulsion and stability very well, but they struggled with advanced missile guidance. With a lack of precision for their weapons, the Germans settled on using these poorly guided munitions as terror weapons, or as some labeled them, vengeance weapons.2


*A JB-2 on a 400-foot portable launch ramp . (USAF)*

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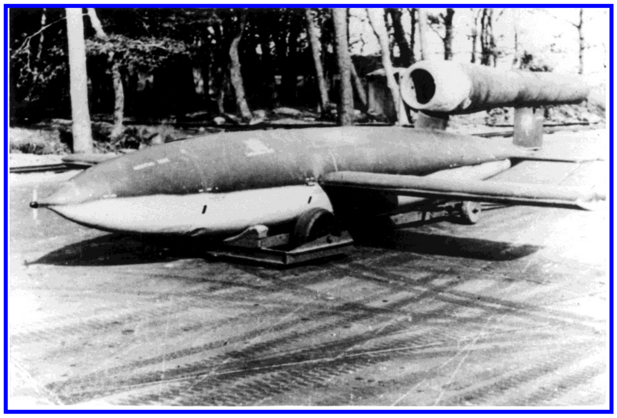


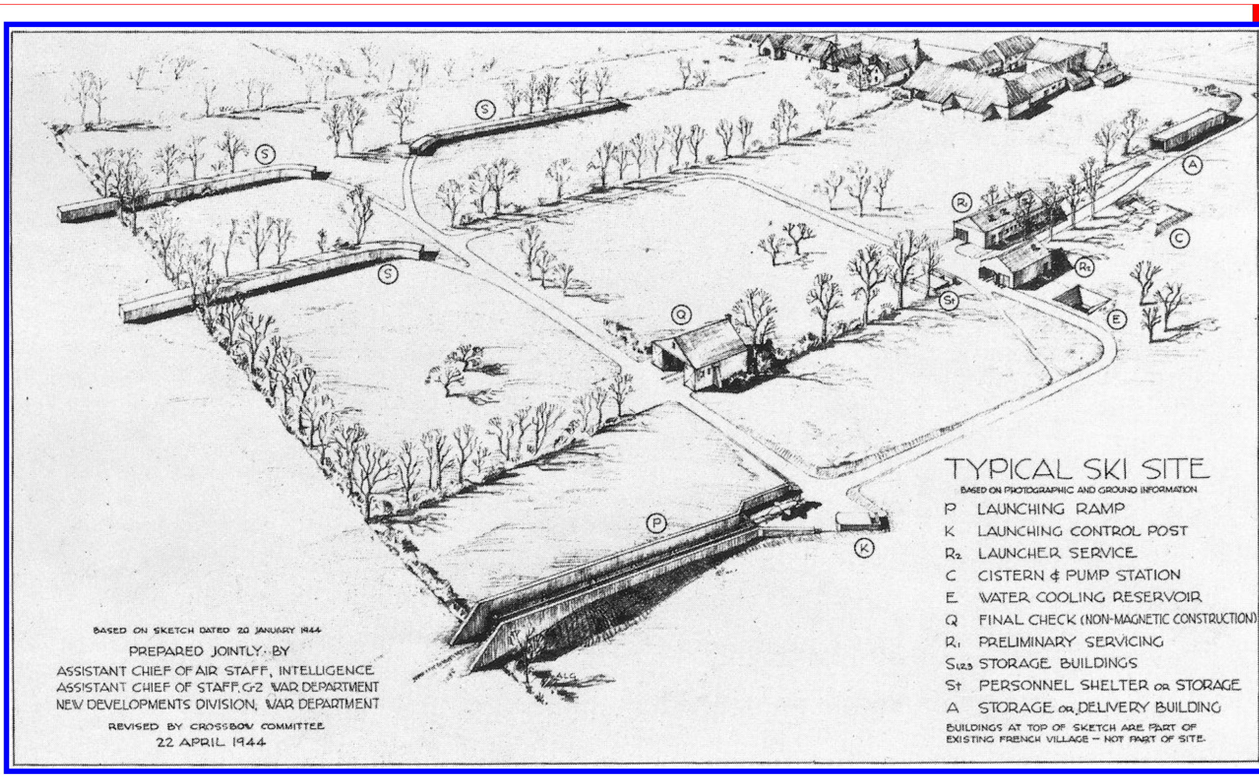
*The German Fiesler Fi 103 . (AFMC archives)*

In April 1942, Germany undertook a program to develop what could arguably be the most famous munition of World War II, the Fiesler Fi 103 or as most of the world knew it, the V-1 Flying Bomb. Prior efforts to develop a pulse jet motor had taken years, and with that problem solved, a group of companies submitted a proposal to RLM for an unmanned, medium range flying bomb. The V-1 resembled a small airplane with the stove pipe (the pulse jet) mounted over its tail. The missile had no cockpit, a length just over 25 feet, a wingspan of 17 ½ feet, and carried a one-ton warhead. Its engine ran on standard 80 octane gasoline, the same gas used in trucks and Lorries. Overall, Germany could build the V-1 quickly, at little cost, but it had one major flaw, accuracy. Even so, it would become the perfect weapon to attack London. 3

Flight testing, as well as the construction of the two acceleration ramps, got underway at Peenemunde-West in October 1942. Initial drops from a Focke-Wulf Fw 200 Condor proved the V-1's glide characteristics while acceleration ramp tests demonstrated a ground launch capability. Of importance, the Germans favored the ground launch capability as it improved the V-1's accuracy. The initial ramp operated on a solid-propellant rocket with a short combustion time. While this system properly launched the test vehicle, it produced a deafening explosion, and discussions after the fact, led engineers to seek an alternative. They later opted for a cylinder accelerator. The new accelerator ramp, metal and inclined, measured 150 feet long and 16 feet high. It had a long hollow tube with a dorsal opening slit along its length. To launch the V-1, workers slid a cylindrical piston with an attached hook into the tube. The hook connected to the V-1. They then packed a combination of hydrogen peroxide and potassium permanganate into the tube and behind the piston. When that combination began to decompose it created expanding gases which created steam and propelled the piston, and in turn, the Flying Bomb.4

In mid-1943, British intelligence stumbled upon the operations at Peenemunde and later attacked the site. Then, in October 1943, while on an aerial reconnaissance flight over France, aircrews identified a series of concrete structures the Allies would later call ski sites. After additional missions and detailed study of the photographs, intelligence personnel surmised that Germany had built a matrix of fixed launching sites for what many believed housed rockets targeting the U.K. Though the Allies launched Operation Crossbow and conducted a series of bombing raids that targeted the ski sites, General Arnold felt the British were not taking the threat seriously. Thus, he contacted Brig Gen Grandison Gardner, the Commander at Eglin Field, and asked that Air Proving Ground personnel reproduce the ski sites on the Eglin range and simulate attacks with a variety of weapons. Within weeks Gardner's personnel built the sites and conducted the tests.

*A German V-1 accelerating ramp. (AFMC archives)*




*Typical layout of a German ski site. Personnel working at Eglin would reproduce one of these on the Eglin Ranges. (AFMC archives).*

Results revealed that in order to render the ski sites inoperable, aircrews operating low-flying fighter aircraft needed to attack the sites with 1,000 or 2,000 pound delayed action bombs. While American commanders strongly supported using a minimum-altitude technique, the British remained skeptical and continued to attack with bombers at high altitude carrying lighter weight weapons. As expected, many of the enemy ski sites survived as did the capability to attack London with the vengeance weapons.5

Consequently, on the night of 12 June 1944, Germany attacked London launching multiple V-1s from its ski sites. Between this time and 3 September, the Germans launched 8,205 V-1s with 5,471 crossing the English Coast. Of those that crossed, 2,354 landed causing 5,476 deaths, and destroying about 23,000 houses. The Army Air Forces Scientific Advisory Group later reported, "In spite of much controversy about the effectiveness of this type of missile as compared to conventional bombers to which the large number of man-hours might have been devoted, the results obtained in the attack on London definitely herald a new type of aerial attack."6

Days into the assaults, Allied commanders sought innovative ideas to destroy the ski sites. To this end, General Arnold again looked to General Gardner and Proving Ground personnel who had been experimenting with converting War Weary bombers (B-17s and B-24s) into remotely controlled missiles. However, with Project Aphrodite in the experimental phase, Gardener could not spin the project up quickly enough to be of much use.7 However, in the wake of the Buzz Bomb attacks, leaders began discussing options for acquiring an American version of the V-1.

The immediate solution came from Jack Northrop who had a close relationship with General Arnold, and since 1941, had fielded several innovative flying wing variants. His latest effort centered on small rocket-propelled interceptor that Wright Field engineers designated as MX-324. Because Northrop had advanced these concepts and could quickly build and test a prototype, on 1 July 1944, Wright Patterson let a contract for Northrop to transform that small flying wing into 13 jet-propelled bombs. The contract also included a requirement for two ground launching sets.8

*Northrop's piloted version of the JB-1. (AFMC archives)*

Designated as MX-543,* the JB-1 flying wing benefitted from the years of evolutionary innovation from the N1-M, N9-M, and most recently, the MX-324/334 Rocket Wing. As a result, and to speed production, Northrop engineer's photo reduced in MX-324/334 tooling templates and directly applied that knowledge to the JB-1. The JB-1 had a wingspan of 28 feet 4 inches, a length of 10 feet 6 ½ inches, and as planned, would have a 200 mile range, a 6,000 foot service ceiling, and carry a pair of 2,000 pound bombs. As hoped, the two experimental General Electric B1 turbo jet engines would propel the missile to 400 mph allowing it to outrun most front-line fighters; however, all of this hinged on Northrop's ability to get the weapon off the ground.9

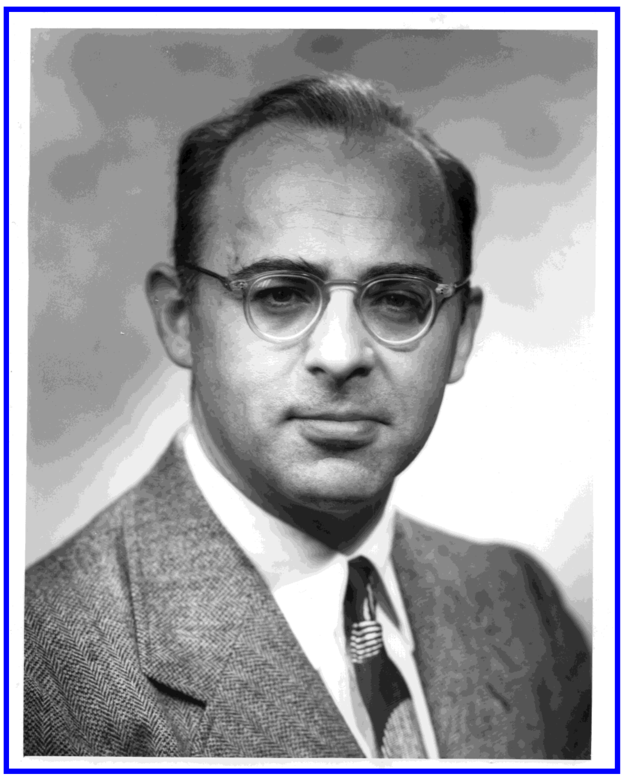

*A Northrop JB-1A sled model. Courtesy of Tony Chong.*

The principle problem facing Northrop engineers centered on launching the weapon. They looked to the German ski sites for the solution. As requested, Northrop would design and build a rocket sled and mount the JB-1 on top. The sled would ride along a 2,000 foot track built on a U.S. standard gauge rail bed. The sled, propelled by three Mark I rockets, needed to produce enough speed so that within 1,000 feet the weapon would take flight, then the sled needed an additional 1,000 feet to slow so the Army Air Force could use it again.10 After building a small model, construction of the launching carts and the Muroc 2,000 foot track got underway with track tests beginning in mid-September 1944. Though Northrop never used the Muroc sled to launch a JB-1, employees conducted a series of tests that helped refine the slippers and the launching cars.11

* Internally, Northrop used the designator Project 16.

Just days after Air Materiel Command (AMC) requested the JB-1, General Gardner wrote to General Arnold making him aware that he planned to send several personnel to England to retrieve parts of the crashed V-1s. That same day, 3 July 1944, General Franklin Carroll, Chief of the Experimental Engineering Section, called Major Ezra Kotcher* to his office and gave him a new assignment. He would receive the V-1 parts and then build a plan to manage project MX-544, the JB-2. On the 4th of July, Major General Bennett E. Meyers, the AMC Deputy Director assembled a group of able experts (both military and industry) and told them he wanted an exact duplicate of the V-1, and he wanted it fast! As planned, AMC would contract American manufactures to work with Wright Field engineers who would reverse engineer and build an American version of the German V-1.[12]


*What Ezra Kotcher called "junk." Pieces of a German V-1. (AFMC archives)*



*General Carroll assigned Ezra Kotcher to the JB-2 program. He would join the X-1 program in later years. (AFMC archives)*

Progress built quickly, and on 9 July, a cargo plane accompanied by Major Tom Wigglesworth of the AMC Intelligence Division delivered sections of unexploded, but badly battered German *Buzz Bombs*. Major Kotcher and his team secreted the parts to a building on Wright Field and began reverse engineering the missile. Just three weeks after the parts arrived, engineers had a duplicate pulse engine running. That same day, General Arnold directed AMC leadership to acquire 1,000 JB-2s, 500 spare pulse engines, and a suitable number of launchers. The following day, 2 August 1944, AMC awarded the contacts. The Ford Company would produce the engines, Republic Aviation Corporation would build the airframes and assemblies (though they later subcontracted the majority of that work to Willys-Overland in Toledo, Ohio) while Jack and Heins would build the control equipment, with the Monsanto Chemical Corporation supplying the catapulting rockets for the sled. The launching rockets became a critical factor as the JB-1 or JB-2 could not take off with only the power supplied by its internal engine. As mentioned earlier, Northrop would build the launching cars and the 2,000 foot track at Muroc.[13]

A couple of weeks later, those involved with the JB-1 and JB-2 met at Northrop headquarters to discuss the Muroc sled track and the possibility of constructing portable launchers. By this point, intelli-

* Kotcher would later become key to the X-1 program.

Early JB-1 design. (AFMC archives)

gence reports identified the vulnerability of the German fixed launch sites and the German's use of a piston within a tube accelerated by a mixture of hydrogen peroxide and potassium permanganate. Because of vulnerability of the fixed sites, the Army Air Force decided to build a shorter, portable unit for combat. Thus, the group decided that in addition to the Muroc 2,000 foot ramp, the Army Air Forces would build two additional ramps: one 400 foot inclined and one 400 foot level, but where remained the question. Major Kotcher recalled in later years.14

> I was in California on some JB-2 business-launching sled testing at Edwards AFB [Muroc] and seeking rockets etc. when I came across General Grandison Gardner, Commanding General of Eglin Field. I knew him since 1928 and worked with him at Wright Field. In California he invited me to accompany him on a flight back to Eglin to see if there was a way the Proving Grounds could help. Before we landed, we decided to look for a launching site on the beaches.15

They selected an area on Santa Rosa Island near Destin, Florida.

*JB-2 Camp Site-The JB-2, 400-ft ramp is in the distance. Crews built this site in less than two months. (AFMC archives)*

Engineers moved quickly and began building the portable ramps along with a camp site that included a mess hall, a JB-1/JB-2 assembly shop, an engine shop, a rocket shop, a munitions storage bunker, and two bomb mission control areas. While slipper and launch car testing would take place at Muroc, actual weapons launches would occur in Florida. Northrop planned to deliver two launching cars by 10 September, one each to Muroc and Eglin Field. As mentioned earlier, Northrop completed the Muroc test track by mid-September while the work on the Eglin launch ramps continued at brisk pace.16

On 8 September, Republic Aviation delivered the initial JB-2, though the Army Air Force planned to withhold launching until they had a total of six missiles. This delay allowed the Corps of Engineers to complete construction at Santa Rosa Island while engineers at the Wright Field put the number two missile through its paces in the 20-foot wind tunnel. At about the same time, Harry Crosby, a Northop test pilot, first flew the glider version of the JB-1. These glider flight tests would determine the stability of the small flying wing and pave the way for future unmanned JB-1 launches. In addition, personnel at Monsanto fired the first, two-second rocket with satisfactory results. In between all this progress, allied forces captured a German accelerating ramp in France and though AMC had yet to use the 400 foot portable ramp at Eglin, General Arnold directed AMC to duplicate the German model. Though testers would go on to use rockets to launch the JB-1 and JB-2 from the shores of Santa Rosa beach, the shortage of rocket powder and the rerouting of critical resources to build new buildings and house the explosives, drove an effort to explore additional options for launching future missiles.17

*Northop pilot, Harry Crosby poses in the MX-324. (AFMC archives)*

One other request came at this time, the ability to remotely control the missile, and it drove a major testing redesign of both the JB-1 and JB-2. The German V-1 had been a point and shoot weapon essentially being launched and after a predetermined time diving into the target. The V-1 proved very effective for area bombing at distances up to 150 miles and the preset guidance system had one very good benefit, the enemy could not use electronic countermeasures to jam the weapon. Even so, General Arnold wanted a remote control guidance system for the JB-1 and JB-2 and though several proposals became discussion points, the group eventually decided to procure 2,000 AN/APW-1 radio sets for installation in the JB-2.18


*September 8, 1944– Republic Aviation ground tests the first production model of the JB-2. (AFMC archives)*

By early October, the Corps of Engineers had completed the JB-2 base at Santa Rosa Island so personnel began preparing for the first launch. They assembled launching devices, the firing control equipment, and checked the flight controls. They placed cameras in strategic areas to capture the events while a P-38 chase pilot practiced following the missile and possibly shooting it down in case it went out of control or flew further than expected.19


*The first JB-2 being readied for launch. (AFMC archives)*

*A JB-2 takes off from the 400-ft ramp. (AFMC archives)*

The day came and the first JB-2 screamed off the Florida 400-foot launching ramp on 12 October 1944 and while the takeoff proved good and the attitude did not change, the missile fell short. The JB-2 settled into the Gulf after two miles of flight. Engineers surmised that the take-off speed had been too slow and resulted in minimum engine thrust. A week later, after discussions about the proper angle of attack for launch, and the need to push the JB-2 with six rockets instead of five, testing resumed. Unfortunately, the high acceleration caused the pulse jet engine to burn out and the flight remained very short. Tests three, four, and five produced similar failure, with the last JB-2 exploding on the ramp. However, test six resulted in success and a nine mile flight at 400mph. Tests seven and eight produced similar positive results with the JB-2 flying so far the chase plane lost track of the tiny missile.20

Tests from the two, 400 foot launching ramps continued throughout November and December 1944, and included not only the JB-2, but the first launch of the JB-1. Northrop launched the *Thunder Bug* on 7 December, and though the missile climbed rapidly, it stalled and crashed approximately 400 yards from the ramp. While investigation revealed flight control problems, engineers surmised that the right turbo-jet engine received damage approximately 30 seconds before take-off which would have also limited a successful flight. Even before this failure, many had started to debate the value of having both missiles.21 In a letter to the Chief of Requirements, Colonel Clarke Bunch wrote, "In the preset type of missile,


*JB-1 sits on the ramp for its first test. (AFMC archives)* it is felt that JB-2 should be considered to the exclusion of the JB-1. This decision is based upon the fact that the JB-1 is an expensive article constructed to aircraft standards and it is felt that even though the range is not as great, the JB-2 can accomplish the same mission as could be accomplished by the JB-1."22 He went on to add, "Such missiles in combination with the use of BQ-7 and BQ-8 will for our 'all weather' Air Force."23

*A German Steam Ramp with American steam modifications. (AFMC archives)*

The New Year would bring major change to the infant jet-bomb program. Prior to Christmas 1944, Lt Gen William Knudsen directed Major Kotcher to pursue options for launching the JB-2 without rocket assisted take off, possibly a mechanical system. Ironically, in January 1945 a captured German accelerating ramp arrived at Eglin along with an American designed and manufactured zero-length launcher. With hydrogen peroxide in short supply, engineers required an alternative for creating steam for the German ramp so they contracted the construction of a steam boiler and required parts. In addition, the Engineering Division at Wright Field pursued a modification of the German ramp using a multiple cartridge approach. Where the German ramp propelled the piston with steam, this version used seven powder charges, placed one after another and screwed into the side of the tube. The pressure from the multiple explosions pushed the piston forward and propelled the JB-2. They tested all these systems at Eglin then later transferred them to Wendover, Utah, where all JB-2 testing remained until it transferred to Holloman Air Base, New Mexico.24

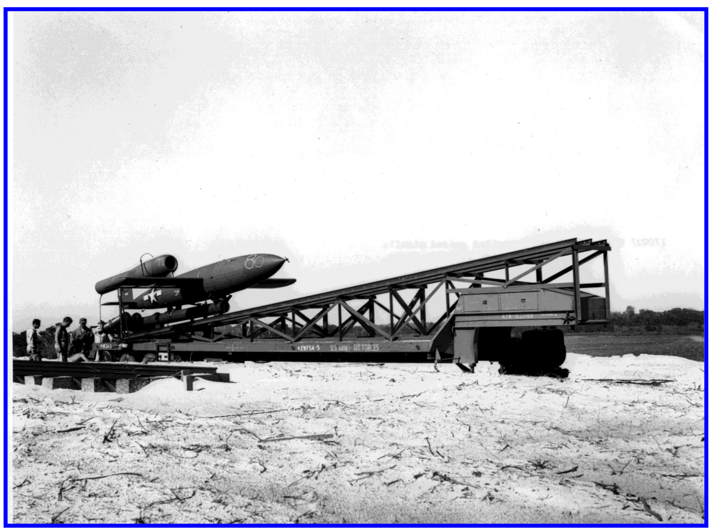
March 2, 1945, JB-2s loaded on an Eglin Field B-17. (AFMC archives)

Also, in December of 1944, General Carroll directed that Colonel George Holloman head up a project to load and launch a JB-2 from a B-17. His team quickly fabricated parts and then transferred one *Flying Fortress* from Wright Field to Brookely Field in Mobile, Alabama for modifications. Eglin testers flew the first B-17/JB-2 mission in February 1945.25

*JB-10 hoisted on to the 400-foot ramp. (AFMC archives)*

Lastly, in that same month, Northrop redesigned the JB-1, trading its two engines for one intermittent jet engine similar to the one used on the JB-2. The Army Air Force designated the redesigned weapon as the JB-10 and testers would conduct four trials of the JB-10 with only one successful flight on 13 April 1945. The AAF later cancelled the project.26

In the background of all the success, failure, and change, General Arnold increased the initial order of 1,000 JB-2s to a whopping 75,000! He wanted the ability to launch 100 missiles per day no later than 1 September 1945,* 200 per day by 1 October 1945, and 500 per day by January 1946. In addition, he wanted an extra 100 launching ramps, 16 per month by July 1945. While Willys-Overland would struggle to meet the monthly quota, the launching ramps became the linchpin for operational use.27



*The 50-foot portable ramp. (AFMC archives)*

In April 1945, the JB-2 test team began putting a 50 foot Trailer Ramp and a 40 foot Inclined Stationary Ramp through their paces. As part of this, Northrop designed a new sled as did General Tire. Between 25 April and 8 June, the team conducted 35 launches with minimum failure. The portable ramps proved so successful that they became a talking point for the Navy who wanted to load them into LSTs and launch JB-2s against Japan. With the Army Air Forces providing technical and acquisition support, and after considerable study of the requirement, all parties agreed that the Bureau of Ships would build a 50 foot ramp for each LST and a capability to store 75 assembled JB-2s. The group discussed the possibilities of using a steam or multiple cartridge launcher, but the Bureau made it clear it only wanted the rocket-type launcher. In addition to the Navy project, General Arnold directed plans for launching JB-2s from the beaches of captured enemy territory. However, as he believed strategic airpower would win the war, and after Germany surrendered in May 1945, he began to see that launching JB-2s from the beach closely resembled artillery, a function of his ground counterparts, not the Air Force. As a result, in mid-May 1945 Arnold cancelled the procurement of 5,000 JB-2s and all necessary auxiliary equipment including radar controls and the AN/APW-1.28

* The exact number is lost to history, but at the completion of the contract, Willys-Overland had delivered almost 1,400 missiles.


April 1945-JB-2 transport trailer. (AFMC archives)

Work at Eglin continued throughout the summer of 1945 with the team conducting 164 launches from a variety of ramp configurations and a few from a B-17; however, after Japan surrendered, Arnold cancelled JB-2 production on 1 September 1945. Before the Army Air Forces shuttered the Santa Rosa Island operation in November 1945 and moved JB-2 testing to Wendover, Kotcher and his team successfully demonstrated the guided version of the infant missile. The last three radar-controlled JB-2s launched from Santa Rosa Island, traveled 80 miles, with two landing within one mile of the water buoy and the other striking within 450 yards.29

JB-2 sled track at Holloman AFB. (AFMC archives)

After moving to Utah, between 25 September 1945 and 21 January 1946, using the 50-foot ramp and the modified German ramp, the Wendover group launched 27 JB-2s with similar results. However, with major drawdowns taking place in combination with consolidation of missions, in 1947, the Army Air Forces split its guided missile test operations between Eglin and Holloman, moving the JB-2 to the high desert base in March 1947. The Wendover Group transferred the rails from their 400-foot-long track to Holloman where engineers used those items to construct a similar ramp. The first Holloman launch did not take place until May 1948. With this said, testing in 1947 continued, as the Air Proving Ground Command's Cold Weather Detachment at Ladd, Field, Alaska began cold weather functional checks of the JB-2 on 19 February 1947. The Detachment planned to launch 15 JB-2s from wooden ramps and 10 from a B-17. However, the required test equipment did not arrive before the weather set in, so the test was limited to three ground launches which proved the JB-2 and the rockets used to propel it from the ramp operated within limits in temperatures ranging between 5- and 17-degrees Fahrenheit.30

Back at Holloman, testing began as mentioned. The Air Force launched a total of 11 JB-2s at Holloman, with the last two taking place in October 1948. In November there was some discussion of using the JB-2 in support of the Matador Project, but the decision to cancel the program had been made, so the Air Force shuttered the project and delivered the remaining missiles and equipment to the Navy.31

In a very short amount of time, Kotcher's team had taken what he referred to as "junk," reversed engineered that material, and paved the way for the Air Force's ability to explore guided missiles. Eleven months after the program began the team had launched hundreds of missiles and developed methods for operationally fielded the system.32 Along the way, that small, dynamic team planted the seed corn for what would blossom and become America's missile effort, but also its sled track program. The sled track provided a test environment where testers could replicate repeatable data points. This started almost immediately as the first five tests resulted in failure, but the sled track provided a solid foundation that allowed testers to make incremental adjustments to the rocket configuration or the missile angle of attack, eventually resulting in success. Kotcher would later comment to Air Force Historian, Dick Hallion, that the JB-2 program had directly influenced the X-1 program. There was "…no paralysis thru analysis because of the immediacy of action necessitated by war before D-Day and immediately following."33 He noted that four actions proved extremely valuable: building the launching tracks at Muroc, producing the rockets at Monsanto, claiming beach land for the test and camp site and construction in two months, and finally, experience of his first isolated command. He was able to watch others make "big decisions," but more importantly, he was allowed to "own really big decisions without repercussions or resistance or hesitation."34 The JB-2 program officially ended in 1948, but it, and the sled track, would go on to influence a host of programs developed during the Cold War.35


*JB-2 loaded on the 50-foot portable ramp and on display at Wright Field, Ohio. (AFMC archives)*

**Epilogue-The Loon**

Though the Navy invested heavily in its weapons programs and created many of its own missiles, leadership from that service showed great interest in the JB-2. So much, that on 26 December 1944, the Navy created a program to investigate launching the JB-2 from an aircraft carrier. In response, the Army Air Forces immediately began transferring JB-2s and equipment to the Navy.* Six months later, on 6 August 1945, the Navy created an additional program to test the electronic systems of the missile to increase its accuracy and control. The Navy centered its JB-2 operation at Point Mugu in southern California and in August, the first XM-1 launcher arrived as did a contingent of 3235th Drone Squadron technicians from Eglin.** They provided training on how to assemble the ramps and operate the equipment. With training complete, on 5 September the group performed 30 dead shots to zero the ramp. Six months later, on 7 January 1946, the group launched the Navy's first JB-2, what they had redesignated as the KGW-1 *Loon*. The Navy would change the designator on 30 July 1947 to LTV-2 and in April 1948 to LTV-N-2. Its nickname remained as the *Loon*.36

From 27 May 1946 through late 1949, the Navy focused its *Loon* program on testing and improving existing or new components while developing new tactics, techniques, and procedures. Through these efforts, they improved the rockets used to launch the weapon, the control and maneuver of the *Loon*, and the launch ramps. They also developed a self-destruct mechanism in the vent of test failure. In addition, under Project Squid, the Air Force and Navy teamed together to improve the JB-2's pulse jet eventually exploring an 8-, 14-, and 21-inch version. They even considered a jet option. The Navy also made plans on how to use the Loon as a target for antiaircraft training during fleet exercises while building tactics and techniques for launching the weapon from a submarine. Even with all the progress, missile technology had progressed, and in March 1950, the Navy cancelled the *Loon* program to make way for the *Regulas*.37


*A Navy LTV-N-2 being launched from the USS*

* By 1951, the Air Force had transferred 349 missiles.
** It's important to note, that the relationship between the 3235th and the personnel assigned to Point Mugu would continue for years with the 3235th stationing a detachment of personnel operating a B-17 and assisting the Navy's missile operation.

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The Ezra Kotcher collection is part of the Air Force Institute of Technology (AFIT) Library located at Wright Patterson AFB, Ohio. This collection not only contains one-of-a-kind X-1 and X-2 information, but also a valuable collection of JB-2 documents, photos, and drawings.

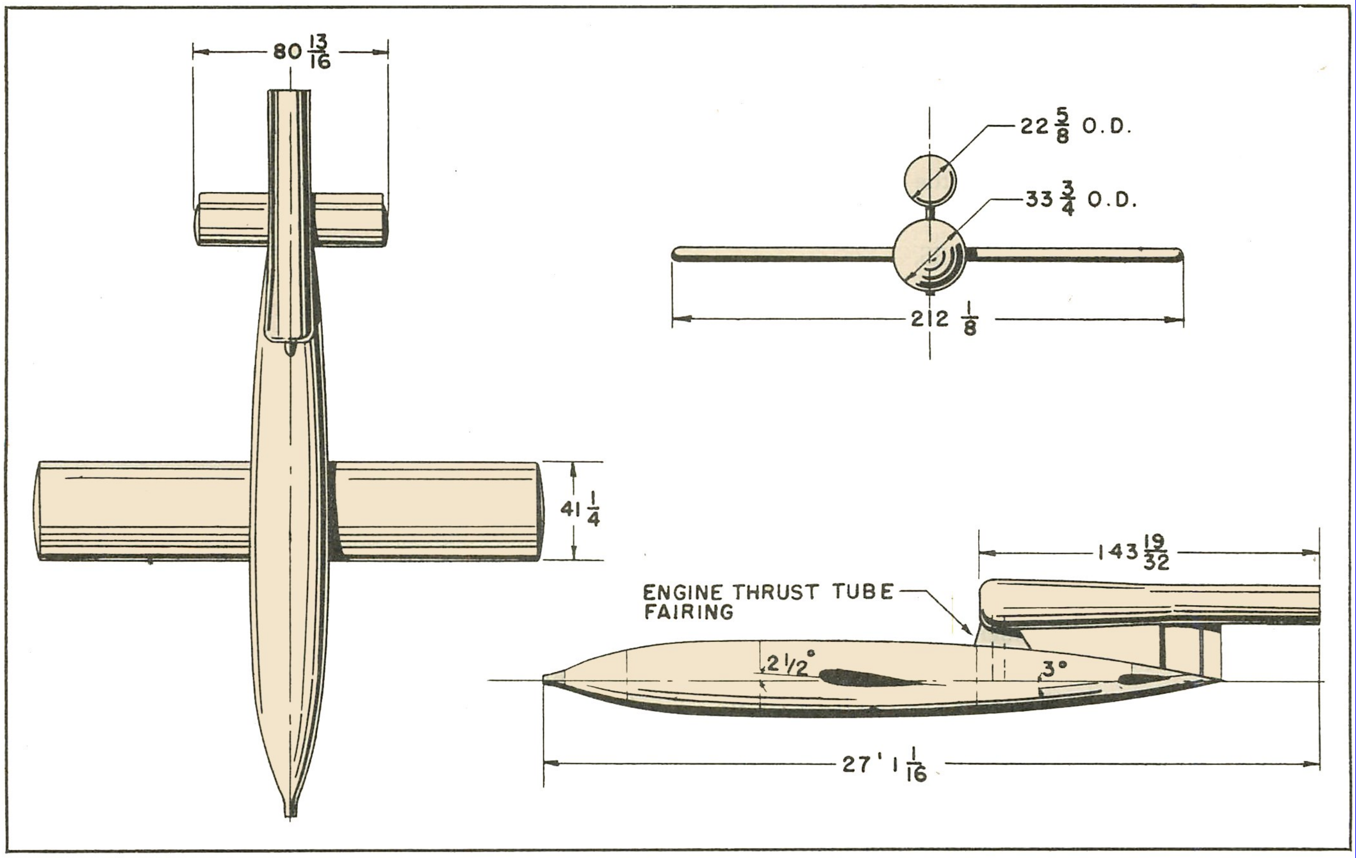
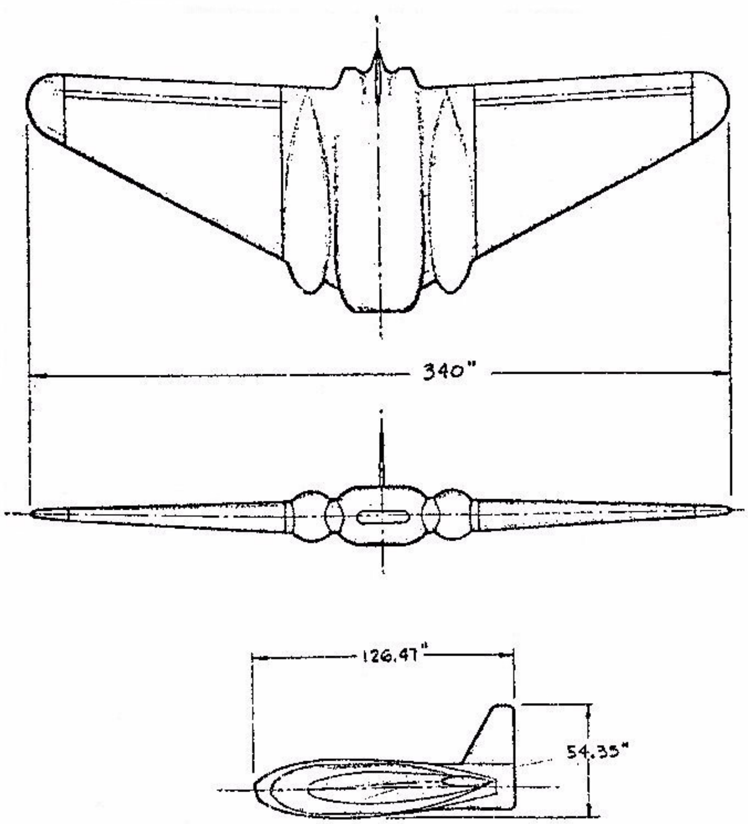


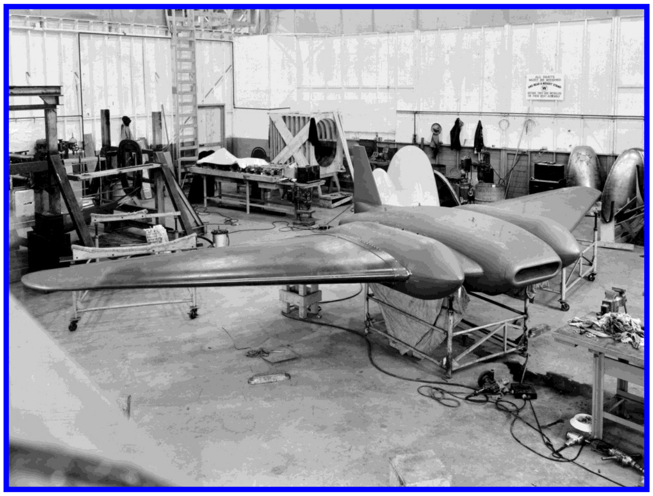

Figure 3—JB-2 Bomb Dimensions

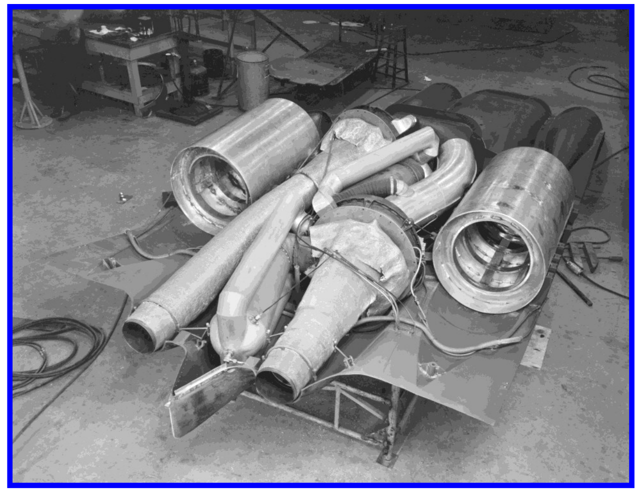



*Line art for the JB-1 and JB-2. (AFMC archives)*

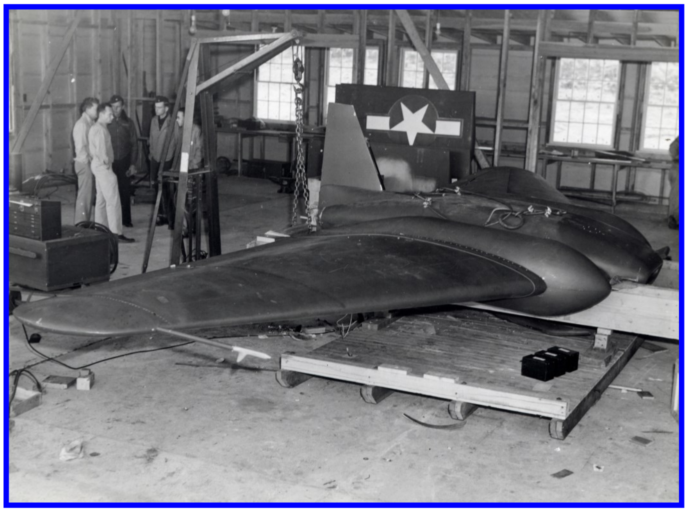

*JB-1 with a Northrop N-9M. Courtesy of Tony Chong.*

*JB-1 sitting on the dry lake bed at Muroc. Courtesy of Tony Chong.*

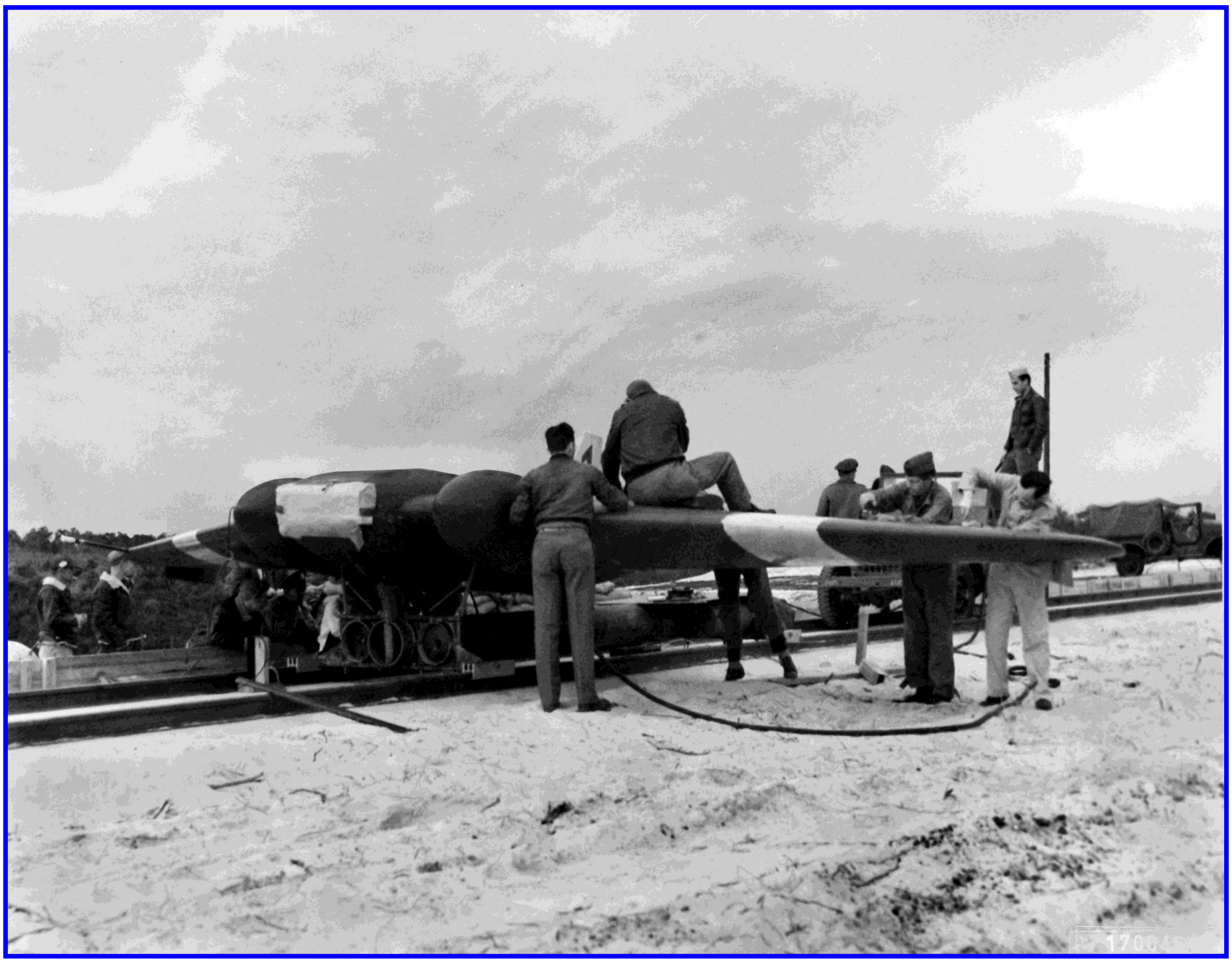


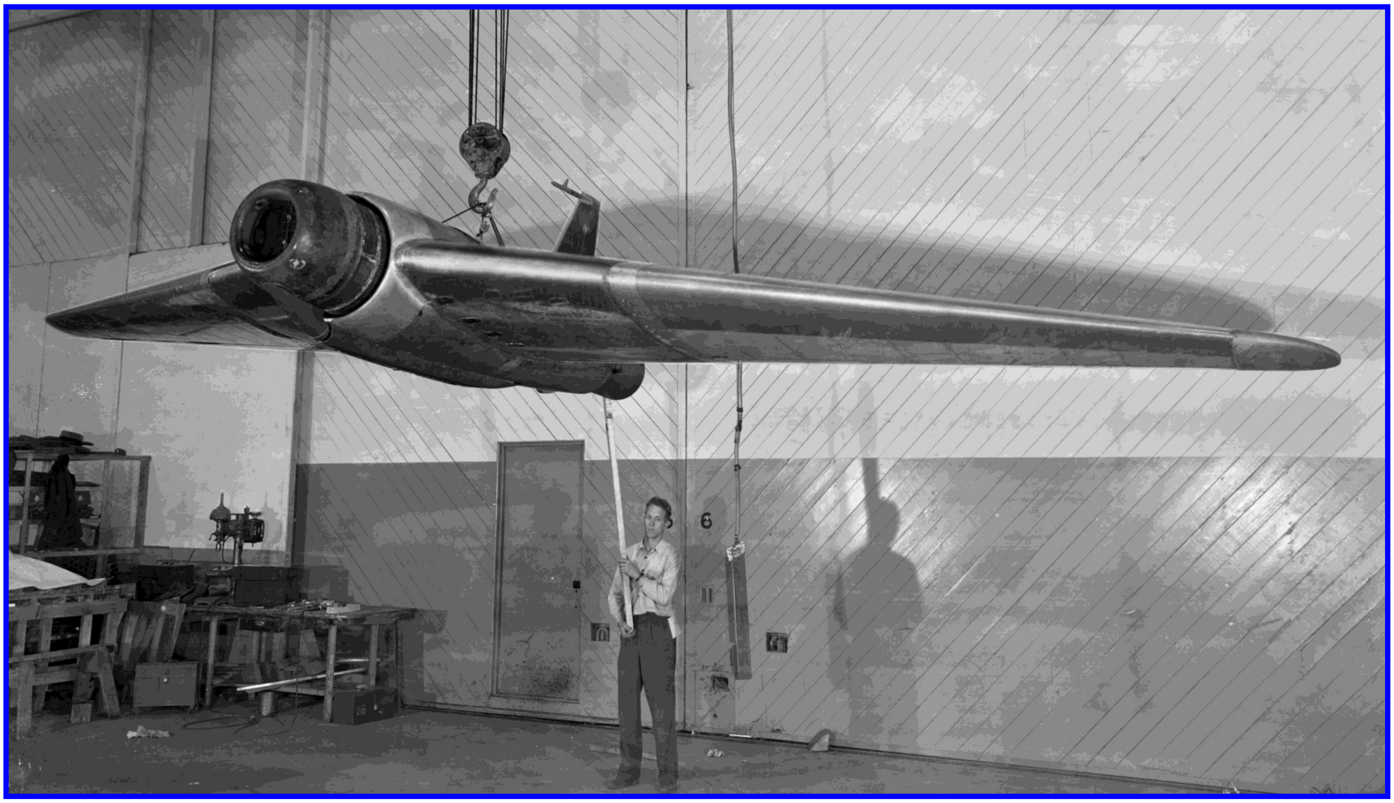


*JB-1 Thunder Bug final assembly. Courtesy of Tony Chong.*



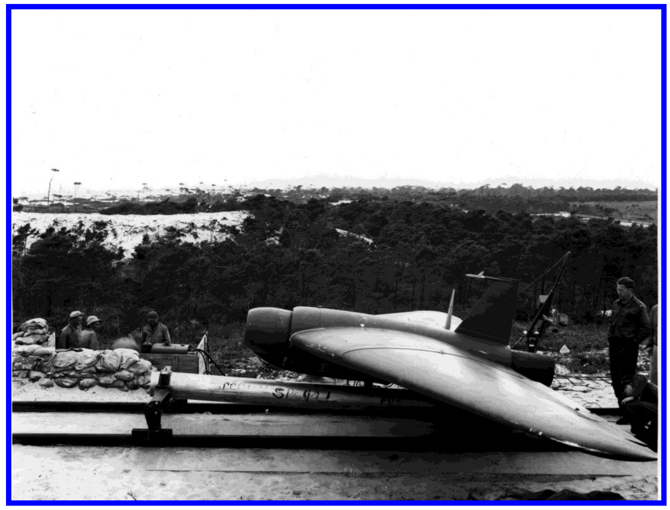
*December 7, 1944, specialist prepare the JB-1 Thunder Bug for its first and only flight.*
*Courtesy of Tony Chong.*



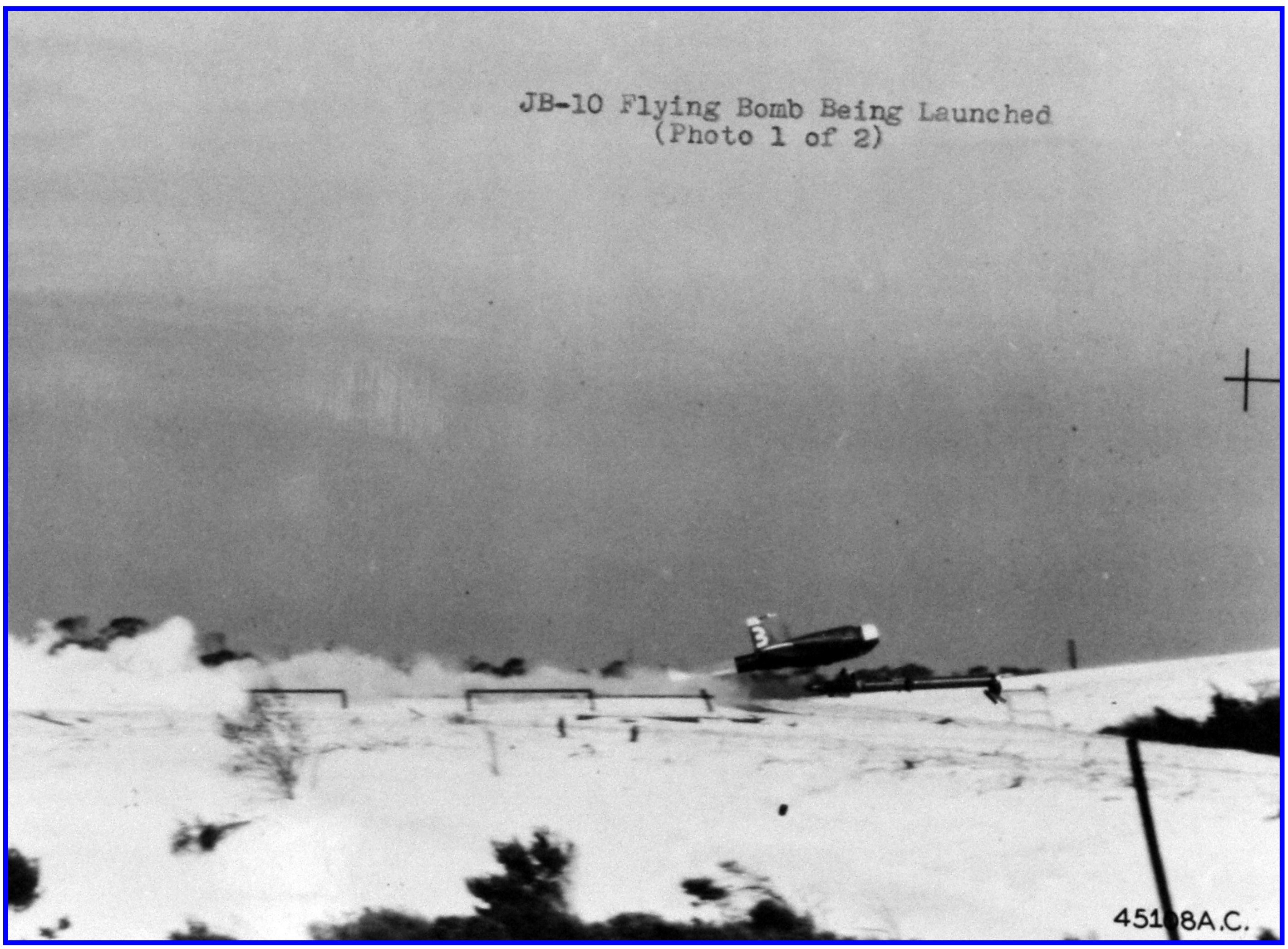


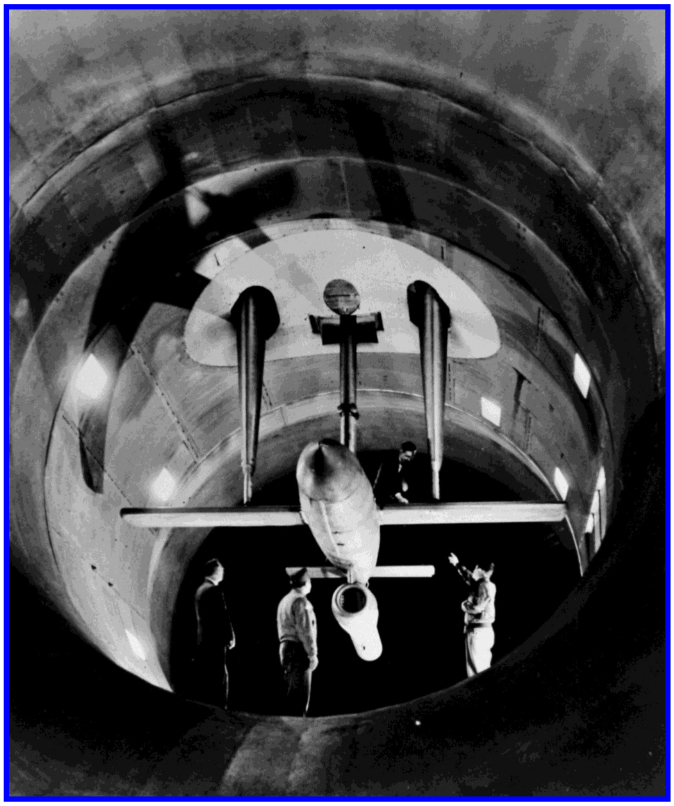

*JB-10 being readied for delivery to the AAF. (AFMC archives)*

*April 6, 1945, JB-10 being readied for its first test. (AFMC archives)*

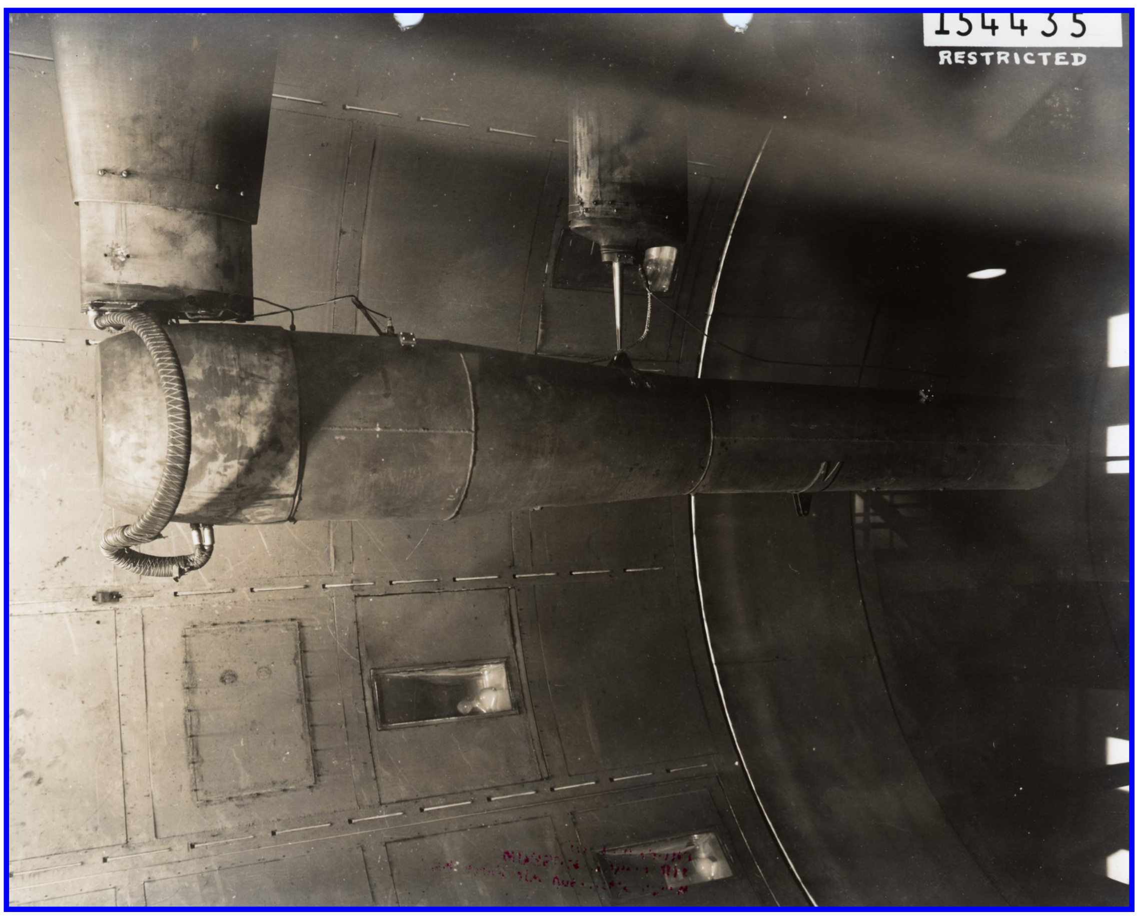


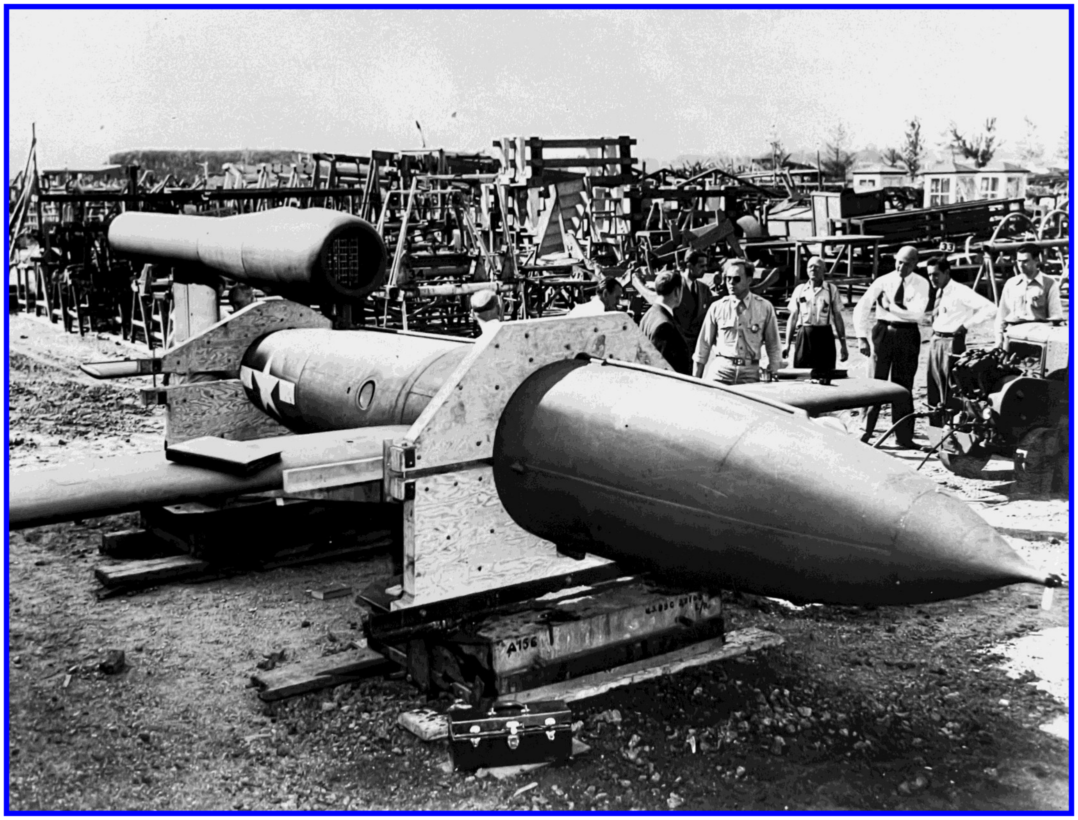
*April 6, 1945, the JB-10's first and only flight. (AFMC archives)*






JB-2 being tested in the Wright Field wind tunnel.  (AFMC archives)



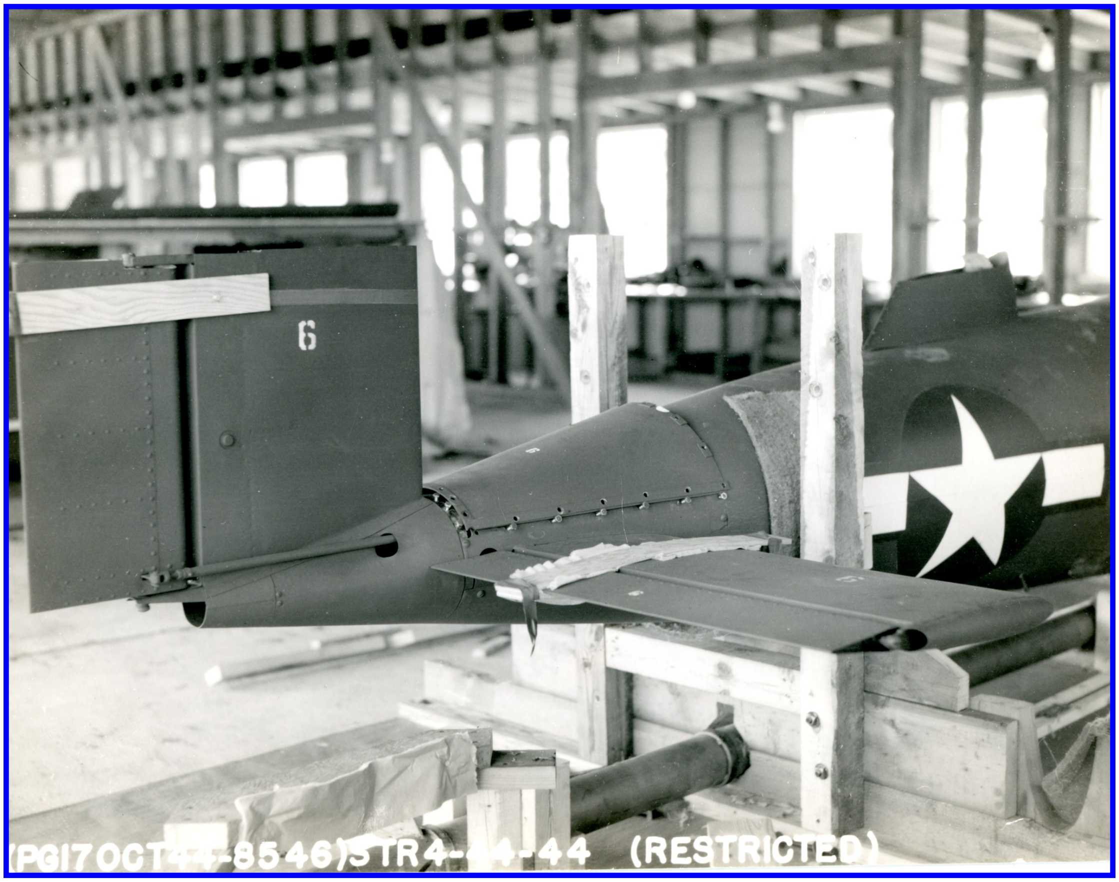


The first JB-2 packaged and ready for delivery.  (AFMC archives)

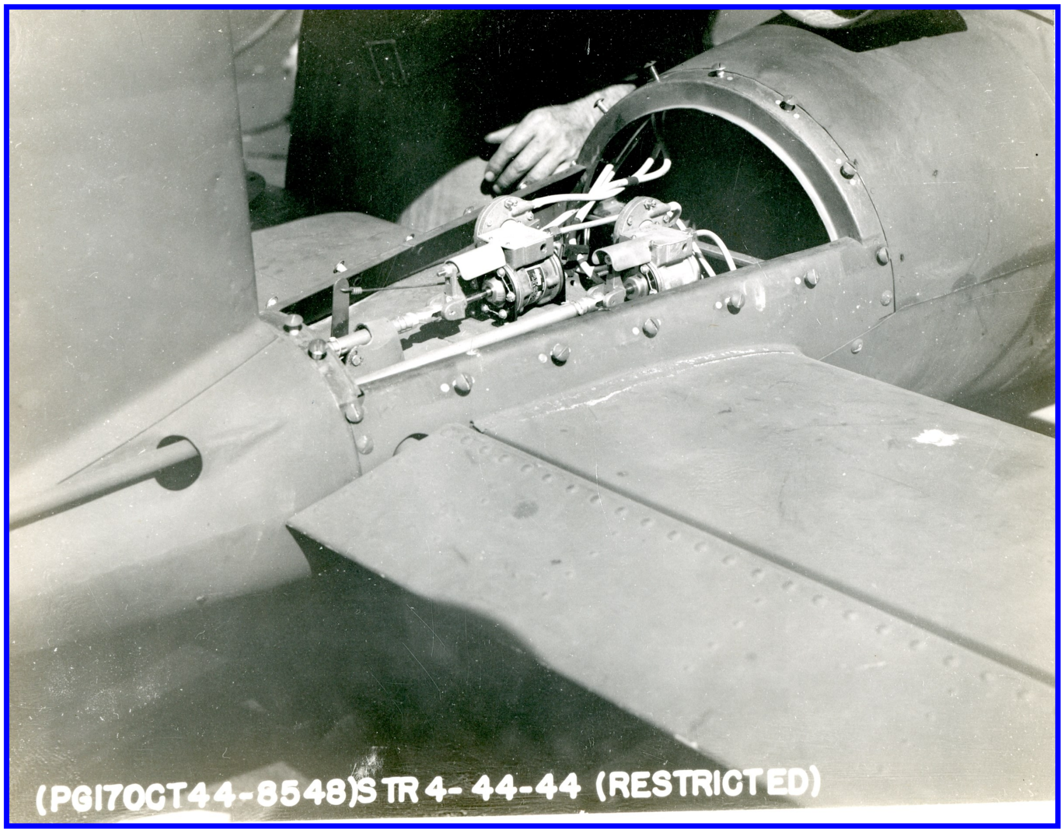

German Buzz Bomb and JB-2 on display.  (AFMC archives)


*Construction at 4-Mile Village progressed quickly and had areas to store the JB-2. The right hand photo shows the jet fuel loading area. (AFMC archives)*

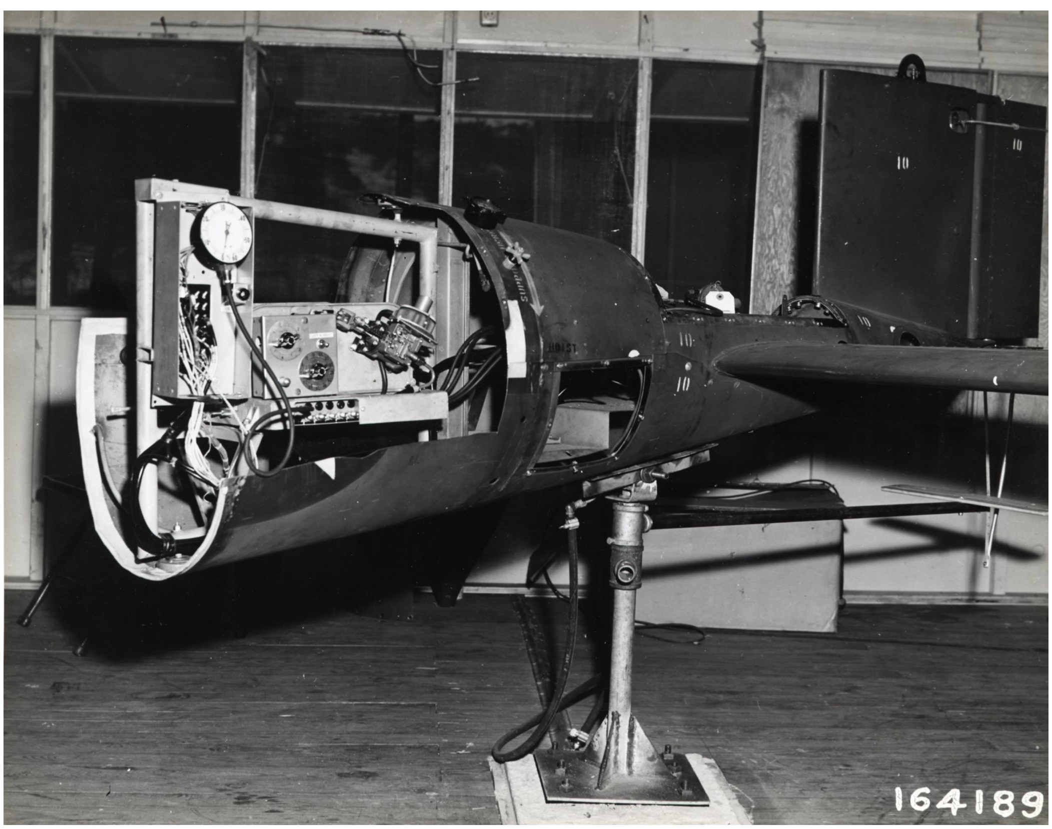
*The first JB-2 arrived on January 26, 1945. Testing got underway very quickly. (AFMC archives)*



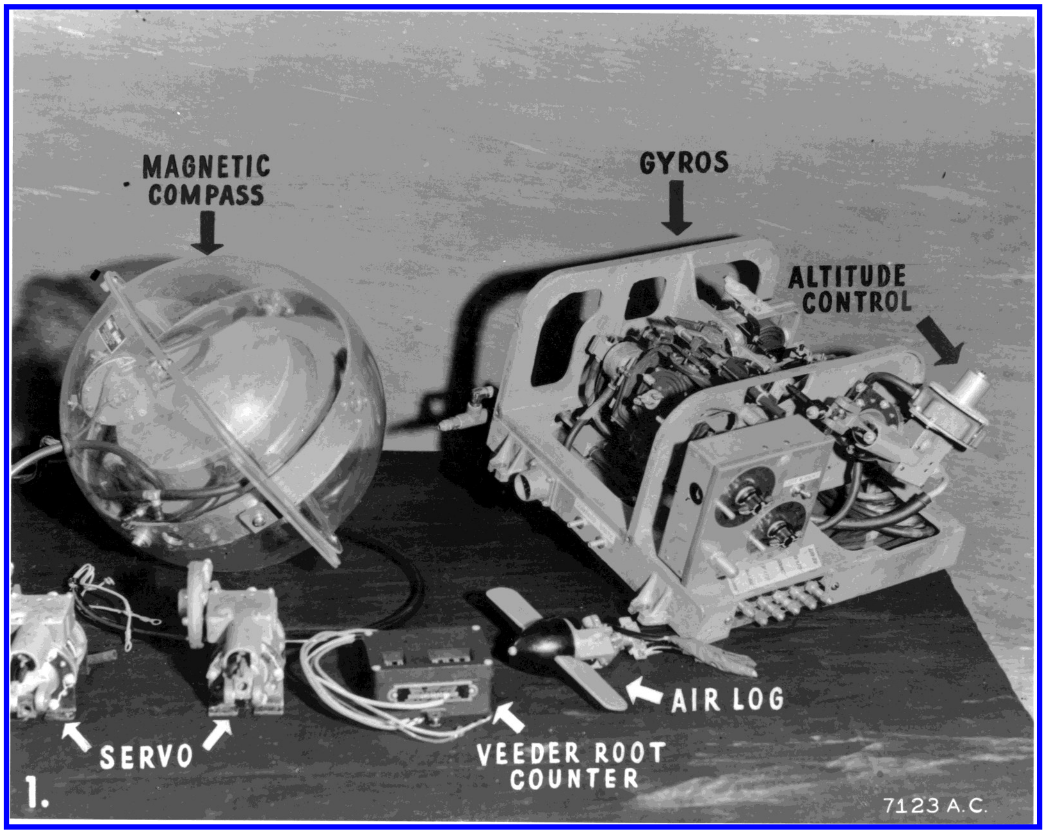

(Top)  JB-2 being uncrated.  (Bottom) Pulse jet being installed.   (AFMC archives)



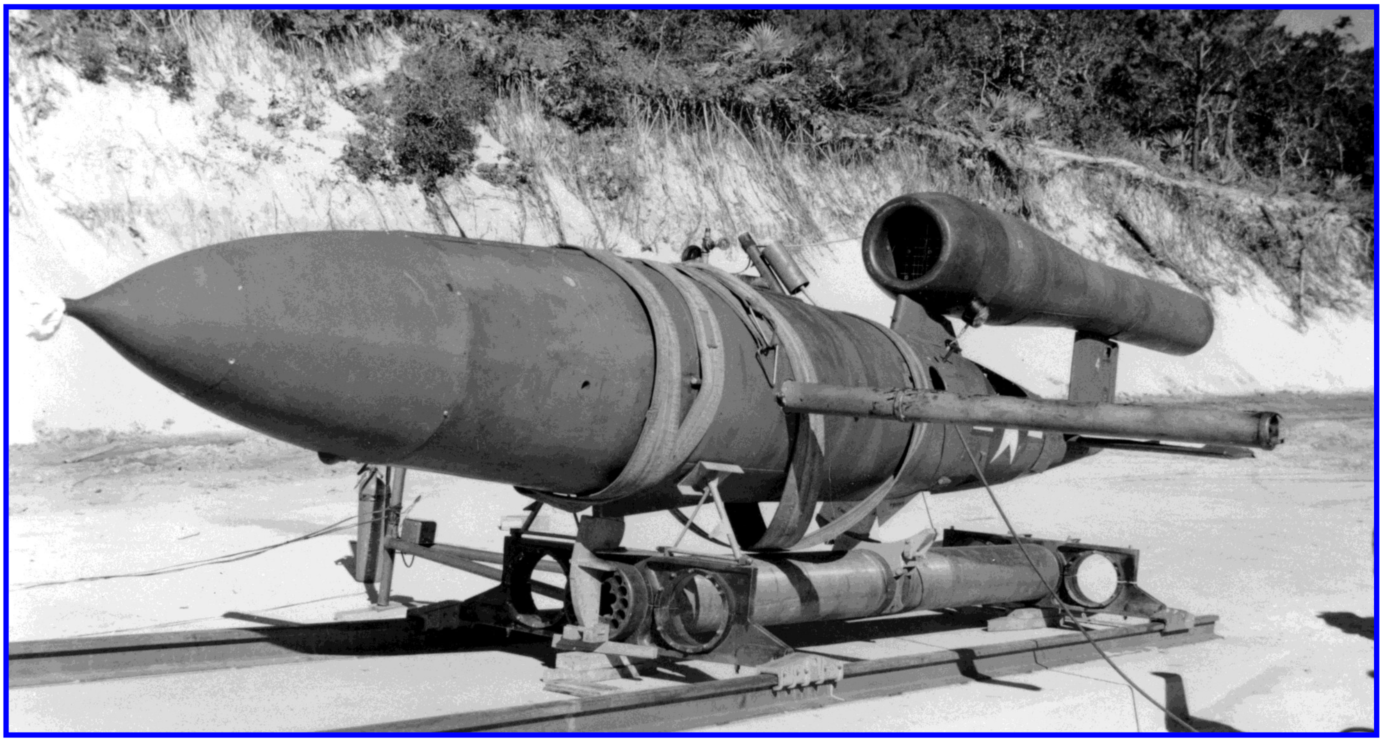

*Installing the JB-2 control servos. (AFMC archives)*



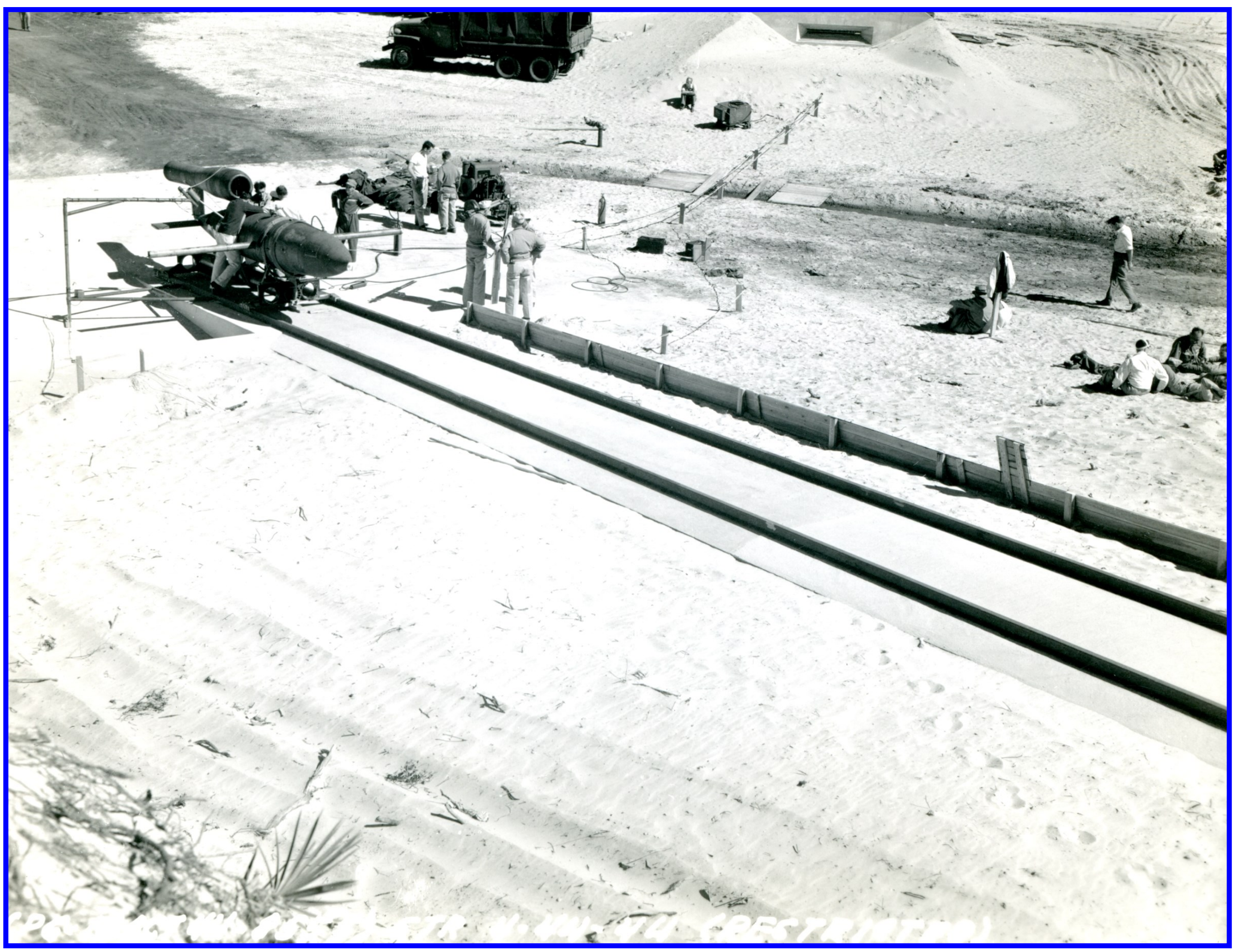

*Inside of the JB-2 tail assembly. (AFMC archives)*




*The JB-2 used a magnetic compass to stabilize the missile. (AFMC archives)*



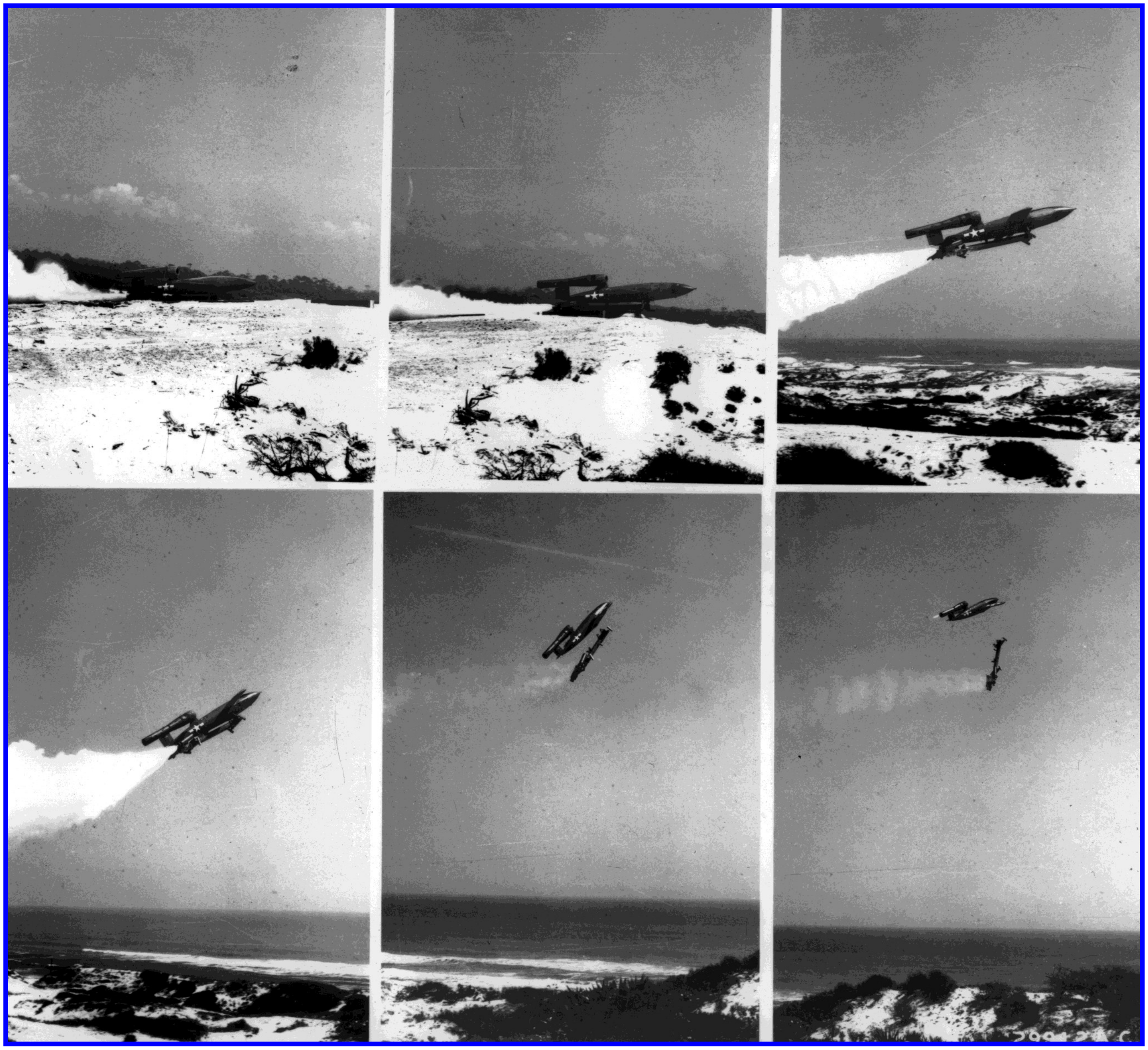
*JB-2 loaded and ready for the first test flight.   (AFMC archives)*



*JB-2 being loaded onto the 400-foot ramp. (AFMC archives)*

*This photo captures the length and angle of the 400-foot ramp. (AFMC archives)*

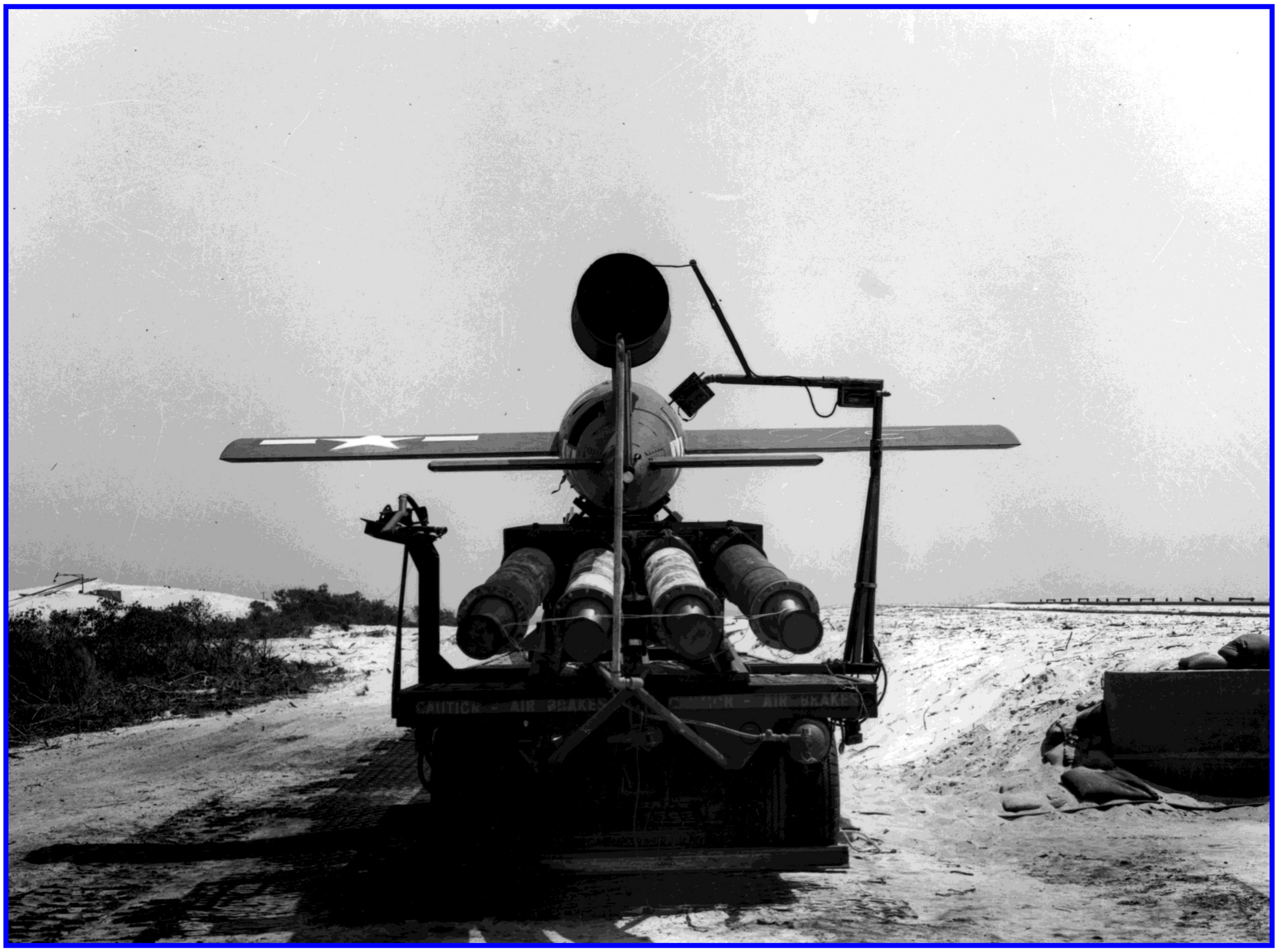
Oct 1944 -- Eglin. Gen. Knudsen, Gen Myers
Gen. Gardner, Col Holloman.
Tests of Buzz Bomb

*Dignitaries gather to watch the JB-2 take flight. The first few flights ended in disaster, but the sled track provided a test environment where testers could replicate repeatable data points. This started almost immediately as the first five tests resulted in failure, but the sled track provided a solid foundation that allowed testers to make incremental adjustments to the rocket configuration or the missile angle of attack, eventually resulting in success. Kotcher would later comment to Air Force Historian, Dick Hallion, that the JB-2 program had directly influenced the X-1 program. There was "…no paralysis thru analysis because of the immediacy of action necessitated by war before D-Day and immediately following." (AFMC archives*

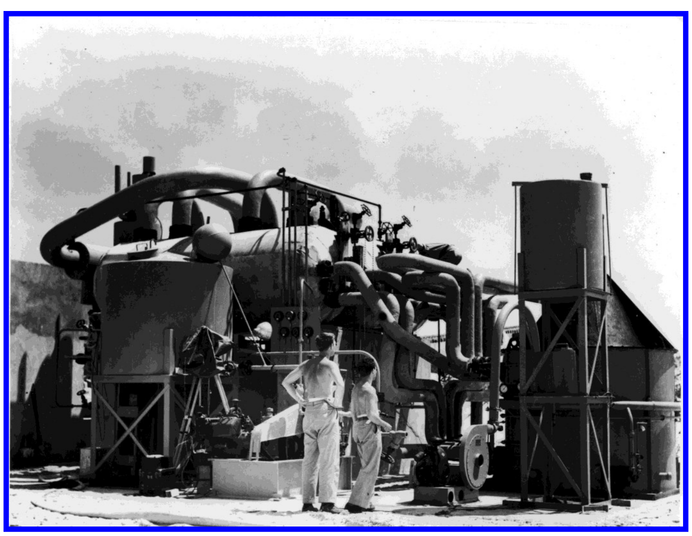
*October 28, 1944. Success came quickly and the team began to replicate the ability to launch at JB-2 from the 400-foot ramp. (AFMC archives)*

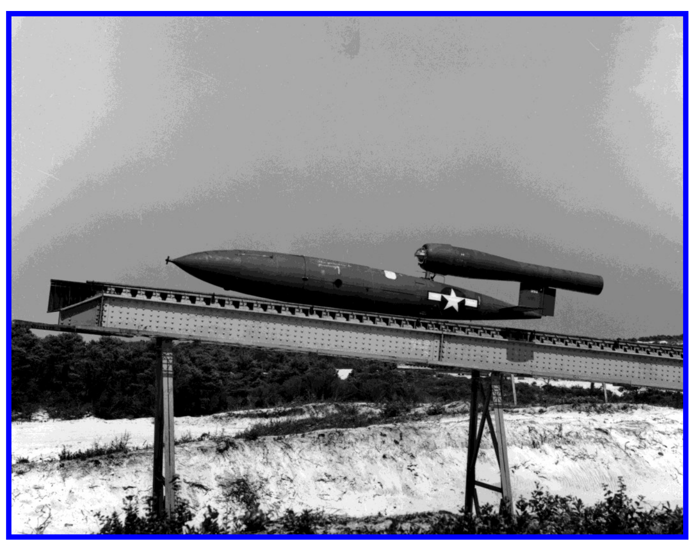
*Ground tests, like this pulse engine run, continued throughout 1944 and into 1945. (AFMC archives)*

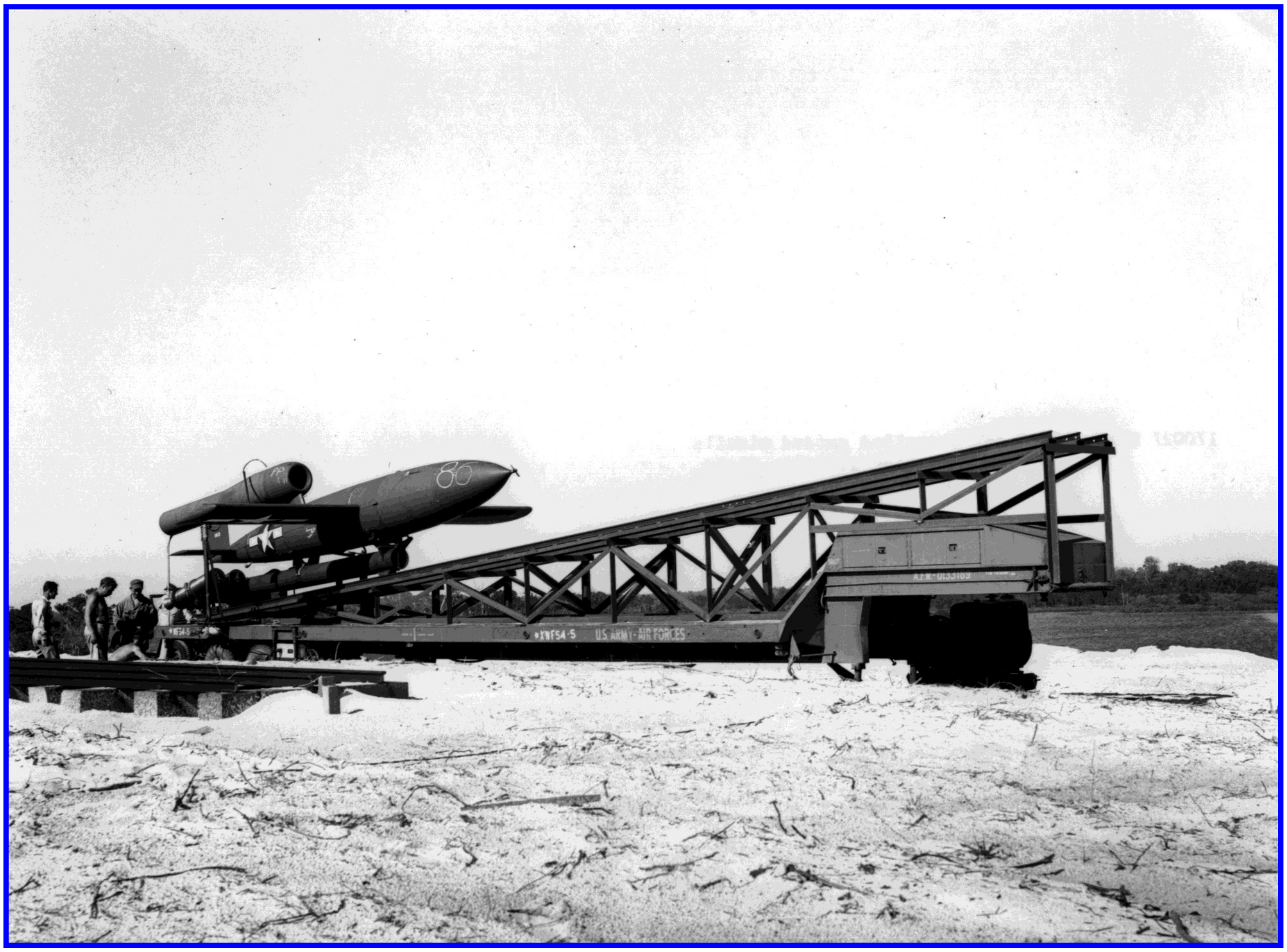


*The team quickly introduced a variety of Jet Assisted Take Off (JATO) configurations to better launch the JB-2. (AFMC archives)*

*The team also adapted the German ramp, but modifying it with steam to power the JB-2 into flight. (AFMC archives)*








*The AAF developed several shorter launch ramps as did the Navy. AAF version top, Navy below. (AFMC archives)*


*The AAF also developed options, then tested how to deliver the JB-2 from the B-17. (AFMC archives)*


*Rare color photographs of the JB-2 in test.  (AFMC archives)*

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For heritage and exhibit questions, contact: Jack Waid

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