Appendix E

Advanced Creations in Aerospace Engineering

<table>
<tr><td>Für den Ring nimm nun auch mein Roß!
Ging sein Lauf mit mir
einst kühn durch die Lüfte,
mit mir
verlor es die mächt'ge Art;
über Wolken hin
auf blitzenden Wettern
nicht mehr
schwingt es sich mutig des Wegs.</td><td>For the Ring take now my horse!
Though he once carried me
boldly through the air—
with me
he lost all his magic powers;
above the clouds
through lightning and thunder
no more
will he brave the way.</td></tr>
</table>

Richard Wagner. 1874. *Götterdämmerung* [*Twilight of the Gods*]. Prologue. Brünnhilde.

As discussed in Chapter 9, a tremendous number of aerospace technologies were invented by German-speaking creators, especially shortly before and during World War II: helicopters, guided missiles, smart bombs, jet engines and jet aircraft, ejection seats, ramjets, the V-1 cruise missile, the A-4 or V-2 single-stage rocket, supersonic wind tunnels, radar stealth technology, etc. There is also thorough documentation (though regrettably too little modern public recognition) that German-speaking creators personally carried those aerospace technologies to their limits during the postwar era, with funding and support from the United States, United Kingdom, France, Soviet Union, and other countries.

However, archival documents strongly suggest that there are several areas in which aerospace technologies may have advanced significantly further in wartime Germany than has been officially acknowledged in the conventional historical narrative.

This appendix presents:

E.1. Evidence for intercontinental jet bombers.

E.2. Evidence for liquid propellant rockets larger than the A-4 or V-2.

E.3. Evidence for space planes or space shuttles.

E.4. Evidence for large solid propellant rockets and submarine-launched rockets.

E.5. Evidence for longer-term technologies for space exploration.

E.6. A physics analysis of some of the evidence for advanced jet developments.

E.7. A physics analysis of some of the evidence for advanced rocket developments.

E.8. Conclusions.

This evidence that is currently publicly available should spur much more extensive searches in archives worldwide. Further searches could uncover documentation clarifying just how far development work proceeded during the war, how those technologies were transferred to other countries after the war, and which scientists were most responsible for the wartime and postwar work.

E.1 Intercontinental Jet Bombers

[English-language histories tend to regard intercontinental jet aircraft as an invention that originated primarily during the postwar period and primarily in Allied countries. For example, Oxford's *Biographical Dictionary of Scientists* says of Frank Whittle: "British engineer and inventor of the jet engine. The developments from his original designs were used first in the Gloster Meteor at the end of World War II. Direct descendents of these engines are now the sources of power for all kinds of military and civil aircraft" [Porter 1994, pp. 721–722]. This biographical dictionary does not mention Hans von Ohain or other German-speaking inventors of jet engines and jet aircraft, apart from briefly mentioning that "the Germans had produced the Messerschmitt Me 262 slightly earlier" than the British. While the existing literature does document the German production of small, shorter-range jet aircraft such as the Me 262, it generally describes more advanced jet aircraft as projects that never progressed much beyond the design stage [e.g., Griehl 2004; Masters 1982; Myhra 1998a].

In fact, there is evidence that even very advanced jet aircraft projects such as large intercontinental jet bombers may have progressed much further in wartime Germany than has been acknowledged in the conventional historical narrative, and that in turn those projects and their creators led directly to the postwar jet aircraft programs in Allied countries:

- March–June 1944 articles in the British magazine *Flight* reported that the Luftwaffe was rapidly constructing several large airfields near Oslo, including workshops for Heinkel, which was known for designing and building new jet aircraft, and BMW, which was known for building engines for jet aircraft (p. 5190).

- On 5 January 1945, Colonel Lowell Weicker at the Headquarters of the U.S. Strategic Air Forces in Europe wrote: "Germany... is leading the world in tested jet propelled airplanes... A large part of her manufacturing facilities have gone underground and she is bending every sinew for the last stand on the Vaterland frontiers. Our Ground Armies, despite superiority in manpower and quantity of equipment, are presently engaged more in defensive than offensive fighting and, unless this state of affairs is quickly changed or the Russians actually drive through to Berlin and victory, we must face the grim expectation of fighting Germany and her new capabilities through greater 1945... The first cycle and period of the war has ended without the capitulation of Germany and with Germany leading in the development of principal new weapons and methods, which will be included in her capabilities during 1945" (p. 5336).

- Based on a 10 May 1945 U.S. interrogation of former Luftwaffe head Hermann Goering, the *New York Times* reported on 8 June 1945 that the Germans had built a prototype Messerschmitt 264 "New York" bomber with four jet engines, found at an undisclosed place in France, and were "within a few months of working out the kinks" when the war ended (pp. 5200–5202).

- On 29–30 June 1945, numerous major newspapers reported that at the end of the war, "40 giant Heinkels of a new type, with a range of 7,000 miles" had been found near Oslo at "the largest Luftwaffe field I have ever seen" according to senior British military officers. The articles reported that "German ground crews said the planes were held in readiness for missions to New York," and that the planes had been captured by the British (pp. 5197–5198).

- On 26 June 1945, Henry Fowler, Director of the Enemy Branch of the U.S. Foreign Economic Administration testified to a U.S. Senate committee: "According to recent reports from Germany, it appears that if the Germans could have held out only 6 months longer they would have been able to smash New York City with improved V-2 bombs. Only a little longer period would have been needed to bring into production the jet-propelled planes that could have reached Washington. It is not necessary here to elaborate upon the terrifying scientific discoveries which our economic and industrial intelligence is gradually uncovering as we work beneath the lid in Germany. With the memories of her new V-weapons fresh in our minds, little needs to be added except to point out that they just didn't appear out of thin air. They were the fruit of carefully organized and adequately financed research institutions in which large numbers of highly trained and specialized scientists went about their business of inventing and developing the weapons that would establish German world supremacy... Germany could rapidly set up plants for such new products because of its enormous capacity to produce machines and machine tools, and the huge supplies of machine tools that were built up in advance of need" (p. 5206).

- On 27 August 1945, Consolidated Vultee Aircraft Corporation (Convair) stated in *Life* magazine: "In a converted salt mine, our ordnance officers examined nearly complete jet-propelled heavy bombers... bombers claimed by the Germans to be capable of crashing high explosives into the industrial cities of the eastern United States and flying back again across the Atlantic. Goering himself said that the planes had been successfully test-flown and would have been in operation if Germany could have held out 3 months longer" (p. 5208).

- In his 1956 autobiography, Ernst Heinkel did not mention the 40 giant Heinkel intercontinental bombers found in Norway, perhaps due to Cold-War censorship or to avoid self-incrimination. However, he did mention that he had long been a strong proponent of jet bombers that he believed could be built quickly, that his company participated in a late-war push to build new jet aircraft that nearly came to fruition, that those aircraft were found by the Allies, that his top designer Siegried Günter had been engrossed with flying wing bomber designs, and that Günter had submitted his information on the flying wings to U.S. Army Air Forces Major Robert L. Cardenas by the end of September 1945 (p. 5220).

- According to a report apparently written by Siegried Günter and filed by Major Cardenas on 1 October 1945, Heinkel engineers had been working on four-jet-engine long-range bombers with a flying wing design before the end of the war. Günter described 26-ton and 60-ton versions of the design with intercontinental ranges (p. 5223).

- If the British captured novel German intercontinental jet bombers with oversized wings at the end of the war, the first British intercontinental jet bombers with oversized wings such as Vulcan (1957) may be based on those German aircraft (p. 5226).

- Several different turbofan and turboprop engines with high fuel efficiencies, suitable for intercontinental bombing round trips, were under active development throughout the war, and at least some of them were built and successfully demonstrated (pp. 1746–1748, 5233–5241, 5779).

- Large numbers of German-speaking creators, designs, documentation, and prototypes for a wide range of jet engines and jet aircraft were taken to the United States and other Allied countries, directly shaping the course of postwar jet programs in those countries (pp. 1707, 5250).[1]

- German-speaking creators also developed a number of anti-radar stealth materials, coatings, configurations, and other techniques during that war that were captured and used by Allied countries after the war (p. 1234).

Today these directly German-derived technologies are represented by one third of the military "nuclear triad" (intercontinental jet bombers), as well as jet fighters, stealth aircraft, jet passenger aircraft, and gas turbines used in everything from helicopters to electric power plants.]

[1]Amtmann 1988; Bohr 2013; Brix 2022; Butler 1994, 2007; Christensen 2002; Christopher 2013; Cole 2015; Conner 2001; Constant 1980; Cooke and Ingells 1945; Daso 2002; Diedrich 1999; Dorr 2013; Duffy 2012; Erfurth 2006; Forsyth and Creek 2007; Franz 1985; General Electric 1979; von Gersdorff et al. 2004; Gleichmann 2013; Gleichmann and Bock 2009; Griehl 1990, 2004, 2005; Griehl 2015; Gunston 2006a, 2006b; Herwig and Rode 2000, 2003; Hill and Peterson 1991; Hirschel et al. 2004; Hyland and Gill 1998; Jacobsen 2011, 2014; Jakobs et al. 2009; Johnsen 2014; Kay 2002; Kerrebrock 1992; Kober 1990; Leist and Wiening 1963; Leyes and Fleming 1999; Lichtfuss and Schubert 2014; Longden 2009; Masters 1982; Hans-Ulrich Meier 2010; Miranda 2015; Myhra 1998a, 1998b, 2000a; Nowarra 1988; Pavelec 2007; Samuel 2004, 2010; Schick and Meyer 1997; Shepelev and Ottens 2015; Simons 2016; Smith and Creek 1992, 2001; Smith and Kay 2002; Thomas 1946; Vajda and Dancey 1998; CIOS XXV-9, XXVI-27, XXVI-28, XXVI-29, XXVI-30, XXXII-41; *Air World* 1946; *Chicago Daily Tribune* 1945-06-29 p. 4; *Daily Telegraph* 1, 2, 5, 9 Oct. 1945, p. 4 each issue; *L.A. Times* 1945-06-29; NYT 1945-06-08, 1945-07-26 p. 6, 1948-04-15 p. 17, 1948-12-04 p. 3; *Washington Post* 1945-06-29.

Behind the Lines. *Flight.* 2 March 1944 p. 230.

For Defence

From neutral sources it is reported that the Germans have started work on two new big airfields in Norway. One of these is at Eggemo[en], between Ådalen and Randsfjorden, and the other at Haslemo[en], only some 18 miles from the Swedish border.

Behind the Lines. *Flight.* 11 May 1944 p. 503.

Preparing

Only time will show the real purpose of the new chain of airfields now being established by the *Luftwaffe* in Norway. But whether for defence or offence, reports indicate a feverish activity in the expansion of existing landing facilities and the construction of new ones.

Over 300 acres of forest have been cleared to make room for the big airfield which the Germans are building at Halsemoen, Flisa, about twenty miles from the Swedish border and about fifty miles from the big air base at Gardemoen which has recently been substantially enlarged.

The work on the Haslemoen airfield started in January and large areas have been evacuated, schools and churches requisitioned, and farms devastated. The whole district has been practically destroyed. One thousand Russian prisoners and 800 Norwegian slave labourers are engaged on the work.

Only twelve miles from this airfield another temporary one is being rapidly built, and the construction of a third situated close to the Swedish border, was started at the end of last month.

Both the Fornebu airfield, near Oslo, and the Bardufors, in the county of Troms, are being expanded.

The method used for the construction of these temporary airfields on frozen ground or lakes is first to remove the snow from the ice, then cover it with a layer of sawdust which acts as an insulator, and then a layer of gravel.

Ice treated in this way—it is said—can last until midsummer, provided the weather in the spring does not become unusually warm.

In Denmark, too, the *Luftwaffe* is preparing; the Kastrup airfield is being transformed from a training to an operational base; many bombers are reported to have arrived and stocks of bombs are placed around the periphery.

On the Avedore airfield the B.M.W. have installed repair workshops for their engines, while the Heinkel concern has taken over the engine shops of the naval dockyards.

[BMW was noted for its jet engines, and Heinkel was noted for its advanced jet aircraft models. Eggemoen airfield, though not specifically named in the May 1944 article, was named in the March article and was also very important.]

Behind the Lines. *Flight.* 29 June 1944 p. 693.

Preparing

From Norway it is reported that over 300 acres of forest have been felled to make room for the big airfield which the Germans are building at Haslemoen, Flisa, about 20 miles from the Swedish frontier. The work was started in January, and large areas have been evacuated and the forests cut down. Schools and churches have been requisitioned and farms devastated. The whole district has been practically destroyed.

Norwegians in the labour service have been conscripted for this work, in the teeth of the Hague Convention, which prohibits the employment of the people of an occupied country for the military purposes of an Occupying Power.

The airfield is situated only about 50 miles from the big German airfield at Gardermoen which the Germans have substantially enlarged.

Figure E.1: Entrance to Haslemoen airfield, near the Swedish border, in 2011.

Figure E.2: Fornebu airfield, approximately 5 miles west of Oslo, in 1940 (upper) and in the late 1970s (lower).

Figure E.3: Gardermoen airfield, approximately 23 miles northeast of Oslo, in 1942 (upper) and in 2010 (lower).

Figure E.4: Eggemoen airfield, approximately 23 miles northwest of Oslo, under construction in 1943 (upper) and operational in 1944 (lower).

Figure E.5: Eggemoen airfield, approximately 23 miles northwest of Oslo, in 2007.

[These facts are firmly established:

- During the war, Germany built several separate airfields in southern Norway.
- Each of those airfields was massive.
- Each airfield had a remarkably large runway with the same dimensions: 1800 meters long and 60 meters wide.
- The German military placed a very high priority on finishing those airfields in 1944.
- The German military stubbornly held those airfields until V-E Day, making them an even higher priority than defending the German homeland.

The above facts are not explained in conventional histories of the war.

The above facts strongly suggest that:

- Germany expected by late 1944 or early 1945 to have huge aircraft that would need such large runways.
- Germany expected to have large numbers of those aircraft.
- Germany expected those aircraft to make war-critical missions to Allied targets—not just the United Kingdom, but also the east coast of the United States.
- Germany expected that those aircraft would be fast enough to make the trip before Allied defenses could be fully mobilized, and that at least some fraction of the aircraft could evade Allied propeller airplanes—apparently the large German aircraft were jet-propelled.
- Germany expected those aircraft to have payloads destructive enough to justify such expensive infrastructure and equipment—likely nuclear weapons, or at the very least chemical or biological weapons.

The following news articles demonstrate that such aircraft were indeed built and stationed at the Norwegian airfields.]

Planes to Bomb N. Y. Uncovered. *The Stars and Stripes* (Paris). 30 June 1945 p. 8.

Planes to Bomb N. Y. Uncovered

21st ARMY GROUP. June 29 (AP).—The Germans had "almost completed" preparations to bomb New York from a "colossal airfield" near Oslo when the war ended, RAF officers disclosed today.

"Forty giant bombers, with a 7000-mile range, were found on this base—the largest Luftwaffe field I have ever seen," a senior officer said. "They were the new type bombers developed by Heinkel. They are now being dismantled for study. German ground crews said the planes were held in readiness for missions to New York."

Hundreds of different type planes were taken intact on the field, cut through a pine forest about five miles from Oslo. Some of the latest model fighters, including the JU88 night fighters, equipped with intricate Radar devices to guide pilots to their target, were found.

RAF officers said they were indications that the Germans had planned a "last-ditch stand" in the area and were hoarding their newest bombers and fighters.

Bombing New York. *The West Australian* (Perth, WA). 30 June 1945 p. 7.

Bombing New York.

New Giant Heinkel.

Nazi Plan Disclosed.

London, June 29.—RAF officers have disclosed that the Germans had nearly completed preparations to bomb New York from a colossal airfield carved out of a forest 23 miles from Oslo, says a correspondent of the American Associated Press at Field Marshal Montgomery's HQ.

A senior officer said that 40 giant Heinkels of a new type, with a range of 7,000 miles, had been found there.

German ground staff members admitted that they were being held in readiness for raids against New York.

Were Ready to Bomb N.Y. *Washington Post.* 29 June 1945.

Twenty-first Army Group Headquarters, June 28 (AP)—RAF officers said today that the Germans had nearly completed preparations for bombing New York from a "colossal airfield" near Oslo when the war ended.

"Forty giant bombers with a 7000-mile range were found on this base—the largest Luftwaffe field I have ever see," one senior officer said.

"They were a new type bomber developed by Heinkel. They now are being dismantled for study. German ground crews said the planes were held in readiness for a mission to New York."

[Discovery of the 40 giant Heinkel intercontinental bombers was also reported in many other newspapers worldwide, such as:

Planned N.Y. Bombing. *Chicago Daily Tribune.* 29 June 1945 p. 4.

Plan to Bomb New York Told. *Los Angeles Times.* 29 June 1945.

To Rocket Mail over Atlantic in 40 Minutes. *Toronto Daily Star.* 29 June 1945 p. 1.

Bombing New York: Germans' Plan Disclosed. *Kalgoorlie Miner* (Australia). 30 June 1945 p. 5.
[https://www.myheritage.com/research/record-10450-31024931/kalgoorlie-miner-wa]

Planes Ready to Bomb New York. *Examiner* (Launceston, Tasmania). 30 June 1945 p. 1.
[https://www.myheritage.com/research/record-10450-33164384/examiner-launceston-tas]

Bomb New York. *The Daily News* (Perth, WA, Australia). 29 June 1945 p. 3.

Nazis Almost Ready to Blast New York. *The Calgary Herald.* June 29, 1945 p. 7.

German Preparations to Bomb New York. *Cairns Post* (Queensland). 30 June 1945 p. 2.]

Long-Range Weapons. *The Evening Post* (Wellington, New Zealand). 29 June 1945 p. 5.
[https://paperspast.natlib.govt.nz/newspapers/evening-post/1945/06/29]

Nazis Nearly Bomb NY City. *Schenectady Gazette* (New York). 29 June 1945 p. 1.
[https://fultonhistory.com/newspaper%208/Schenectady%20NY%20Gazette/Schenectady%20NY%20Gazette%201945%20Grayscale/Schenectady%20NY%20Gazette%201945%20Grayscale%20-%203174.pdf]

The articles disagreed on whether the airfield was 5 miles from Oslo (the approximate distance of Fornebu) or 23 miles from Oslo (the approximate distances of both Gardermoen and Eggemoen). See Figs. E.2–E.5. The Luftwaffe used all of those airfields during the war, as well as Haslemoen (Fig. E.1). The Heinkel long-range bombers and other advanced German aircraft may have been found at all four airfields when the war ended. A combination of those or similar airfields likely would have been necessary to launch a coordinated, simultaneous, intercontinental mission by 40 large bombers and to receive the returning planes, which would have been running low on fuel after the round trip. The Luftwaffe equipped those airfields with some of the most advanced radars, approach lights, radio-guided blind landing systems, and other technology available at the time.]

Bombs Slow Down Nazi Atomic Use. *Wilmington Morning Star.* 28 September 1945, p. 8. [https://chroniclingamerica.loc.gov/lccn/sn78002169/1945-09-28/ed-1/seq-8/]

Washington, Sept. 27.—(AP)—A report by Maj. Alexander De Seversky that Allied strategic bombing of Germany may have prevented the Nazis from being the first to use atomic bombs was released today by the War Department.

De Seversky, aircraft designer and aviation writer, returned recently from Europe where he had gone as a special consultant to the Secretary of War to appraise the use of air power.

His report said that the Germans were far advanced in the aerodynamics of high speed flying, jet propulsion, the study of ballistics, rocket projectiles and synthetic fuels. He added that the German jet design was more efficient than ours.

"Moreover, there are indications that German science had made great advances in atomic power research," Seversky said. "If our strategic bombardment had not nipped enemy atomic research in the bud, the Germans might have succeeded in winning the race for the atomic bomb."

(While the De Seversky report did not detail where the air attacks on the German atomic bomb efforts occurred, the Allied air forces paid attention to German installations in Norway and islands in the Baltic sea.)

De Seversky was critical of some of the equipment used by the American Air Forces in the European war. He declared that the United States fought the war "largely with a bomber more than 10 years old in basic design."

Discussing bombsights, Seversky asserted that "I am constrained to say that there has been some gross exaggeration about the allegedly miraculous powers of our sighting devices."

Nazis Nearly Beat Allies to Atom Bomb Secret. Examiner (Launceston, Tasmania). 29 September 1945, p. 1. [https://trove.nla.gov.au/newspaper/article/91945338]

WASHINGTON (A.A.P.)—Major de Seversky, world famous aviation figure and special consultant to the Secretary for War, has reported after a five months' inspection of Europe, that German scientists might have beaten the Allies to a solution of the atomic power riddle if unrelenting Allied airpower had not interfered with their research.

De Seversky, who is at present in the Pacific, declared that the Germans were achieving sensational developments when the Reich fell. The U.S. should bring German scientists to America and make them complete their experiments for America's benefit.

The American air force must be prepared to jettison all its present equipment because, due to the advent of jet propulsion and the faster-than-sound era in aircraft design, it would be totally obsolete within 10 years.

De Seversky interrogated German military leaders, scientists and officials, including Goering. and also key figures in Britain, France, Sweden and Switzerland. He said the Germans excelled in high-speed flying research, jet propulsion, ballistics, and synthetic fuels. Their jet design was more efficient than America's.

[Can Alexander de Seversky's actual September 1945 report be located? See also:
- Atomic Energy Control Board Voted in Senate. Chicago Daily Tribune. 28 Sept. 1945, p. 12.
- Would Unify Air Forces. Army, Navy, Air Force Journal & Register. 29 Sept. 1945, p. 154.
- German Progress in Atomic Research. *The Advertiser* (Adelaide, Australia). 29 Sept. 1945, p. 8. [https://trove.nla.gov.au/newspaper/article/48669930]
- Germany Fell Just in Time. *Barrier Daily Truth* (Broken Hill, Australia). 1 Oct. 1945, p. 2. [https://trove.nla.gov.au/newspaper/article/141566398]]

Interrogation of Reich Marshall Hermann Goering. 10 May 1945. [Cornell University Donovan Archive]

(Because General Patch is personally responsible for the safe custody of the prisoner, it was necessary for General Spaatz' party to go from Headquarters Ninth Air Force to Headquarters Seventh U.S. Army). [...]

Interpreter provided by the Seventh Army.

Those present were:

Reich Marshal Hermann Goering.
General Spaatz, CG, USSTAF.
Lt. Gen. Patch (part of the time), CG, 7th Army.
Lt. Gen. Vandenberg, CG, Ninth Air Force.
Brig. Gen. E. P. Curtis, C/S, USSTAF.
Brig. Gen. Paul Barcus.
Major Alexander de Seversky, Special Consultant to Secretary of War.
Dr. Bruce Hopper, Historian, USSTAF.

SPAATZ: Would you tell us something of the organization of the Luftwaffe and the plans, especially the factors which went into the non-fulfillment of those plans?

GOERING: In the early years when I had supreme command of the Luftwaffe, I had definite plans, but in 1940 Hitler began to interfere, taking air fleets away from our planned operations. That was the beginning of the breakdown of the Luftwaffe efficiency. [...]

SPAATZ: Did the jet airplane really have a chance to win against us?

GOERING: Yes, I am still convinced, if we had only four to five months more time. Our underground installations were practically all ready. The factory at Kahla had a capacity of 1000 to 1200 jet airplanes a month. Now with 5000 to 6000 jets the outcome would have been different.

VANDENBERG: But could you train sufficient jet pilots, considering your shortage of oil?

GOERING: Yes, we would have had underground factories for oil, producing a sufficient quantity for the jets. The transition to jets was very easy in training. The jet pilot output was always ahead of the jet aircraft production.

SPAATZ: Could Germany have been defeated by air power alone, using England as a base, without invasion?

GOERING: No, because German industry was going underground, and our counter measures could have kept pace with your bombing. [...]

GOERING: We had too few long-range airplanes and then, later, when you got to Algiers the airfields in Italy were inadequate. You have no idea what a bad time we had in Italy. If they had only been our enemies instead of our Allies we might have won the war. [...]

SPAATZ: Have you any knowledge of a proximity fuze?

GOERING: Yes, in three or four months there would have been production. [...]

SPAATZ: If you had to design the Luftwaffe again, what would be the first airplane you would develop?

GOERING: The jet fighter and then the jet bomber. The problem of speed has been solved. It is now a question of fuel. The jet fighter takes too much. The jet bomber, ME 264, designed to go to America and back, awaited only the final solution of the fuel consumption problem. I might add that according to my view the future airplane is one without fuselage (flying wing) equipped with turbine in combination with the jet and propeller.

SEVERSKY: In view of your diminishing manufacturing resources, who made the decision to divert a large portion of your national effort to manufacture of V-1 and V-2 weapons instead of building up the Luftwaffe?

GOERING: Well, there was great confusion of thought in Germany. Prior to the invasion the V-1 would have been effective. After the invasion our effort should have been concentrated on the ME 262 (jet). The decision on the V-2 project was made at higher headquarters. [...]

SPAATZ: Did you have a three-inch gun for the jet?

GOERING: The 5.5 centimeter machine gun, only now going into production, would have made a great difference in the jet. While waiting for that we used the 5.5 centimeter rocket. You might find around Germany some jet airplanes equipped with anti-tank guns. Don't blame me for such monstrosities. This was done on the explicit orders of the Fuehrer. Hitler knew nothing about the air. He may have known something about the Army or Navy, but absolutely nothing about the air. He even considered the ME 262 to be a bomber; and he insisted it should be called a bomber.

SEVERSKY: I know that four-engine Focke-Wulf planes were in production in 1939. When you found after the Battle of Britain that your planes did not have sufficient fire power and bombing power, why didn't you concentrate on these four-engine planes as a heavy bomber?

GOERING: Instead of that, we were developing the HE 177 and tried to develop the ME 264 which was designed to go to America and return. We did use the Focke-Wulf against shipping from Norway. Because our production capacity was not so great as that of America we could not produce quickly everything we needed. Moreover, our plants were subject to constant bombing so that it was difficult to carry out our plans for heavy bomber production.

SEVERSKY: The reason why I asked the previous question was because I wanted to establish whether you failed to build the big bombers because you did not believe in strategic air power or because your productive capacity was restricted to the production of tactical aircraft for the Russian campaign.

GOERING: No, I always believed in strategic use of air power. I built the Luftwaffe as the finest bomber fleet, only to see it wasted on Stalingrad. My beautiful bomber fleet was used up in transporting munitions and supplies to the army of 200,000 at Stalingrad. I always was against the Russian campaign.

New York Bomber Built in Germany. *New York Times.* 8 June 1945.

New York Bomber Built in Germany.

De Seversky Says Principal Bar to Use Was Its High Rate of Fuel Consumption

The Germans planned to bomb New York and other eastern American ports and, according to Hermann Goering, were within a few months of working out the kinks in a jet-propelled plane that would do it, Maj. Alexander P. de Seversky, airplane designer and airpower advocate, said today.

Major de Seversky, World War I commander of the Russian Navy's Baltic fighter plane force, has been touring Germany as a special air consultant to Secretary of War Henry L. Stimson. He interviewed Goering with Gen. Carl A. Spaatz right after Goering was captured at Augsburg.

[...] The Germans' "New York" bomber, a prototype of which was found at an undisclosed place in France, was a Messerschmitt 264. It had four engines with jet propulsion for high altitudes, Major de Seversky said. The Germans started working on it before the war, designing it to cross the Atlantic and return nonstop with two or three tons of bombs. The only obstacle to its introduction was its big fuel consumption, but this, Goering asserted, the Germans had expected to solve in a few months.

[The intercontinental jet bomber described in the Goering interrogation and the article above was built by Messerschmitt and found in France. It was probably similar to, but should not be confused with, the intercontinental bombers described in the previous articles, which were built by Heinkel and found in Norway.]

Chicago Daily Tribune 1945-04-13 p. 9. German 'Flying Wing' Factory Found by Yanks. 718 M.P.H. Claimed; Plane Tailless.

GOETTINGEN, Germany, April 9 [Delayed]—A factory in which the Germans had been experimenting with a "flying wing," a super-powerful plane without fuselage or tail, has been overrun by American infantry. Both bomber and fighter types had been produced, with one to six engines. Later models were jet propelled.

Eight German technicians who had been left behind said they had flown the flying wings and found them much more maneuverable and of greater stability than conventional type planes.

One model was said to have a speed of 625 miles an hour at an altitude of 3,280 feet and 718 miles an hour at 4,600 feet. The plane's ceiling is about 52,500 feet, with a climbing rate of 65.6 feet a second. Its flying radius was reported at 937 miles.

This plane was designed to carry two bombs under the wings. [...]

[For another report of a similar six-jet-engine flying-wing bomber, see pp. 5227–5231. Note that the demonstrated airspeed reported above is in the high subsonic range. For jet engines that were optimized to operate at such airspeeds and were successfully tested in 1943, see pp. 5233–5241.]

Dated; October 12, 1944.

AMEMBASSY

LUMMY.

Hart adds following details on V-3: Capture of Watten and flooding of Walcheren has played out V-2. Atom splitting explosive and frozen blitz considered diversions by industrialists acquainted with German industry. V-3 also known as cistern plane considered the real thing and estimated that a third of Luftwaffe productive capacity devoted to it. Probably two engined long range bomber but some four engined and considerable proportion jet-propelled. Experiments conducted on Leuneberger Heide near Hambrug and is now in mass production. About 2000 to be produced. Also reports that Germans are distributing gasmasks with new energy and putting new filters on old ones.

N.P.

1431-1432

Figure E.6: Allen Dulles. 12 October 1944. [Princeton University Library, Allen Dulles Papers, Series 4, Subseries 4K: Telegrams d'etat, 1942–1945, 1942–1943, MC019.09_c44.pdf, https://findingaids.princeton.edu/catalog/MC019-09_c44].

PW Intelligence Bulletin No 1/34, 5 February 1945. [AFHRA folder 506.61951 Nos. 1/19–1/35 26 Dec 1944–7 Feb 1945, IRIS 207524; AFHRA A5185 frame 481; also NARA RG 165, Entry NM84-79, Box 1915]

11. Experimental Aircraft

PW heard in 1942 when he was working as a camera man at the aircraft testing field RECHLIN (Mecklenburg) that a new type of plane was being designed which could retract its wings during flight and thereby increase its speed considerably.

PW saw the plane in flight in Feb 44 and describes it as a two (4) motor transport plane, similar to the US C47. PW heard from mechanics that the plane was designed to fly bombing missions to the US, it can carry a load of 3,000 to 4,000 kg. The speed is supposed to be 700 to 800 km per hr. The two propellers are connected to two in-line 16 cylinder engines each.

According to PW the experimental flights were very successful but the plane is not being mass-produced as yet.

(Source: S/Gefr Gerd JARNOWSKI, Pz Lohr Div, captured 14 Jan VILLY)

[See document photo on p. 5205.]

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PW Intelligence Bulletin No 1/34

10. 20 July 44 (Continued)

They had been arrested by a group of AHA officers led by Obst i G VON DER HEYDE, Obst FLIESSBACH, Maj in G KUBAN, and the AHA Ib, who had turned against OLBRICHT. Other conspirators personally known to PW were Obslt i G BERNARDIS, Maj i G HAYESSEN, Obslt VON DER LANCKEN (hanged), Obslt d Res GRAF VON DER SCHULENBURG, Hptm d Res KAISER, Maj THOMA, Gen VON HASE (hanged), Obst i G VON FREYTAG LOHRINGHOVEN (formerly Ic with Army Group Süd, now Amt Ausland Abwehr), Dr KIEP (former Consul General in NEW YORK, executed after he was denounced by a BERLIN physician, Dr RECKZE), and Ambassador VON HASSEL.

PW saw Dr GÖRDELER, Gen STIEFF, Obslt i G KLAMROTH, Maj i G KUHN, and Gen d Art LINDEMANN visit Gen OLBRICHT's office. Others who were involved, but not known to PW personally, were obst i G FREIHERR VON RÖNNE (OKH, Fremde Heere West), Gen VON STÜLPNAGEL, GRAF DOHNA, GRAF LEHNDORF, Obst i G SANDROSZINSKI (Ia, Befehlshaber des Ers Heeres), Gen VON PFUHLSTEIN (Div Brandenburg), Gen CRAMER (PW, exchanged from ENGLAND, May/June 44), Ambassador GRAF VON DER SCHULENBURG, Hptm d Res SCHOLZ-BABISCH (Generalkommando BRESLAU), GRAF LYNAR (Adjutant to WITZLEBEN), GRAF HARDENBERG (Adjutant to BOCK), Obst i G MEIDNER (Wehrmachts Führungsstab, executed. His father, Konsistorialrat in WITTENBERG, was under arrest as of Nov.), Gen Obst ZEITZLER's adjutant, and the Ia of the Kommandantur, BERLIN.

The fate of Gen Obst FROMM was not clear. Although he shot Gen Obst BECK personally in an opportune, last minute change of heart, he was still under arrest late in Nov 44.

PW visited the AHA on 22 July and saw 2 SS guards with MPs in front of every door. Patrols of the BERLIN guard Bn roamed the corridors. The offices of the executed officers were searched. The atmosphere was strained.

The hanging of Feld Marschall VON WITZLEBEN, Gen Obst HÖPNER, Gen VON HASE etc in PLÖTZENSEE prison was filmed by the UFA on HITLER's orders.

OLBRICHT was succeeded by Gen d Art KAINER.

(Source: Hptm Hans G von WATZDORF, 1 Bn 60 Pz Gren Regt, captured 13 Jan, vic BERISMENIL)

11. Experimental Aircraft

PW heard in 1942 when he was working as a camera man at the aircraft testing field RECHLIN (Mecklenburg) that a new type plane was being designed which could retract its wings during flight and therby increase its speed considerably.

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(Source: S/Gefr Gerd JARNOWSKI, Pz Lehr Div, captured 14 Jan VILLY)

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Figure E.7: PW Intelligence Bulletin No 1/34, 5 February 1945 [AFHRA folder 506.61951 Nos. 1/19–1/35 26 Dec 1944–7 Feb 1945, IRIS 207524; AFHRA A5185 frame 481; also NARA RG 165, Entry NM84-79, Box 1915].

Testimony of Henry H. Fowler, Director, Enemy Branch, Foreign Economic Administration. *Elimination of German Resources for War. Hearings Before a Subcommittee of the Committee on Military Affairs, United States Senate, Seventy-Ninth Congress, First Session, Pursuant to S. Res. 107 (78th Congress) and S. Res. 46 (79th Congress) Authorizing a Study of War Mobilization Problems. Part 3: Testimony of Foreign Economic Administration and Materials on German Penetration of European Industry.* Washington, DC: U.S. Government Printing Office. 26 June 1945.) p. 162. [https://www.economicsvoodoo.com/wp-content/uploads/Elimination-of-German-Resources-for-War-Hearing-1945-Part-3-German-Infiltration-of-European-Industry-mas-0015.pdf]

In assessing these bare bones of Germany's industrial war potential certain other less tangible, but none the less important, aspects of her economic base for aggression should be appraised. These include her amazing technical ability to produce new weapons as a result of technological invention, her vast pool of skilled workmen and highly trained scientists, the existence abroad of extensive economic assets and activities, and finally, a highly integrated organization and control of her economy. Each of these aspects of Germany's base for aggression deserves a brief reappraisal as of today.

Ability to produce new weapons and products.—According to recent reports from Germany, it appears that if the Germans could have held out only 6 months longer they would have been able to smash New York City with improved V-2 bombs.

Only a little longer period would have been needed to bring into production the jet-propelled planes that could have reached Washington.

It is not necessary here to elaborate upon the terrifying scientific discoveries which our economic and industrial intelligence is gradually uncovering as we work beneath the lid in Germany. With the memories of her new V-weapons fresh in our minds, little needs to be added except to point out that they just didn't appear out of thin air. They were the fruit of carefully organized and adequately financed research institutions in which large numbers of highly trained and specialized scientists went about their business of inventing and developing the weapons that would establish German world supremacy. The results they achieved and would still achieve if opportunities are provided, spring from the existence of a laboratory here and pilot plant there and a research institution in another place. These institutions and these scientists are still on hand ready to do business for a new Germany when the break comes. Nor will their ideas and inventions be fruitless because of a lack of German capacity to translate them into mass production.

Germany could rapidly set up plants for such new products because of its enormous capacity to produce machines and machine tools, and the huge supplies of machine tools that were built up in advance of need. The plants the victors so innocently permitted to operate after the last war to turn out agricultural, construction, and textile machinery for the devastated regions of Europe were expanded and re-equipped to supply German factories to meet the needs of the war of 1939—already being planned when the armistice of 1918 was signed.

German economic assets and activities outside Germany.—One of the most important bases for German aggression consists of the properties owned or controlled by Germans, which are located outside the physical borders of the country. Coupled with these properties and based upon them, there are a wide variety of economic activities which act as transmission lines for the achievement of German economic and political objectives.

Consolidated Vultee Aircraft Corporation (Convair). 1945. ...By the Skin of Our Teeth. *Life* (27 August) 19:9:2–3.
https://books.google.com/books?id=e0gEAAAAMBAJ&pg=PA2

...by the Skin of our Teeth

Several times during the European phase of this war, victory was almost within Germany's grasp... on land, on the sea, or in the air.

Above all, knowing the vital importance of air supremacy, the Nazis tried time and again to wrest it back from the Allies.

And they almost succeeded.

Time ran out

Especially in the last months of the war, our margin of safety was slimmer than most of us suspected.

Just how slim it was is known best to certain American military experts who have since inspected some of Germany's underground research laboratories and war plants.

Here they saw secret weapons in various stages of development... weapons which might conceivably have turned the trick for the Nazis if they could have used them boldly in a last desperate gamble.

Some of these things can now be revealed. Others cannot—yet.

In one plant, the U.S. Army officers found partially assembled jet fighter planes of radical new design. There were planes potentially better than anything the Allies had in combat at that time.

If time hadn't run out on the Germans, quantities of these jet planes might have changed the balance of air power in their favor.

In a V rocket plant, burrowed 800 feet deep in limestone rock, our technicians found blueprints for a fearful V bomb with an estimated range of 3000 miles.

"We planned to destroy New York and other American cities starting in November," said a German rocket engineer.

Target: U.S.A.

In a converted salt mine, our ordnance officers examined nearly complete jet-propelled heavy bombers... bombers claimed by the Germans to be capable of crashing high explosives into the industrial cities of the eastern United States and flying back again across the Atlantic.

Goering himself said that the planes had been successfully test-flown and would have been in operation if Germany could have held out 3 months longer.

But those catastrophes, and others, never quite came to pass on the German timetable of war. We managed, right to the end, to maintain the air supremacy we had achieved... sometimes *just by the skin of our teeth.* [...]

[This two-page spread from *Life* is reproduced in full on pp. 5210–5211.

Although it was published on 27 August 1945, it was written before the 6 August 1945 bombing of Hiroshima, since it said the war with Japan was still a very serious concern. It references the end of the war in Europe and makes extensive use of postwar Allied discoveries in Europe, several of which are mentioned here but were never publicly disclosed in any other documents. Therefore the spread appears to have been written and finalized between May and July 1945.

The "nearly complete jet-propelled heavy bombers" for intercontinental missions found in the salt mine have never been publicly revealed, and appear to be distinct from the 40 intercontinental jet bombers discovered in Norway. Can documentation on this discovery be found and released? According to information given here, these long-range jet bombers had been successfully test-flown and mass produced, and would have been deployed to bomb American cities no later than the beginning of August 1945. For all of the time and money that Germany must have spent to develop such bombers, and for the long distance they would have had to travel, would their cargo really have been only conventional "high explosives," or would it have actually been atomic bombs? Note that U.S. government censorship would not have allowed any publications to write about atomic bombs prior to the public announcement of the Hiroshima bombing (and this spread was written before that time).

A German rocket engineer was specifically quoted as saying, "We planned to destroy New York and other American cities starting in November." He was not only talking about New York, but many American cities, which would have required a number of intercontinental rockets. Furthermore, he said that those cities would be "destroyed," which would have required atomic bombs and not merely one-ton conventional explosive warheads such as the V-2 rockets delivered to London. Thus this engineer who was apparently deeply involved with and knowledgeable about the German programs indicated that mass-production of both numerous intercontinental rockets and numerous atomic bombs apparently would have been completed before November 1945. That would have required mass production of both to begin well before that time, and prototype intercontinental rockets and atomic bombs to have been completed and tested even before that. From that timeline, the intercontinental rocket and atomic bomb programs must have been extremely advanced by the end of the war—they would have been far beyond the stage of just "blueprints for a fearful V bomb."]

...by the Skin of our Teeth

SEVERAL TIMES during the European phase of this war, victory was almost within Germany's grasp . . . on land, on the sea, or in the air.

Above all, knowing the vital importance of air supremacy, the Nazis tried time and again to wrest it back from the Allies.

And they almost succeeded.

Time ran out

Especially in the last months of the war, our margin of safety was slimmer than most of us suspected.

Just how slim it was is known best to certain American military experts **who have since inspected some of Germany's underground research laboratories and war plants.**

Here they saw secret weapons in various stages of development . . . **weapons which might conceivably have turned the trick for the Nazis if they could have used them boldly in a last desperate gamble.**

Some of these things can now be revealed. Others cannot—yet.

In one plant, the U. S. Army officers found partially assembled jet fighter planes of radical new design. There were planes potentially better than anything the Allies had in combat at that time.

If time hadn't run out on the Germans, **quantities** of these **jet planes might have changed the balance of air power** in their **favor.**

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Target: U. S. A.

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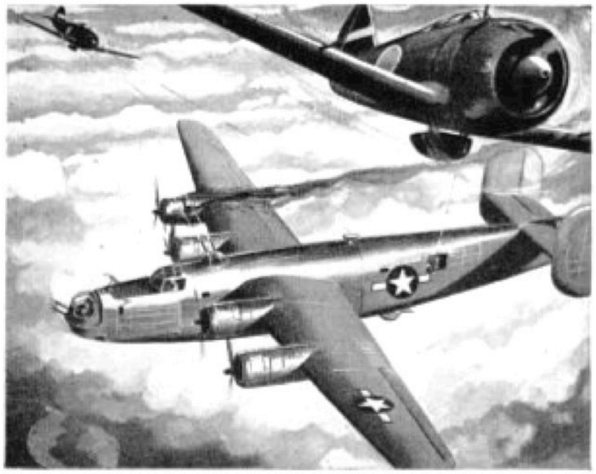
But those catastrophes, and others, never quite came to pass on the German timetable of war. **We managed,** right to

2

Figure E.8: Two-page spread from *Life*, 27 August 1945.

the end, to maintain the air supremacy we had achieved . . . sometimes *just by the skin of our teeth.*



How about Japan?

What's happening in those war plants the Japs have built underground? We wish we knew! We, for one, are not selling *this* enemy short—**not on scientific ingenuity born of desperation.**

Every now and then—close on the heels of dispatches telling how our heroic flyers are knocking Japs out of the sky at a ratio of 10 to 1—comes a disturbing rumor of an entirely new Jap weapon.

This is why it would be one of the costliest mistakes this country could possibly make, if we were to permit ourselves to be lulled into a sense of security because of our *present-day* air superiority.

The race we must win

We are woefully stupid if we assume that Japan isn't working desperately to develop new planes and air-borne weapons that will whittle down our air superiority.

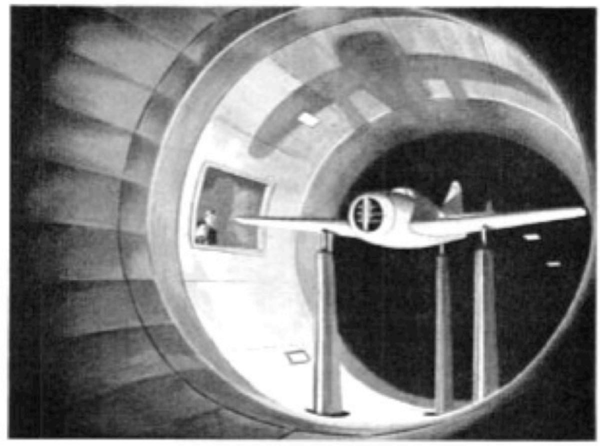
Air supremacy, alone, of course, will not win this war or guarantee a lasting peace in the years to come.

But if we maintain air supremacy in the Pacific, Japan *can't* win.

And as long as we maintain our air superiority after victory, **no aggressor nation is apt to be foolhardy enough to dream of attacking us.**

That is why *constant* and *continuing* research in the field of aeronautics is a MUST for America—today and always!

But experimental research is only the **first step in winning the race that will insure America from attack in the future . . .**



The best planes periodically resulting from this research must be put in production in sufficient quantities to develop *manufacturing techniques and tools* and to keep the nucleus of a manufacturing organization which can be quickly expanded if ever needed.

We must also have enough planes for our Armed Services to train the Flight and Ground Crews in their use. *One or two experimental planes are not enough* to keep our Air Force and manufacturing organizations ready for any emergency.

Only when the design and production "bugs" always present in a new plane are revealed and eliminated by use—can our ever-improving aircraft be considered ***proven* military weapons.**

LET'S KEEP AMERICA STRONG IN THE AIR!

CONSOLIDATED VULTEE AIRCRAFT CORPORATION

San Diego, Calif. · Vultee Field, Calif. · Fairfield, Calif. · Tucson, Ariz. · Fort Worth, Texas · New Orleans, La. · Nashville, Tenn. · Louisville, Ky. · Wayne, Mich. · Dearborn, Mich. · Allentown, Pa. · Elizabeth City, N. C. · Miami, Fla.

Member, Aircraft War Production Council

3

Figure E.9: Two-page spread from *Life*, 27 August 1945.

Figure E.10: Example of an underground factory for Heinkel jets (in this case, He 162 fighters at the Salzberwerk in Tarthun) discovered and photographed by the U.S. Army on 15 April 1945.

Figure E.11: Another photo of the underground factory for Heinkel jets (He 162 fighters at the Salzberwerk in Tarthun) discovered and photographed by the U.S. Army on 15 April 1945.

Figure E.12: 1945 photo of the huge underground factory for Me 262 jet fighters at Kahla. This factory was approximately 15 km from the reported location of an underground factory that was said to have been producing "V-4 two-man rockets" near the end of the war (pp. 5365–5373). There were also other large underground factories for Me 262 fighters throughout Reich territory, such as St. Georgen/Gusen in Austria (pp. 4967–4969).

Figure E.13: Remains of the huge underground factory for Me 262 jet fighters at Kahla.

Figure E.14: Remains of the huge underground factory for Me 262 jet fighters at Kahla [photo courtesy of Frank Döbert].

Figure E.15: Remains of the huge underground factory for Me 262 jet fighters at Kahla [photo courtesy of Frank Döbert].

Albert Ducrocq. 1947. *Les Armes Secrètes Allemandes.* Paris: Berger-Levrault. pp. 163–164.

Les bombardiers lourds intercontinentaux Heinkel

C'est vraisemblablement à partir du mois de juin 1945 que l'Allemagne pensait attaquer le territoire américain. Notons-le: alors que la mise en action d'autres armes secrètes, comme les bombes volantes et les nouveaux avions-fusées, était littéralement imminente, cette menace contre les États-Unis doit être située à six semaines ou deux mois après la date qui marqua l'effondrement du Reich. On nous permettra de la trouver pratiquement tout aussi dangereuse, d'autant plus que les V-2 amphibies, elles aussi, auraient très bien pu transporter des bombes atomiques.

Mais les Allemands préparaient, en plus, des raids de bombardement sur l'Amérique à partir de leurs bases européennes. Ils avaient, en effet, mis en construction sur une assez vaste échelle des bombardiers géants de type Heinkel, capables de couvrir sans escale de 11.000 à 12.000 kilomètres, c'est-à-dire largement un aller et retour Europe-Amérique!

La Norvège avait été choisie comme point de concentration de ces bombardiers intercontinentaux. Les Allemands avaient aménagé près d'Oslo le plus grand aérodrome de toute la Luftwaffe. Et il n'est pas sans intérêt de noter que, le 27 avril 1945—trois jours avant la fin de la bataille de Berlin et la disparition d'Hitler—400 [sic: 40] de ces bombardiers étaient bel et bien rassemblés sur l'aérodrome en question, prêts à prendre leur envol vers l'Amérique. C'est le 21ᵉ Groupe d'armées américain [sic: U.K.] qui devait les découvrir deux semaines plus tard...

Heinkel intercontinental heavy bombers

Germany was probably thinking of attacking American territory beginning in June 1945. It should be noted that while the use of other secret weapons, such as flying bombs and new rocket planes, was literally imminent, this threat to the United States must be located six weeks or two months after the date of the collapse of the Reich. We are allowed to consider it almost as dangerous, especially since the amphibious V-2s, too, could very well have carried atomic bombs.

But the Germans were also planning bombing raids on America from their European bases. They had, in fact, built giant Heinkel-type bombers on a fairly large scale, capable of covering non-stop 11,000 to 12,000 kilometers, i.e. a round trip from Europe to America!

Norway had been chosen as a concentration point for these intercontinental bombers. The Germans had set up near Oslo the largest airfield of the Luftwaffe. And it is not without interest to note that, on April 27, 1945—three days before the end of the battle of Berlin and the demise of Hitler—400 [sic: 40] of these bombers were indeed gathered on the airfield in question, ready to take off for America. It was the 21st American [sic: actually British] Army Group that was to discover them two weeks later...

[Albert Ducrocq (1921–2001) was a French scientist and science writer who was involved in the French investigations of German science and German scientists near the end of the war and after the war. He would have had considerable first-hand knowledge about German scientific plans and capabilities, although some of his knowledge would have been second- or third-hand. His story of the Heinkel intercontinental bombers agreed with the 29/30 June 1945 articles in English-speaking newspapers, but he also included several details that were not in those stories. It is not clear where Ducrocq got those details.

Note that Ducrocq suggested that Germany possessed atomic bombs and planned to deliver them via the Heinkel bombers or other means. Note too that he mentioned "amphibious V-2s," submarine-launched missiles that also would have been nuclear armed; see Section E.4.

For more information from Ducrocq, see pp. 5380, 5658–5659, 5666.

For independent confirmation of German plans for a nearly simultaneous nuclear attack on multiple Allied targets, see pp. 4549–4550, 4587, 4621, 4627–4665, 4679–4681, 4766, 5038, 5454–5466.]

Rudolf Lusar. 1956. *Die deutschen Waffen und Geheimwaffen des 2. Weltkrieges und ihre Weiterentwicklung.* 1st ed., Munich: J. F. Lehmanns. p. 49

Kurz vor dem Kriegsende kam Professor Heinkel noch mit einem schweren Vierstrahltriebwerk-Bomber heraus, anscheinend He-343 (?), der eine Reichweite von 11000 bis 12000 km haben sollte. Dieses Bombenflugzeug war bestimmt Amerika anzugreifen. Nach amerikanischen Berichten waren am 27. April 1945 mehrere dieser Maschinen auf einem Flugplatz bei Oslo, Norwegen, versammelt, wo sie der amerikanischen 21. Armee in die Hände gefallen sein sollen. Sie sollten im Mai den ersten Einsatz gegen New York fliegen.

Just before the end of the war, Professor Heinkel came out with a heavy four-jet engine bomber, apparently He-343 (?), which was supposed to have a range of 11,000 to 12,000 km. This bomber was destined to attack America. According to American reports, on April 27, 1945, a number of these machines were massed at an airfield near Oslo, Norway, where they were to fall into the hands of the American [sic: actually British] 21st Army. They were supposed to be flying to New York in May.

[The details provided by Lusar were very similar to those provided by Ducrocq. Did Lusar obtain his information from Ducrocq, or did Lusar and Ducrocq have other sources that provided the same information? Lusar was apparently speculating about the exact identity of the Heinkel intercontinental bomber.]

Ernst Heinkel [Heinkel 1956, pp. 236–241, 246–247; see also Myhra 1998a, pp. 156–160]

On this occasion [early 1942] I was so upset that I declared, "At the present stage of jet units I am convinced we can produce jet bombers as well as very fast fighters in an extremely short time. I cannot see why we should delay for a moment. The Ministry must form a commission to eliminate all difficulties. It's a matter of indifference whether Junkers or BMW units [jet engines] or any other units are used. The plane can, in any case, be built by the middle of next year."

The conference ended without result. Neither Milch nor his colleagues would decide upon the building of jets. [...]

No one will take exception to my having had my doubts about the technical soundness of the reasons for scrapping my He 280...

After the rejection of the He 280 I remained excluded until the summer of 1944 from the development of jet airplanes, which Sauer now carried on with great vigor. This development, however, remained limited chiefly to the Me 262 and the outstanding Arado reconnaissance plane Ar 234. Much time had been lost and the general situation was now so precarious that up to October, 1944, only from one to three Me 262's appeared each month. Then for the first time Sauer's ruthlessness and powers of organization and improvisation made themselves felt, and by the end of the war about 1,600 Me 262's were built, under the indescribable conditions that prevailed during those last six months.

They were produced in countless factories and small workshops, both above and below ground. Because of the disorganized railroad system, road convoys had to bring the individual parts to the assembly sheds. Smaller parts were brought by courier in haversacks. It is understandable that only a few hundred of these planes actually reached the last front-line units which still remained in South Germany and were largely destroyed from the air simply because it was no longer possible to supply them with some last piece of equipment, such as a cabin canopy. German industry could not bring the two-engined Me 262 into mass production, in spite of all improvisations and efforts. Destruction by enemy bombing, shifting of plants, the flight from occupied territory and constant communications breakdowns made it impossible. [...]

When I, too, received orders at Vienna to build a light single-engined jet fighter, I realized that this was a last attempt to struggle against the inevitable. Yet the fact that I had been shut out from the revolutionary development of jet aircraft, even though I had been the first to take it up, had left such scars in me that I was eager to prove my supremacy in the field once more.

[...] Now we started to work on the last jet fighter of the German Luftwaffe in World War II. It was the He 162, misnamed "people's fighter."

Construction began on September 24, 1944, in Vienna. [...]

All arrangements had been made when the heavy Allied attacks on German communications started in the spring of 1945. A few weeks later, despite our efforts, there was no further possibility of achieving a regular output. On April 1, 1945, we had to close all our factories in Vienna in the face of the advancing Russian armies.

Thus ended the last great effort in the field of jet-plane building, without a single plane ever getting to the front. Most of the completed planes were destroyed in the factories or in Oranienburg, where the Lufthansa had tried to open a test-flight center, or they fell into the hands of the British, American or Russian engineers advancing with their victorious armies through Germany. [...]

After returning home on August 5, 1945, I wanted to see the situation in Jenbach with my own eyes. [...]

Stopping at Landsberg, I searched for Siegfried Günter, who had escaped there in the middle of April, 1945, and had managed to carry on a primitive office with thirty-five other employees from my design office. I found him—the most important expert on airplane structures and aerodynamics that Europe had at that time—living with his wife in a small room. He was working with ten of my people in a technical office that an American, Major Cardenas, had established on the airfield. They had tried in vain to call the attention of the American military authorities to the importance of Günter.

Günter was too modest and shy to blow his own horn. Now he was happy that Cardenas had enabled him to carry on his scientific work. This work embraced everything we had planned for the future in the way of fresh developments in jet propulsion. He was particularly engrossed with new "flying wing" types. I hoped on this visit that Günter would find a permanent outlet for his activities, either in Landsberg or in America.

I knew him. His only happiness was in scientific work and I told this to Cardenas. A few weeks later, however, at the end of September, Cardenas closed his office and flew to England. He informed Günter that a larger office was planned in Wiesbaden and that he would send for him, but he never did.

Günter remained in Landsberg until the spring of 1946, when his money ran out. During the last weeks he constantly repeated that he had no skill for anything else—he had to build airplanes. If the West didn't want him, he might have to work for the East. At that moment, I was empty-handed and could do nothing for the man who for so many years had been my closest collaborator and whose unique abilities no one could appreciate better than myself.

In the spring of 1946 he used the last of his money to go to Berlin to see his father-in-law, who kept a garage. He still hoped the Americans would send for him, and left his address in case some message should arrive, but no message came.

Instead, the Soviet special experimental unit OKB IV, in Berlin, took him on. Günter continued to work on our latest designs and was then taken to Russia, where, I am convinced, he worked on constructions that today have become a problem for the Western world.

[Ernst Heinkel did not mention the 40 giant bombers in Norway, but due to Cold War censorship and Heinkel's motivation to avoid self-incrimination, one would not expect him to. However, he did mention that he had long been a strong proponent of jet bombers that he believed could be built quickly, that his company participated in a late-war push to build new jet aircraft that nearly came to fruition, that those aircraft were found by the Allies, that his top designer Siegried Günter had been engrossed with flying wing bomber designs, and that Günter had submitted his information on the flying wings to Major Robert L. Cardenas [see Johnsen 2014, pp. 119–120] by the end of September 1945.]

Figure E.16: Siegfried Günter and Ernst Heinkel (1941).

Dieter Herwig and Heinz Rode. 2000. *Luftwaffe Secret Projects: Strategic Bombers 1935-1945.* 2nd ed. Hinckley, UK: Midland. p. 68:

Heinkel Projects for a Four-Jet Long-Range Bomber

According to a report which Dipl-Ing Siegfried Günter—who had been head of Heinkel's Project and Design Department in Vienna—was required to write for the US Technical Service on 1st October 1945, Heinkel engineers had been engaged on designs for four-jet long-range bombers right up until May 1945. These designs included not only aircraft of standard 'fuselage and tail' configuration, but also of flying-wing layout.

Work was concentrated particularly on one flying-wing bomber which was powered by four HeS 109-011 jet engines, each developing 1,300 kg (2,865 lb) static thrust, and which weighed 26 tons.

Another flying-wing bomber was to have been fitted with either four BMW 109-018s, each of 3,000 kg (6,612 lb) static thrust, or six Junkers Jumo 004 jet engines, each of 1,300 kg (2,865 lb) static thrust. This machine which possessed a very high wing loading, would have weighed 60 tons.

[...] Again according to Günter's report, the 60-ton flying-wing project was to have combined a 3,000 kg (6,612 lb) bomb load with a range of 28,000 km (17,388 miles).

[Can this 1 October 1945 report by Siegfried Günter be located? It appears to have been filed by Major Robert Cardenas when he left Germany.

Is this information directly related to the 40 Heinkel intercontinental bombers that were reported to have been found in Norway?

Oslo to New York is approximately 5930 km (3680 miles), or approximately 11,860 km (7360 miles) roundtrip. Oslo to Los Angeles is approximately 8570 km (5320 mi), or approximately 17,140 km (10,640 mi) roundtrip.

Are there UK or US aerial surveillance photos of the Oslo-area Luftwaffe airfields from 1944 or 1945?

Are some postwar Allied long-range jet bomber designs such as the British Valiant, Victor, and Vulcan series directly descended from these planned or completed German bombers?

Other German intercontinental jet bombers had been designed and may have been in various stages of development, testing, or production by the end of the war. [Herwig and Rode 2000; Miranda 2015; Masters 1982, especially pp. 79–80; Myhra 1998a, especially pp. 156–160; Griehl 2005, Vol. 2].]

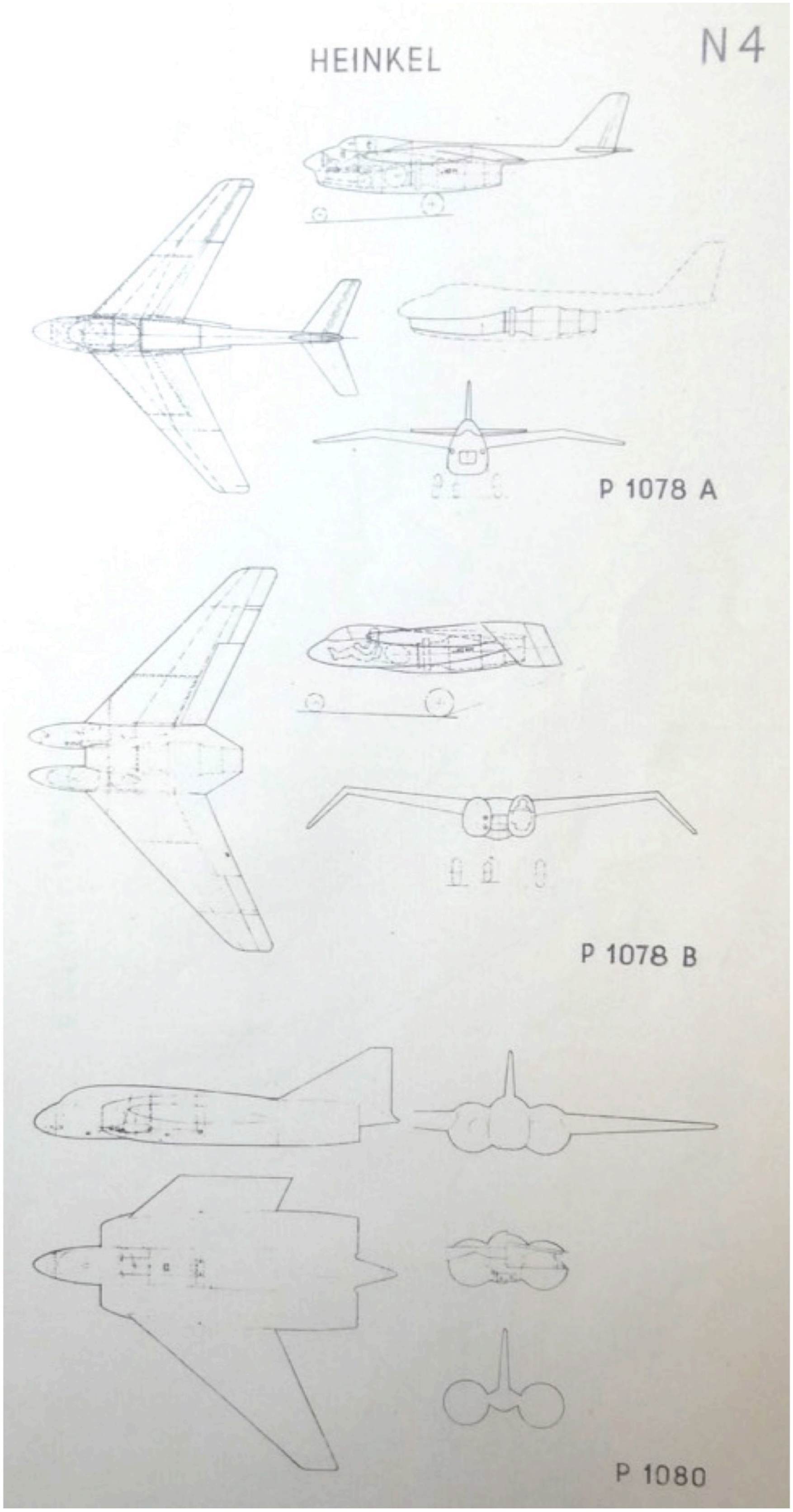


Figure E.17: Wartime Heinkel jet bomber designs now in the U.K. Imperial War Museum, Duxford [Newton 1946].

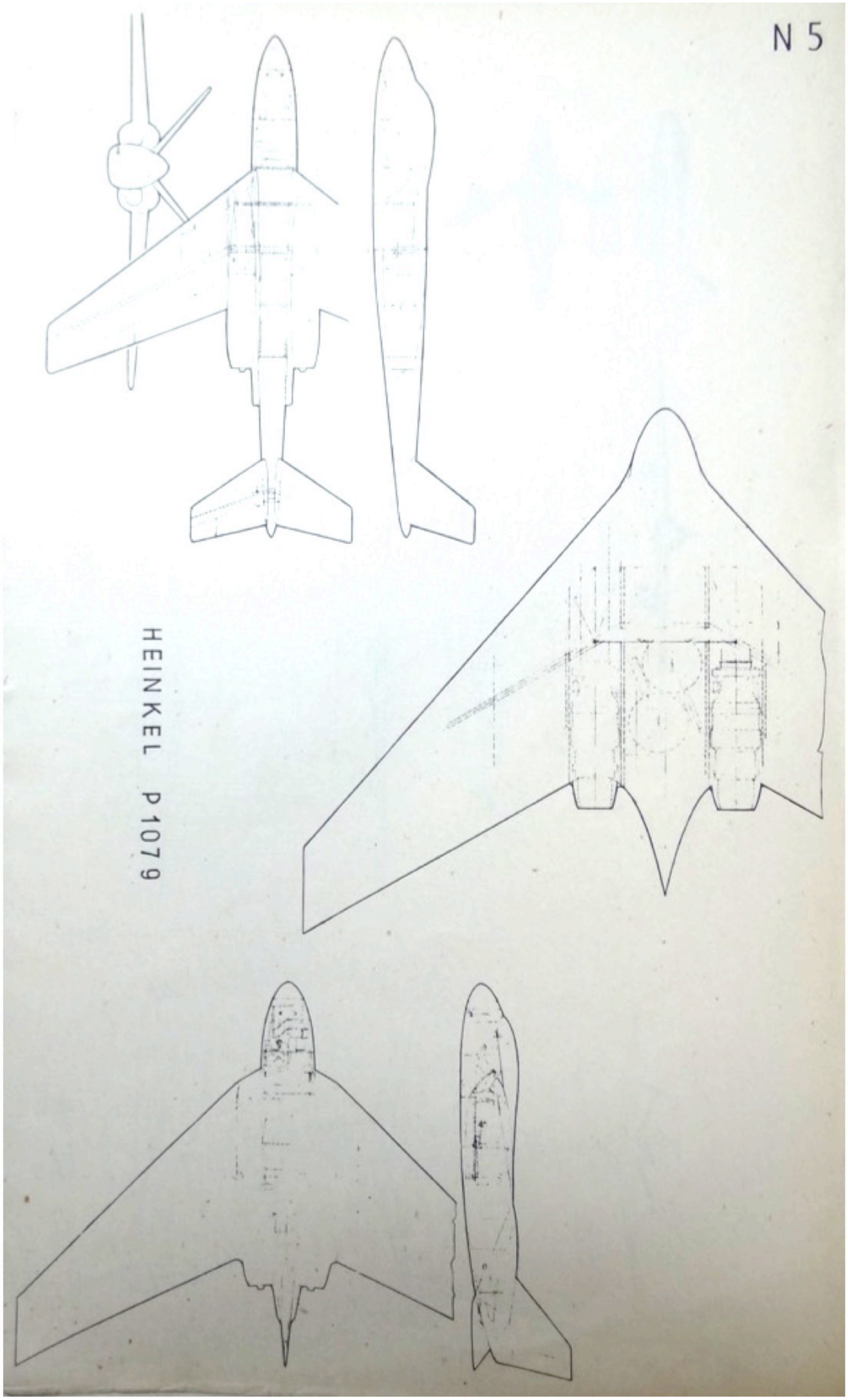


Figure E.18: Wartime Heinkel jet bomber designs now in the U.K. Imperial War Museum, Duxford [Newton 1946].

Figure E.19: British Vulcan bombers (1957).

FOIA: Operation Harass and the Horton [sic: Horten] Brothers. Control Number: FP-10-027542. Activity Number: FA-10-4911. Initial Reception Date: 7/13/2010. Requested by: Jacobsen, Annie. pp. 202–205 and 318–325.
http://documents.theblackvault.com/documents/ufos/ArmyUFOs.pdf
http://documents.theblackvault.com/documents/foia/4402F-12Greenewald_Redacted.pdf

[See pp. 5228–5231 for this document. It was released along with many other unrelated documents as part of a Freedom Of Information Act (FOIA) request.

This document was a proposal sent to the U.S. Army after World War II by a group of German aerospace engineers and pilots, including Albert Kalkert (German, 1902–1977, p. 1679) and Herbert Hintze (German, 1921–??). They offered to immediately begin building for the United States a Horten-style flying wing intercontinental bomber with 6 jet engines, various armaments, a 48-meter wingspan, an operating radius of 7,000 km (14,000 km total range round trip), and a speed of 900 km/hour ("900 Km/St." on the drawing, or 250 m/sec).

Since their offer was so specific and so immediate, was it based on an identical aircraft (or multiple aircraft) that they had already built during the war? For reports that such aircraft were actually constructed and even flown during the war, see for example p. 5202.

Note that the combined range and speed strongly suggest that the German engineers had a detailed and ready knowledge of (or access to) turbofan engines, not just the more common wartime German turbojet engines (p. 5779). In fact, a suitable turbofan engine that was specifically designed for a cruise velocity of 250 m/sec was first demonstrated in 1943–see pp. 5233–5241.]

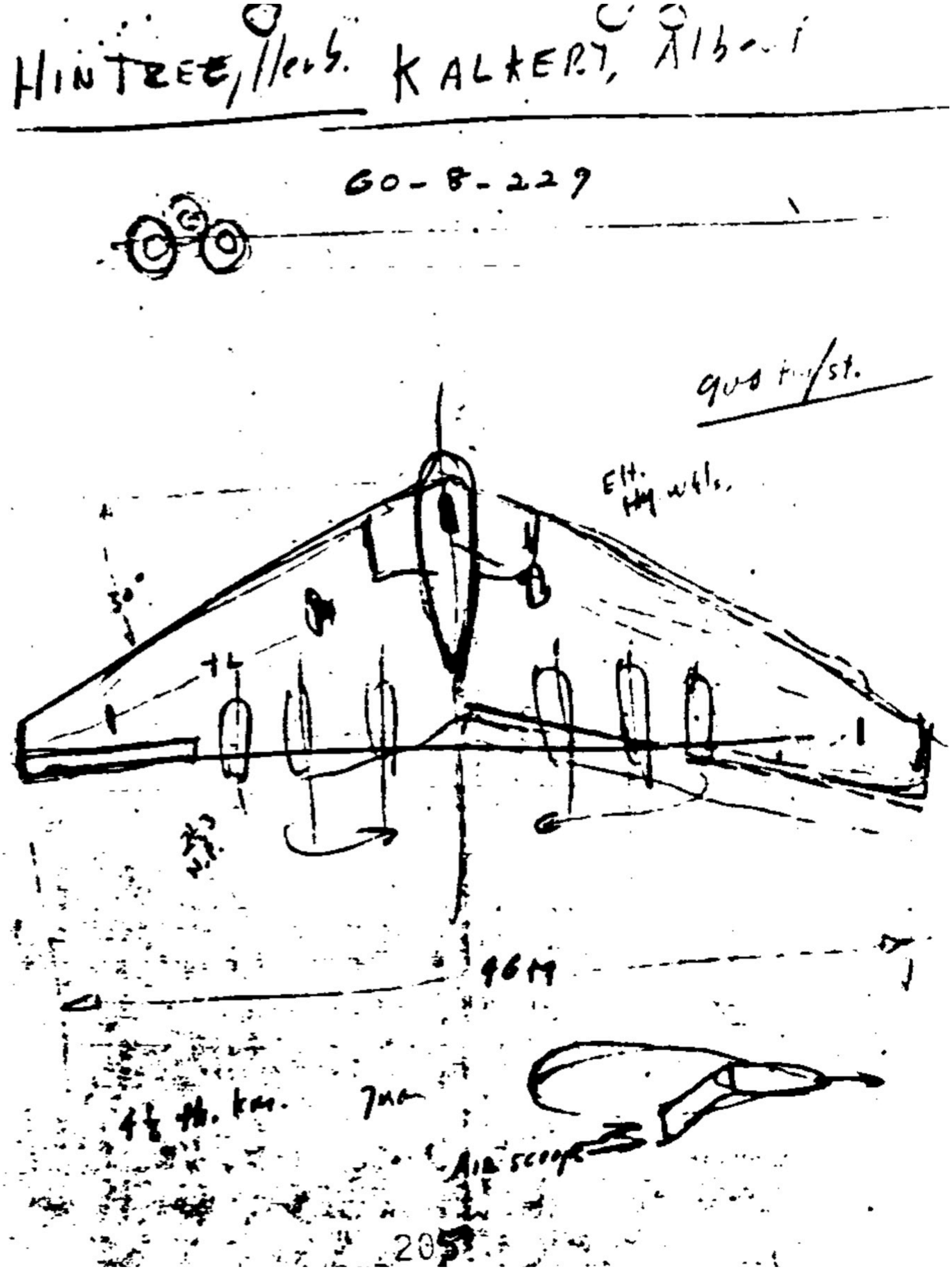


Figure E.20: After the war, a group of German aerospace engineers offered to immediately begin building for the U.S. military a 7,000-km-range (14,000-km round trip), 6-jet-engine flying wing bomber. Was their offer based on an aircraft they had already built during the war?

Bericht.

Die Ermittlungen über das Projekt "Horten-Parabel sind abgeschlossen.
Die Ergebnisse können folgendermassen zusammengefasst werden.

1 .
Die Russen sind im Besitz der einschlägigen Pläne und werden von Deutschen Fachleuten unterstützt.
Der Serienbau der sogenannten Horten 13 (Modell mit 2 TL-Triebwerken) soll beim Russen nicht über das Anfangsstadium hinaus gediehen sein. Die Zahl 300 die für den Ausstoss genannt wurde, ist wesentlich zu hoch gegriffen. Die Flugzeit der Horten 13 wird von Fachleuten mit 1 Stunde angegeben. Dieses Modell ist nur zur Verteidigung geeignet.
Die grosse Horten 48 mtr. Spannweite, 6 TL-Triebwerke. 7000 km Aktions-Radius ist beim Russen nicht über das Projekt hinausgediehen, da sich nur ein geringer Teil der einschlägigen Mitarbeiter beim Russen befindet.

2
Zur Entwicklung dieser Angelegenheit wird folgender Vorschlag gemacht:
Wir sind jetzt in der Lage, innerhalb von 4 Wochen den einschlägigen Mitarbeiterstab aufzustellen, der sich mit dem obigen Projekt befasst hat. Der Chef-Konstrukteur hat bereits günstige Angebote aus der Türkei und der Sowjet-Union erhalten, erklärte sich jedoch nach Rücksprache grundsätzlich bereit für die US-Army zu arbeiten. Alle anderen in Frage kommenden Mitarbeiter (etwa 30) sind grundsätzlich zur Zusammenarbeit bereit, bitten jedoch um die Bekanntgabe der finanziellen- u. Existenz-Bedingungen, da die meisten sich nach dem Zusammenbruch eine eigene Existenz gegründet haben und naturgemäss nicht gern bereit sind, Bindungen mit Unsicherheitsfaktoren einzugehen.
Ferner ist zu klären, ob die Versuchsgruppe in Deutschland oder den Verein. Staaten arbeiten soll.
Wenn die US vorgesehen sind, so erscheint Sicherung gegen unvorhergesehene Entlassung angezeigt. (Chef-Konstrukteur macht das zur Bedingung, da bereits mehrere Jahre in US-Flugzeug-Industrie gearbeitet, um sich gegen Eventualit. zu sichern)
Nach seinen Angaben kann nach Aufgabenstellung der konstruktive Teil in allerkürzester Zeit abgeschlossen werden.
Wenn das Projekt anlaufen soll, bitten wir um Zuweisung eines PKW u. Betriebsstoff, um die Aufstellungs-Organisation durchführen zu können.
Weiterhin wird um die Unterstützung der US-Militär-Regierung gebeten, wenn verschiedne Mitarbeiter aus der R. Zone geholt werden müssen.

Zu Beginn der Arbeit bitten wir um genaue Aufgabenstellung seitens der US-Army, z.B.
wird Holzbauweise verlangt, wieviel Triebwerke, Aktionsradius. Zuladung, Besatzungs-Stärke, Waffen-Anordnung etc.

Kalkert Abgl. Angebot, muss alles dann!
Flugkapitän Hanna Reitsch
Die aufgeführten Leute hat Kalkert an der Hand

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Figure E.21: After the war, a group of German aerospace engineers offered to immediately begin building for the U.S. military a 7,000-km-range (14,000-km round trip), 6-jet-engine flying wing bomber. Was their offer based on an aircraft they had already built during the war?

REPORT,

THE DISCUSSIONS CONCERNING THE PROJECT "HORTEN-PARABEL" ARE FINALIZED. THE RESULT CAN BE SUMMED UP IN THE FOLLOWING MANNER:

1. THE RUSSIANS ARE IN POSSESSION OF THE RELEVANT PLANS AND WILL BE SUPPORTED BY GERMAN SPECIALISTS. THE CONSTRUCTION SERIES OF THE SO-CALLED HORTEN 13 (MODEL WITH 2-TL (SIC) POWER UNIT) SHOULD NOT BE DEVELOPED BEYOND THE INITIAL STAGES BY THE RUSSIANS. THE NUMBER 300, NAMED AFTER THE LAUNCH, HAS ESSENTIALLY BEEN FIXED TO HIGH. THE SPECIALISTS HAVE STATED THE FLIGHT TIME OF THE HORTEN 13 TO BE ONE HOUR. THIS MODEL IS ONLY SUITABLE FOR DEFENSE. THE LARGE HORTEN (48 METER WINGSPAN, 6 TL (SIC) POWER UNIT, 7000 KILOMETER OPERATING RADIUS) IS NOT BEYOND RUSSIAN DEVELOPMENT, BUT THERE ARE ONLY A SMALL PORTION OF KNOWLEDGEABLE RUSSIANS CO-WORKERS TO BE FOUND.

2. FOR THE DEVELOPMENT OF THIS OPPORTUNITY THE FOLLOWING RECOMMENDATION ARE MADE:
WE ARE NOW IN THE POSITION OF ASSEMBLING WITHIN FOUR (UNREADABLE WORD) THE PERTINENT CO-WORKER STAFF THAT WORKED WITH THE ABOVE MENTIONED PROJECT. THE CHIEF ENGINEER HAS ALREADY RECEIVED REASONABLE OFFERS FROM TURKEY AND THE SOVIET UNION, HOWEVER, HE EXPLAINED HE IS READY FOR FUNDAMENTAL DISCUSSIONS WITH THE U.S. ARMY. ALL OTHER CO-WORKERS IN QUESTION (6 TO 30) ARE FUNDAMENTALLY READY TO JOIN WORK, THEY HAVE REQUESTED HOWEVER, DUE TO THE ANNOUNCEMENT OF THE FINANCIAL AND EXISTING CONDITION, THAT MOST HAVE HAD CREATED AFTER THE FAILURE OF THERE OWN LIVELIHOOD AND ARE NATURALLY NOT HAPPY TO ENTER INTO CONTRACTS WITH UNSAFE FACTORS. IT IS YET TO BE DECIDED, WHETHER THE RESEARCH GROUP WILL WORK IN GERMANY OR THE U.S. WHEN THE U.S. BECOMES AWARE, IT APPEARS INSURANCE AGAINST UNFORESEEN DISMISSAL IS DEEMED APPROPRIATE. (THE CHIEF ENGINEER HAS SET THE CONDITION, THAT ONE MUST HAVE ALREADY WORKED MANY YEARS IN THE U.S. AIRPLANE INDUSTRY TO PROTECT AGAINST THIS POSSIBILITY) AFTER THEIR INSTRUCTION, THE CONSTRUCTION PORTION CAN BE FINISHED IN A SHORT AMOUNT OF TIME. WHEN THE PROJECT SHOULD START, WE ASK FOR ASSIGNMENT OF A CAR WITH FUEL TO BE PROVIDED BY THE BUILDING ORGANIZATION. IN THE FUTURE, WE ASK FOR THE ASSISTANCE OF THE US MILITARY GOVERNMENT IN PICKING UP DIFFERENCE CO-WORKERS FROM THE R-ZONE WHEN NEEDED.

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Figure E.22: After the war, a group of German aerospace engineers offered to immediately begin building for the U.S. military a 7,000-km-range (14,000-km round trip), 6-jet-engine flying wing bomber. Was their offer based on an aircraft they had already built during the war?

TO BEGIN THE WORK, WE ASK FOR EXACT ORDERS FOR THE U.S. ARMY, FOR EXAMPLE, TIMBERWORK STYLE, HOW MANY POWER UNITS, OPERATING RADIUS, ADDITIONAL LOAD, CREW SIZE, WEAPONS LAYOUT, ETC.

TRANSLATOR'S NOTE: THE GERMAN CURSIVE WRITING AT THE BOTTOM OF THE PAGE WAS UNREADABLE AND COULD NOT BE TRANSLATED. CERTAIN TRANSLATOR'S DISCRETION WAS USED DURING TRANSLATION IN ORDER TO HAVE IT MAKE SOME SENSE. MANY WORDS USED IN THE GERMAN TEXT HAD MULTIPLE TRANSLATIONS. THIS DOCUMENT THEREFORE, REPRESENTS A "BEST GUESS" TRANSLATION OF THE GERMAN TEXT PROVIDED.

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Figure E.23: After the war, a group of German aerospace engineers offered to immediately begin building for the U.S. military a 7,000-km-range (14,000-km round trip), 6-jet-engine flying wing bomber. Was their offer based on an aircraft they had already built during the war?

NARA Still Pictures, RG 111 SCA---Records of the Chief Signal Officer. Prints: U.S. Army Signal Corps Photographs of Military Activity During WW II and the Korean Conflict, 1941-1954. Captured German Equipment, German, Box 3353, Book 15, SC 314829.

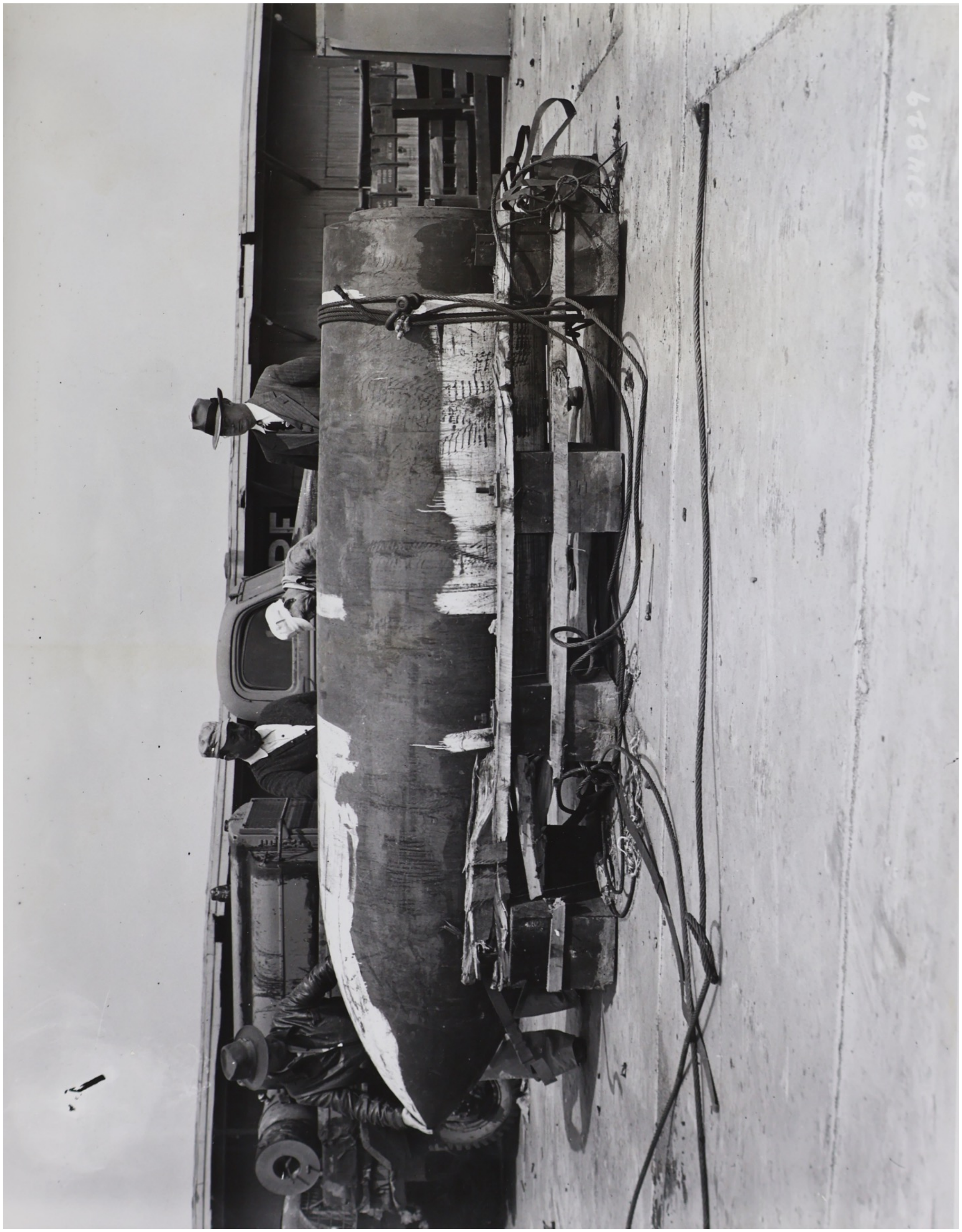


Figure E.24: Original photo caption: "Ordnance experts examine a 35,000 pound German giant aerial bomb upon its arrival at the New Orleans Port of Embarkation, La., from Germany. 11 March 1948." What wartime German aircraft were intended to carry a 35,000 lb [15.9 metric ton] bomb? [NARA Still Pictures, RG 111 SCA—Records of the Chief Signal Officer. Prints: U.S. Army Signal Corps Photographs of Military Activity During WW II and the Korean Conflict, 1941–1954. Captured German Equipment, German, Box 3353, Book 15, SC 314829.]

Karl Leist, and Hans Georg Wiening. 1963. *Enzyklopädische Abhandlung über ausgeführte Strahltriebwerke.* pp. 356–360: Daimler-Benz-Triebwerk 109-007.

Die Firma Daimler-Benz began Mitte 1939 als letzte der deutschen Firmen mit der Entwicklung von Strahltriebwerken. Dies war in ester Linie die Folge davon, daß die Kapazität des Werkes weitgehend durch die Entwicklung und Fabrikation der Daimler-Benz-Kolbenflugmotoren ausgelastet war. Auch während des Krieges, wo erklärlicherweise die in sehr viele Flugzeugbaumuster eingebauten DB-601-, DB-605- und DB-603-Motoren mit ihren verschiedenen Abarten einen außerordentlichen Einsatz des gesamten Werkes erforderten, konnte sowohl in der Konstruktion wie in der Werkstatt nur sehr allmählich die auf die Gasturbinenentwicklung angesetzte Mannschaft verstärkt werden.

Der späte Beginn der TL-Entwicklung hatte zur Folge, daß die Firma vom Reichsluftfahrtministerium, da schon genügend Firmen auf einfache Strahltriebwerke angesetzt zu sein schienen, mit einer Weiterentwicklungsaufgabe, nämlich Schaffung eines Triebwerkes mit besonders geringem Kraftstoffverbrauch für längere Einsatzzeiten, betraut wurde, welches als Zweikreistriebwerk entwickelt werden sollte. Da bei dieser komplizierten Einheit gleichzeitig ein größerer Schub als bei den anderen gefordert wurde und außer dem späteren Entwicklungsbeginn die Erfahrungen, die an einem einfachen TL-Gerät hätten gesammelt werden können, übersprungen werden mußten, ergab sich hiermit eine Aufgabe, die besonders hohe Anforderungen an die Entwicklung stellte. Außerdem führte diese zu einer großen Reihe von zusätzlichen Problemen, da die spezielle Zielsetzung des Projektes, nämlich die Erreichung höchster Wirtschaftlichkeit durch den Ballastluftkreislauf und seine speziellen Forderungen, ein besonders starkes Heranrücken an die Grenzen der ausführbaren Werte in bezug auf Druckverhältnisse, Gastemperaturen usw. forderte. Hierdurch war bei dem damaligen frühen Entwicklungsstand der Strahltriebwerke und dem gänzlichen Fehlen von Erfahrungen, auf die man sich hätte stützen können, eine schnelle und einfache Lösung sehr erschwert.

Daimler-Benz was the last of the German companies to begin developing jet engines in mid-1939. This was primarily the result of the fact that the plant's capacity was largely utilized by the development and production of Daimler-Benz piston aircraft engines. Even during the war, when the DB-601, DB-605, and DB-603 engines with their various versions, which were installed in a large number of aircraft models, required an extraordinary commitment from the entire plant, it was only possible very gradually to strengthen the team dedicated to gas turbine development, both in the design department and in the workshop.

The late start of TL [turbojet] development meant that the company was entrusted by the Reich Aviation Ministry, since enough companies already seemed to be focused on simple jet engines, with a further development task, namely the creation of an engine with particularly low fuel consumption for longer operating times, which was to be developed as a dual-flow [turbofan] engine. Since this complicated unit also required greater thrust than the others and, apart from the later start of development, the experience that could have been gained on a simple TL unit had to be skipped, this resulted in a task that placed particularly high demands on development. Moreover, it led to a large number of additional problems, since the special objective of the project, i.e. to achieve maximum efficiency through the cold air flow and its special requirements, demanded a particularly strong approach to the limits of feasible values in terms of pressure ratios, gas temperatures, etc. This meant that the development of the TL unit at that time was not possible. Given the early stage of development of jet engines at that time and the complete lack of experience on which to draw, this made it very difficult to find a quick and simple solution.

Da der geforderte Kraftstoffverbrauch außerordentlich niedrig war, mußte zu einer für damalige Verhältnisse sehr hohen Verdichtung übergegangen werden (ca. 1: 8), die, da sonst durch zu viele Kompressorstufen die Länge außerordentlich groß ausgefallen wäre und auch die kritische Drehzahl kaum hätte beherrscht werden können, zu einem gegenläufigen Verdichter führte, der in einer Lösung von der Aerodynamischen Versuchsanstalt Göttingen, in einer späteren Parallelausführung von der Firma Voith konstruiert wurde. Die Entspannungsanfangstemperatur wurde—ebenfalls mit dem Ziel bester Wirtschaftlichkeit—auf 1100^o C festgelegt. Um diese hohen Temperaturen für die Laufschaufeln erträglich zu machen, wurden diese gekühlt, und zwar vermittels einer Teilbeaufschlagung durch Luft, die nicht auf den Brennkammerdruck, sondern nur auf den Druck hinter der Turbine verdichtet war. Für diese Kühlmethode, die als einzige im praktischen Betrieb eine Temperatur von 1100^o C bereits erlaubt hatte, lagen die Verhältnisse gerade beim Zweikreistriebwerk deswegen besonders günstig, weil der Verdichter, die Turbine und die Brennkammern von dem zweiten Kreis (Ballastluft) umströmt wurden, dem die Kühlluft zwanglos entnommen werden konnte. Auch ließ sich der durch die Teilbeaufschlagung etwas größere Turbinenraddurchmesser ohne weiteres in dem Hauptspantquerschnitt unterbringen, der durch den Verdichterdurchmesser zuzüglich des zweiten Kreises sowieso nötig war. Die für die Gastemperatur von 1100^o C ausreichende Kühlwirkung der auch in der ausländischen Literatur günstig beurteilten* kühlenden Beaufschlagung mit unverdichteter Luft war vorher aus einer ganzen Reihe von Versuchen an Abgasturbinenrädern mit geeignet geformten Schaufeln festgestellt worden, bei denen Dauerläufe über 200 Stunden mit höchsten Drehzahlen bei dieser Temperatur anstandlos durchgeführt worden waren.

* Vgl. z. B. JUDGE, Modern Gas Turbines.

Since the required fuel consumption was extraordinarily low, a very high compression ratio (approximately 1:8) had to be used, which, since the length would otherwise have been extraordinarily large due to too many compressor stages and the critical speed could hardly have been controlled, led to a counter-rotating compressor, which was designed in one solution by the Aerodynamische Versuchsanstalt Göttingen and in a later parallel design by the Voith company. The initial expansion temperature was set at 1100^o C—also with the aim of achieving the best efficiency. In order to make these high temperatures bearable for the rotor blades, they were cooled by means of a partial admission of air, which was not compressed to the combustion chamber pressure, but only to the pressure behind the turbine. The conditions for this cooling method, which was the only one to permit a temperature of 1100^o C in practical operation, were particularly favorable for the dual-flow engine because the compressor, the turbine and the combustion chambers were surrounded by the duct carrying the second flow (cold air), from which the cooling air could be taken without constraint. Also, the somewhat larger turbine wheel diameter due to the partial pressurization could be easily accommodated in the main bulkhead cross-section, which was necessary anyway due to the compressor diameter plus the second flow. The cooling effect of the non-compressed air, which is also favorably assessed in foreign literature*, was sufficient for the gas temperature of 1100^o C. This had previously been established from a whole series of tests on exhaust gas turbine wheels with suitably shaped blades, in which endurance runs over 200 hours at maximum speeds had been carried out at this temperature without any problems.

* Cf., e.g., JUDGE, Modern Gas Turbines.

Als besonderes Kennzeichen der Konstruktion dieses Zweikreistriebwerks soll noch genannt werden, daß die Schaufeln zur Verdichtung der Ballastluft, also des zweiten Kreises, auf dem Außenläufer des gegenläufigen Verdichters angebracht waren, wodurch die Baulänge noch weiter verringert wurde.

Das DB-Triebwerk 109-007, wie die beschriebene Zweikreisentwicklung genannt wurde, sollte bei 250 m/sec Fluggeschwindigkeit in 6 km Höhe einen Schub von 600 kp erzeugen, das entsprach einer Vortriebsleistung von 2000 PS. Die Gastemperatur wurde aus den besprochenen Gründen auf 1100^o C, der Gasbeaufschlagungsgrad auf 67% festgelegt. Die Förderhöhe des Verbrennungsluftverdichters betrug 20 000 mkg/kg, die des Ballastluftverdichters 3000 m bei einer Drehzahl der Turbine von 12 600 U/min. Der Außenläufer des Verdichters der gleichzeitig die Beschaufelung des Ballastluftverdichters trug, lief mit 6200 U/min um und wurde durch ein Planetengetriebe von der Turbinenwelle aus angetrieben. Der Gegendruck der Turbine ergab sich zu 1,9 ata am Boden, so daß also weitgehend Schallgeschwindigkeit in der Enddüse herrschte. Der Luftdurchsatz betrug im ersten Kreis in Bodennähe 14,8, in 6 km Höhe 8,2 kg/sec; im zweiten Kreis 35,8 bzw. 19,9 kg/sec. Das Ballastluftvielfache betrug danach ca. 2,42.

Die Turbine war einstufig, obgleich das Expansionsdruckverhältnis bis 1 : 6 stieg, der Verdichter besaß 17 Stufen, d. h. gegenläufige Kränze. Dadurch war die Gesamtbaulänge trotz des hohen Druckverhältnisses relativ kurz.

Der feste Mittelträger unmittelbar hinter dem Verdichteraustritt hat die Rolle einer senkrechten Grundplatte, an der sich nach vorn ein die vorderen Lager tragender zylindrischer Teil als Verdichtergehäuse anschließt, und nach hinten der das Getriebe umhüllende konische Träger des Lagers der fliegend angeordneten Turbinenscheibe.

A special feature of the design of this dual-flow engine is that the blades for compressing the cold air, i.e. the second flow, were mounted on the outer rotor of the counter-rotating compressor, which further reduced the overall length.

The 109-007 DB engine, as this dual-flow project was called, was intended to produce 600 kp of thrust at 250 m/sec airspeed at 6 km altitude, equivalent to 2000 hp of propulsive power. The gas temperature was set at 1100^o C for the reasons discussed, and the gas impingement rate at 67%. The head of the combustion air compressor was 20,000 mkg/kg, that of the ballast air compressor 3000 m at a turbine speed of 12,600 rpm. The external rotor of the compressor, which also carried the blading of the cold air compressor, rotated at 6200 rpm and was driven by a planetary gear from the turbine shaft. The back pressure of the turbine was 1.9 ata at ground level, so that the speed of sound largely prevailed in the final nozzle. The air flow rate in the first flow near the ground was 14.8, at 6 km altitude 8.2 kg/sec; in the second flow 35.8 and 19.9 kg/sec, respectively. The air bypass ratio was thus approximately 2.42.

The turbine was single stage, although the expansion pressure ratio increased to 1:6; the compressor had 17 stages, i.e. counter-rotating rings. As a result, the overall length was relatively short despite the high pressure ratio.

The fixed center support immediately behind the compressor outlet had the role of a vertical base plate, to which a cylindrical part supporting the front bearings as the compressor housing was connected to the front, and to the rear the conical support of the bearing of the overhung turbine disk enclosing the gearbox.

Von den beiden Verdichterläufern ist der innere in einer Ausführung aus trommelartigen Ringen, in der anderen aus Rädern zusammengesetzt. Durch die Anbringung der zwei Stufen des Ballastluftgebläses auf dem Außenläufer des gegenläufigen Verbrennungsluftkompressors wird die Gesamtbaulänge des Kompressorteils trotz des hohen Verdichtungsverhältnisses und trotz der zwei notwendigen Verdichter sehr kurz, was der kritischen Drehzahl zugute kommt. Die erste Scheibe sowie die Schaufelringe sind sowohl beim Innen- wie beim Außenläufer aus einer besonderen Leichtmetallegierung gefertigt, die durch Nickelzusatz eine erhöhte Warmfestigkeit aufweist. Die letzten Stufen waren aus Stahl. Die Schaufeln der Erstlingsausführung waren aus dem Material der Ringe herausgeschnitten, für später war zwecks Verbilligung ein schräg einzuschiebender Schwalbenschwanzfuß für die Verdichterschaufeln vorgesehen. Die Lagerung wurde—mindestens bei der ersten Ausführung—als Gleitlagerung (teilweise mit schwimmenden Buchsen) ausgeführt mit einem Blockdrucklager zur Aufnahme des beträchtlichen Achsschubes, der durch einen Druckausgleichkolben am Außenläufer gesenkt wurde.

Of the two compressor rotors, the inner one was composed of drum-like rings in one design and wheels in the other. By placing the two stages of the ballast air blower on the outer rotor of the counter-rotating combustion air compressor, the overall length of the compressor section becomes very short, despite the high compression ratio and despite the two compressors required, which benefits the critical speed. The first disk as well as the blade rings, both for the internal and external rotors, were made of a special light alloy that has increased high-temperature strength due to the addition of nickel. The last stages were made of steel. The blades of the first version were cut out of the material of the rings; for later versions, an oblique dovetail base was provided for the compressor blades in order to make them cheaper. The bearing arrangement was—at least in the first design—as a plain bearing (partly with floating bushings) with a block thrust bearing to absorb the considerable axle thrust, which was lowered by a pressure compensating piston on the outer rotor.

Die Düsen der einstufigen Turbine waren mit Rücksicht auf das sehr hohe Entspannungsverhältnis erweitert ausgeführt. Die Umfangsgeschwindigkeit des Turbinenrades betrug 375 m/sec. Das Rad ist mit Hirthverzahnung an der Welle befestigt und trägt einen radialen Schaufelkranz zur Förderung von Kühlluft zur Kühlung des Rades und insbesondere der Düsen. Ergänzend wurden Untersuchungen über eine zweistufige Ausführung der Turbine durchgeführt, die jedoch baulich ungünstigere Verhältnisse lieferte. Die Schaufelprofile warn vorn stark abgestumpft und im Verhältnis 1 : 2,7 verjüngt ausgeführt. Der Außenrand des Rades trug auf beiden Seiten eine konzentrische Umfangsrippe, die durch die radiale weiter nach innen reichende Kühlluftzuführung bespült wurde und somit dem besonders gefährdeten Radkranz die Wärme entzog.

The nozzles of the single-stage turbine were of expanded design in consideration of the very high expansion ratio. The peripheral speed of the turbine wheel was 375 m/sec. The wheel was attached to the shaft with Hirth teeth and carried a radial vane ring for conveying cooling air to cool the wheel and, in particular, the nozzles. Supplementary investigations were carried out on a two-stage design of the turbine, which, however, provided structurally less favorable conditions. The blade profiles were heavily truncated at the front and tapered in a ratio of 1:2.7. The outer rim of the wheel had a concentric circumferential rib on both sides, which was flushed by the radial cooling air supply extending further inward and thus extracting heat from the particularly vulnerable wheel rim.

Die Zahl der Brennkammern betrug vier, wobei die Möglichkeit der Anbringung einer fünften Kammer offengelassen war, was während der Versuche bereits durchgeführt wurde. Der Luftüberschuß betrug mit Rücksicht auf die hohe Entspannungsanfangstemperatur 2,7–3. Die Düsen hatten neben ihrer hohen thermischen Beanspruchung durch die hohe Druckdifferenz der Entspannung auch hohe mechanische Beanspruchungen auszuhalten. Ihre Stege wurden daher hohl ausgeführt und von Kühlluft durchströmt.

Um den Gewinn durch den Ballastluftkreislauf vollständig zu machen, war eine möglichst weitgehende Mischung des Turbinenabgases mit der Luft des zweiten Kreises hinter der Turbine notwendig. Die Mischung geht dabei um so verlustärmer vor sich, je geringer die Strömungsgeschwindigkeit während derselben ist. Es wurden zwei Mischstrecken mit verschiedener Länge und mit verschieden aufwendigen Einbauten hergestellt, die diesem Gesichtspunkt bei verschiedenem Baugewicht und Werkstattaufwand Rechnung tragen sollten. Bei geringeren Geschwindigkeiten im Mischraum ergab sich gleichzeitig die Möglichkeit einer intensiveren Nachverbrennung ohne Erreichung der Schallgeschwindigkeit vor der Enddüse, d. h. also einer besseren Ausnutzung eines der wesentlichen Vorteile der Zweikreisers.

Der Einlaufverkleidung wurde zwecks Erzielung einer günstigen Einströmung sowohl im Stand wie bei voller Geschwindigkeit besondere Aufmerksamkeit durch Vorversuche gewidmet. Die Hilfsapparate waren mit dem Triebwerk unmittelbar verbunden. Sie bestanden aus je einer Pumpe für den Kraftstoff der Brennkammer und für die Zusatzverbrennung zuzüglich Vorpumpen, für den Schmierstoff wurden drei Druck- und drei Saugpumpen zunächst im Nabenkopf, später an einem gesonderten Apparateträger über dem Triebwerk untergebracht, an dem außerdem Einspritzregler, Drehzahlgeber, Anlasser und Zündgerät sowie Atemluftverdichter, drei Generatoren und eine Hydraulikpumpe für die Zelle usw. angeordnet waren.

The number of combustion chambers was four, leaving open the possibility of adding a fifth chamber, which was already carried out during the tests. The air ratio was 2.7–3. The nozzles had to withstand not only high thermal stress due to the high pressure difference during expansion, but also high mechanical stress. Their walls were therefore hollow and had cooling air flowing through them.

To make the gain from the cold air flow complete, it was necessary to mix the turbine exhaust gas as much as possible with the air from the second flow behind the turbine. The lower the flow velocity during mixing, the lower the losses. Two mixing sections of different lengths and with different complex internals were produced to take account of this aspect with different construction weights and workshop requirements. At lower velocities in the mixing chamber, there was at the same time the possibility of more intensive afterburning without the flow reaching the speed of sound upstream of the final nozzle, i.e., better utilization of one of the essential advantages of the two-flow mixer.

The inlet cowling was given special attention in preliminary tests for the purpose of obtaining a favorable inflow both at standstill and at full speed. The auxiliary equipment was directly connected to the engine. This consisted of one pump each for the fuel for the combustion chamber and for the auxiliary combustion plus backing pumps; for the lubricant, three pressure and three suction pumps were initially accommodated in the hub head, later on a separate apparatus support above the engine, on which were also arranged the injection governor, speed sensor, starter, and ignition unit as well as breathing air compressor, three generators, and a hydraulic pump for the airframe, etc.

Die für das Triebwerk benutzten Werkstoffe entsprachen bei den hohen Belastungen naturgemäß den besten damals verfügbaren Legierungen.

Wen auch in Anbetracht des durch den Krieg diktierten außergewöhnlich beschleunigten Entwicklungstempos viele Vorversuche, die wünschenswert gewesen wären, nicht durchgeführt werden konnten, wurde doch eine Reihe wichtiger Elemente, bezüglich derer besonders wenig Erfahrungen vorlagen, mindestens teilweise vorerprobt. Hierzu gehört insbesondere die Brennkammer und getrennt davon die Einspritzdüsen, der gegenläufige Verdichter, die Achsschublager, das Getriebe, welches bei leichtester Bauart 4000 PS übertragen mußte, die Einlaufverkleidung usw.; weiter gingen Schleuderversuche mit Überdrehzahlen, Schwingungsmessungen und umfangreiche Schaufelkühlungsversuche, Hilfsaggregatuntersuchungen usw. der Erprobung des Gesamttriebwerkes voraus. Zum Ausschleudern der Turbinenräder wurde en gesonderter Schleuderstand mit aufheizbarer Umgebungsluft und unter Absaugung auf Vakuum erstellt.

Die Gesamterprobung, die nach verschiedenen anfänglichen Schwierigkeiten mit allen Drehzahlen von der Abhebedrehzahl* 4000 U/min bis zur Auslegungsdrehzahl 12 600 U/min des Innenläufers (teilweise ohne Ballastluftverdichter) durchgeführt wurde, ergab für das erste Volltriebwerk eine Gesamtversuchszeit von 152 Stunden. Es wurde dabei auf eine Anzahl von Einzelfragen, die nicht in Vorversuchen geklärt werden konnten, miteingegangen. Teilweise wurde mit Wassereinspritzung in die Brennkammer gefahren.

* Mindestdrehzahl, bei der das Triebwerk in der Lage ist, sich ohne Anlaßmotor selbst zu beschleunigen.

The materials used for the engine naturally corresponded to the best alloys available at the time for the high loads.

Although, in view of the exceptionally accelerated pace of development dictated by the war, many preliminary tests that would have been desirable could not be carried out, a number of important elements with respect to which particularly little experience was available were at least partially pre-tested. These include in particular the combustion chamber and, separately, the injection nozzles, the counter-rotating compressor, the axle thrust bearings, the gearbox, which had to transmit 4000 hp in the lightest design, the inlet cowling, etc.; furthermore, spinning tests with overspeeds, vibration measurements, and extensive blade cooling tests, auxiliary unit tests, etc. preceded the testing of the overall engine. For spinning out the turbine wheels, a separate spinning stand was set up with heatable ambient air and under vacuum extraction.

The complete engine testing, which after various initial difficulties was carried out at all speeds from the lift-off speed* 4,000 rpm to the design speed 12,600 rpm of the internal rotor (partly without cold air compressor), resulted in a total test time of 152 hours for the first full engine. A number of individual issues that could not be resolved in preliminary tests were addressed. In some cases, the engine was run with water injection into the combustion chamber.

* Minimum speed at which the engine is capable of self-acceleration without a starter motor.

Die Brennkammerbelastung lag bei voller Drehzahl bei $94 \cdot 10^6$ kcal/Std. Die Freilaufdrehzahl rückt bei Zweikreisern, da die Ballastluft Leistung aufnimmt, ohne daß sie zur Leistungserzeugung herangezogen wird, höher als beim einfachen TL-Triebwerk. Sowohl die Einzelversuche wie insbesondere auch die Versuche am Volltriebwerk ergaben eine große Zahl von Erkenntnissen und aussichtsreichen Verbesserungsvorschlägen. Da andererseits die Aussicht gering erschien, daß dieses durch seine komplizierte Aufgabenstellung ziemlich problemreiche Triebwerk bei dem damaligen noch recht geringen Stand der allgemeinen Erfahrungen auf dem Strahltriebwerksgebiet noch innerhalb der im Rahmen des Kriegsfortgangs verfügbaren Zeit zur Betriebsreife würde entwickelt werden können, wurde die Weiterarbeit hieran von seiten des Luftfahrtministeriums zwecks Konzentration der Industriekapazität abgebrochen. Aus diesem Grunde mußten auch die im Gange befindlichen Schubmeßversuche des Gesamttriebwerks vor der Feststellung einigermaßen stichhaltiger Ergebnisse beendet werden. Auch Brennstoffverbrauchsmeßversuche, die einen Aufschluß über die Erreichung des Ziels der Zweikreisbauart mit einigermaßen zielsicher aufeinander abgestimmten Einzelmaschinen hätten geben können, konnten nicht mehr durchgeführt werden. Andererseits deuteten die zahlreichen Vorschläge für Konstruktionsvarianten und Auslegungsverbesserungen, die sich aus den Versuchen ergaben, darauf hin, daß trotz der schwierigen Aufgabenstellung bei ausreichender Zeit die Weitererprobung der mit Rücksicht auf unbekannte Havariequellen möglichst sicher und daher auch verhältnismäßig schwer konstruierten Erstausführung mindestens in der bei derartigen neuen Entwicklungen üblichen Zweit- und Drittkonstruktion eine erfolgreiche Entwicklung versprochen hätte.

The combustion chamber load at full speed was $94 \cdot 10^6$ kcal/hr. The freewheeling speed goes higher in turbofan engines than in the simple turbojet engine because the cold air absorbs power without being used to produce power. Both the individual tests and, in particular, the tests on the full engine yielded a large number of findings and promising suggestions for improvement. Since, on the other hand, there seemed little prospect of this engine, which was rather problematic because of its complicated task, being developed to operational maturity within the time available during the war, given the still rather limited state of general experience in the field of jet engines at that time, further work on it was discontinued by the Ministry of Aviation in order to concentrate industrial capacity. For this reason, the thrust measurement tests of the complete engine, which were currently in progress, had to be terminated before reasonably valid results could be obtained. Fuel consumption measurement tests, which could have provided information on the achievement of the goal of a dual-flow design with reasonably well-matched individual engines, could also no longer be carried out. On the other hand, the numerous suggestions for design variants and design improvements that resulted from the tests indicated that, despite the difficult task, given sufficient time, further testing of the first design, which was constructed to be as safe as possible with regard to unknown sources of damage and therefore also relatively heavy, would have promised successful development at least in the second and third design iterations that are customary for such new developments.

[For more information on the DB 007 and other early turbofan and turboprop engines, see pp. 1746, 1748 and Brix 2022; von Gersdorff et al. 2004; Jakobs et al. 2009; Kay 2002; Leyes and Fleming 1999.]

Ernst Heinrich Hirschel, Horst Prem, and Gero Madelung. 2004. *Aeronautical Research in Germany: From Lilienthal until Today.* Berlin: Springer.

[p. 227:] The development of the axial flow compressors for the BMW 003 and Junkers 004 engines was started already according to the requirements of the RLM. In this context a statement of *Helmut Schelp* is of significance, saying: *"Because in 1939 the development difficulties could not be foreseen, it was decided to assign as task a parallel development. Junkers was to work on a more conventional basis and BMW on a more advanced one with better technology [18]"*. For BMW this meant a compressor with seven stages, for Junkers one with eight stages for the same pressure rise. Both these compressors will be addressed later on.

Since the RLM had initiated promising development projects for turbo-jets and with a thrust of 8–9 kN (1,800-2,025 lbf), Daimler-Benz was given the task to develop an engine with higher thrust and a lower fuel consumption. The engine proposed under the direction of *Karl Leist* and tested 1943 on a test bed was one of the first bypass engines of the world [18]. For the required pressure ratio of eight, based on proposals made by *Walter Encke*, a compressor was designed consisting of two counter-rotating drums. A parallel development of the compressor was also undertaken and the compressor constructed by the company Voith in Heidenheim.

The development of the engine He S 30 under the direction of *Max Adolf Müllller* was the first engine of the company Heinkel with purely axial flow components: compressor, combustion chamber and turbine. The compressor, based on proposals by *Rudolph Friedrich* [18], reached a circumferential velocity of 313 m/s (1,027 ft/s) and a notable high efficiency of 87 per cent. The design of the compressor was based on the same considerations as for the *Wagner* engine, namely pressure transformation in the rotors and stators (degree of reaction 50 per cent). The He S 30 engine was thus superior at that time to all other designs regarding the important parameters for an aircraft like frontal area, weight and specific fuel consumption. By order of the RLM this engine development was however stopped at a time when a Me 262 with Jumo 004 engines took off on its first flight. Similar decisions of the RLM did also affect other developments.

The engines with axial flow compressors addressed here were followed by further ones with higher thrust. Apart from turbo-jet engines (TLs), developments were under way of turbo-propeller engines (PTLs) with axial flow compressors (BMW 028, Jumo 022). [...]

[p. 242:] **Combustion Chamber Development for a Bypass Engine at Daimler-Benz**

Daimler-Benz started after initial hesitation somewhat later with the jet engine development because of the large programme variety for piston aeroengines. From *Helmut Mauch* of the RLM the company obtained the difficult task to develop an engine with larger thrust and considerably lower fuel consumption. Under the leadership of *Karl Leist*, who had joined Daimler-Benz from the "Deutsche Versuchsanstalt für Luftfahrt, DVL", in September 1939 studies were commenced for the very advanced and very complex bypass engine DB 109-007 (later RLM designation) proposed by him, one of the first bypass engines of the world. After the start of the actual development work in the year 1941 the first of three test engines built was put on April 1, 1943 on a test bed in Stuttgart-Untertürkheim and reached in autumn of that year the full load rotational speed of 12,600 rpm. The combustion chamber module consisted initially of four single combustion chambers, later of five. In ground static operation a total of 50.6 kg/s (111.6 lb/s) of air flowed through the engine, of which 14.8 kg/s (32.6 lb/s) went through the gas generator with the combustion chambers. The design target for the combustion chamber outlet temperature had a very high value of 1,100 ^{o}C (1,373 K), requiring for the turbine an especially sophisticated cooling. At the end of 1943 the development was discontinued on order by the RLM [38]. [...]

[pp. 248–249:] **Turbine Cooling for the Daimler-Benz DB 109-007**

The development of turbo-jet engines at Daimler-Benz in Stuttgart-Untertürkheim began on request by the RLM in 1940/41. Preliminary work concerning the blade cooling was carried out under the leadership of *Karl Leist*, who came from the DVL in 1939, on exhaust-driven turbo-superchargers for the Daimler-Benz altitude engines. Because the bypass engine DB 109-007 possessed a turbine entry temperature of 1,100 ^{o}C (1,373 K), the single-stage axial turbine had to be cooled. A partial bleed of cooling air from the bypass flow duct was chosen, which was supplied via slots from the secondary air duct. Preliminary tests for these methods were performed at Daimler-Benz on exhaust gas turbine wheels also already at high gas temperatures. For supplying the cooling air a radial blade ring on the turbine rotor was responsible, a kind of radial fan. [...]

[pp. 257–258:]

18 Different Authors, DGLR-Symposium "50 Jahre Turbostrahlflug", Munich, 26/27 October, 1989, Vol. I DGLR-Report 89-05 (1989) and Vol. II DGLR-Report 92-05 (1992) [...]

38 Erinnerungen: 1934–1984 Flugtriebwerkbau in München. Herausgegeben von der MTU Motoren- und Turbinen-Union München GmbH, Munich, May 1984 [...]

[p. 407:] A further aspect of the development of the jet engine was the introduction of the so-called bypass engine as powerplant for civil transport aircraft at the beginning of the sixties and the subsequent increase of the bypass ratio. This led to various research and development tasks of the past two decades and will be dealt with in the following in more detail. Bypass engines were, however, already the subject of investigations at the beginning of the jet engine development and were realized at the company Heinkel as engine He S 10 and particularly in 1943 tested in the successful test-bed runs of the Daimler-Benz bypass engine DB 109-007 with a thrust of 11.3 kN (2,543 lbf) and a bypass ratio of 2.42 [1]. The He S 10 was perhaps the most practical bypass engine that has been designed (1940) in the early days of the jet engine [2].

[p. 469:]

1 K. von Gersdorff, K. Grasmann, H. Schubert, Flugmotoren und Strahltriebwerke. Reihe "Die deutsche Luftfahrt", Vol. 2, 3. Ed., Bernard & Graefe, Bonn, 1995

2 50 Jahre Turbostrahlflug—DGLR-Symposium 1989 Munich, DGLR-Report 89-05 and 92-05

[How far did work on turbofan engines such as the DB 007 actually progress during the war? How much did German wartime work on turbofan engines influence postwar work on turbofan engines such as the General Electric CJ805-23 (also by German-speaking creators)?]

National Air and Space Museum. General Electric CJ805-23 Turbofan Engine, Cutaway. https://airandspace.si.edu/collection-objects/general-electric-cj805-23-turbofan-engine-cutaway/nasm_A19760792000

In 1956, based on the commercialized CJ805-3 version of the military J79 turbojet then powering the Convair 880, GE began development of an aft fan engine, the J79-X220, later designated CJ-805-23. This uncomplicated and low cost development increased take-off thrust by 40 percent, lowered specific fuel consumption by 15 percent, and reduced takeoff and landing noise. The engine became the first U.S. turbofan and, on the Convair 990 in the 1960s, the first in the world to enter airline service.

George E. Smith and David A. Mindell. 2000. The Emergence of the Turbofan Engine. In: Peter Galison and Alex Roland, eds. 2000. *Atmospheric Flight in the Twentieth Century.* Alphen aan den Rijn: Kluwer. pp. 107–155. https://vdoc.pub/documents/atmospheric-flight-in-the-twentieth-century-7o4lo0covue0

[p. 127:] Peter Kappus, the principal advocate of the turbofan engine within GE, then began pushing the concept of an aft fan. The idea was to install an independently rotating fan rotor behind the gas generator. The exhaust from the gas generator would drive turbine blades mounted on this rotor, and fan blades would extend from the tips of the turbine blades. This idea dates at least as far back as a Whittle patent [50] and the Metro-Vick counter-rotating fan discussed above. One of the leading academic experts on turbomachinery, G. F. Wislicenus of Penn State University, had promoted its advantages in a talk entitled "Principles and Applications of Bypass Engines" presented at the Society of Automotive Engineers Golden Anniversary Aeronautical Meeting in April 1955. The most obvious advantage of an aft fan from GE's point of view was that a new core engine would not have to be developed. GE could use the J-79, or what amounted to almost the same thing, its commercial counterpart, the CJ805. [...]

[p. 142] Why then was P&W not the first to come up with a superior turbofan engine? Perhaps P&W had no influential in-house proponent of turbofan engines, comparable to Peter Kappus at GE. But this can at most be part of the answer, for the potential of bypass engines to realize high propulsion efficiency in the high subsonic flight speed range had been known for years, and Wislicenus had called attention to it prominently once again in 1955. So, the answer must also include aspects of P&W's engineering style and orientation. [...]

[pp. 144–145] As a first step toward unraveling this complexity, we can identify the several local factors that lay behind General Electric's developing their first turbofan, the CJ805-23, when they did: (1) persistent advocates of fan engines within GE, especially Peter Kappus; (2) an established gas generator with sufficient specific-power to drive the fan; (3) the aft fan concept, which allowed the turbofan engine to be developed at remarkably little cost; (4) the realization, which emerged in the last years of the NACA supersonic compressor research program, that comparatively high Mach number transonic stages could be designed without first having to learn how to control shocks; (5) the shift of key figures in this research program from NACA to GE, especially Lin Wright; (6) the advent of the computer, allowing the introduction of streamline-curvature methods for analyzing radial equilibrium effects in compressors; (7) the idea of adapting streamline-curvature methods to provide a through-blade analysis that could define a blade contour precisely tailored for the significant radial redistribution of the flow that occurs within a high pressure-ratio transonic blade row. Three other factors may have been important in GE's decision to commit money to developing the CJ805-23: (1) Rolls-Royce's Conway engine, perceived perhaps by some as heralding the advent of bypass engines; (2) Pratt & Whitney's overwhelmingly dominant position in high-subsonic flight, achieved initially through their J-57 on the B-52 and then in the process of being repeated by the commercial version of the J-57, the JT3C, on the Boeing 707 and Douglas DC-8; and (3) Wislicenus's talk at the SAE Golden Anniversary Aeronautical Meeting, promoting the concept of an aft fan engine.

[For more information on the postwar work of Peter Kappus, Bruno Bruckmann, and other German-speaking creators who produced jet engines at General Electric, see pp. 1750–1763.

Anselm Franz's team produced the first high-bypass turbofan engine (PLF1) at Lycoming after the war; see pp. 1732, 1739–1743.]

R. P. Linstead and T. J. Betts. 15 September 1945. *The Intelligence Exploitation of Germany. Report of Combined Intelligence Objectives Subcommittee.* G-2 Division, SHAEF. Ch. 4, pp. 37, 62–67. [AFHRA A5186 electronic version pp. 904–1026]

Certain items have been omitted because of security considerations. [...]

German progress in aerodynamics, particularly aircraft capable of super-sonic speeds, was the subject of intensive investigation by British and U.S. specialists. A wind tunnel, which is considered as probably the most advanced in the world was discovered near Kochel in the Bavarian Alps. This tunnel, with a test section 40 inches square, was capable of developing wind speeds of 3,360 miles per hour by utilizing only 880 kilowatts of electrical power. The maximum wind speed which could be obtained by this tunnel approached a Mach No. of 7.6 or 5,800 miles per hour. The power plant of this wind tunnel had a rated capacity of 57,000 horsepower.

The exceptional testing facilities provided by the German super-sonic wind tunnels made possible aerodynamic research by German experts which, at this writing, appears to be more advanced than any similar development in the United Kingdom or United States.

Perhaps the most important aerodynamic intelligence obtained related to the "swept-back" wing. Many authorities believe the development of the swept-back wing had never received the attention it deserved in British and United States aero-research establishments. Investigation of new German models and prototypes incorporating these wing features has disclosed apparent advantages. The sharply swept-back wing results in a substantial increase in the critical Mach number in speeds approaching supersonic velocities, therefore the development of shock waves and excess drag at extremely high speeds is minimized.

A second enemy aerodynamics development of perhaps equal significance is the trapezoidal wing. When tested at supersonic speeds, this type of wing has resulted in improved ease of control due to the slight shift of "center of pressure" in relation to center of gravity occurring when this wing design is used.

It was discovered that German designers had placed considerable emphasis on air duct designs for high-speed aircraft. An important design feature for which full data has been obtained is that of a center rod placed in the air duct. This device minimized pressure build-up and eliminated shock waves.

A research airplane known as the DFS-346 had been designed for the purpose of testing all flying qualities at extremely high speeds in the free air. This prototype was designed to test stability, controllability, maneuverability, the values and distributions of the forces of directional controls on the wing and on the tailplanes, and other essential conditions of flight. This plane was to be capable of a 1,250 miles per hour speed and a 66,000 foot ceiling. Investigation of German aerodynamic research records and interrogation of leading design personnel has disclosed that tests of aerodynamic speeds in wind tunnels did not always agree with actual tests of prototypes in the free air. The DFS-346 was designed for further research into the unknown conditions of supersonic speeds, notably the pronounced shifts of the center of pressure.

Of probably equal importance was German research activity in jet and rocket propulsion. Enemy developments in these latter fields were in general more advanced than our own. Interesting discoveries were encountered in the design of combustion chambers for greatly increased thermal efficiency and minimum pressure loss. Enemy technicians had devoted energy and skill to the design of jet turbine blades capable of withstanding extreme stresses and high temperatures. A particularly interesting development is that of the ceramic metal turbine blade which was molded with a composition of 100% metal at the rotor end of the blade with a gradual decrease in metal content until the composition became 100% ceramic at the blade tip. This type of construction had the advantage of providing the strength of metal at the base of the blade, where the greater stresses occur, and the heat resistant qualities of ceramics at the outside tip where temperatures are most extreme. Other innovations of blade design provided ingenious air vents or water-circulation-blade cooling. Hollow steel blades were discovered which possessed considerable advantage over blade types previously known. Another discovery was a construction and assembly technique in the production of turbine blades and rotors which used a novel method of welding pressed-steel materials. This method eliminates the cost of extensive machining and slashes man-hours required from approximately six hundred to ten.

German design of automatic controls for jet motors are believed to hold much promise when applied to similar work in the United States and the United Kingdom. These controls automatically regulate fuel ratios for optimum performance under given conditions. It was discovered that German jet motors normally incorporated bullet shaped devices which could be moved back and forth in the jet outlet varying the area of the nozzle, thereby keeping the engine working at maximum efficiency and economy.

A vast amount of enemy development on jet fuels was discovered. Test and development data covering 1,100 different fuel combinations have been obtained as a result of CIOS investigations. Of special importance are the German "multi-fuels" which provide specific chemical-dynamic characteristics for given combustion chamber designs. Fuel and water injection for turbojets permitted development of sudden bursts of speed when required. Test results indicate that a 14% increase in jet thrust can be sustained for five minutes.

[...] A new enemy method of attaching fins to air cooled engines is expected to provide a substantial saving in labor and expense.

United States and British experts were impressed with the extremely compact and simple arrangement of engine accessories in integral power units. The methods used have resulted in improved engine serviceability.

Investigation of German accomplishments in the aircraft instrument field revealed a new process which permits winding of potentiometers with very fine wire (approximately 1000th of an inch in diameter). This process permits extremely refined control by automatic pilot operation.

Roy Fedden. German Plans to Revolutionise Air Warfare. *Daily Telegraph & Morning Post* 1 October 1945, p. 4.

[...] In the course of two recent visits to Germany, as leader of a technical mission for the Minister of Aircraft Production, I have seen enough of their designs and production plans to realise that if they had managed to prolong the war some months longer, we might have been confronted with a set of entirely new and deadly developments in air warfare.

Atomic Explosives

There is some reason to believe that Hitler had been promised atomic explosives by October of this year, and if Germany had been first to use them the idea of changing the whole course of the war from a small base in the South German Mountains is by no means so far-fetched.

A new range of very high-speed fighters and jet bombers was already flying, or within a few weeks of flying, when the war ended. Immense developments were under way with robot rocket weapons, some of which had already started in production. They were simple and cheap to make, and with atomic explosives even a few such devices could have placed air warfare on a new nightmare plane of impersonal long-distance annihilation such as we have not so far contemplated. [...]

Superb Test Equipment

To an engineer who has seen the wonderful efforts made by the British aircraft industry with the restricted facilities at its disposal during the recent war, and the very small number of available scientists and trained investigators, it is staggering to see the lavish research plant and vast accumulation of most modern test equipment available in Germany.

Their scientific laboratories, supersonic wind tunnels, and high-altitude engine test beds are in some ways ahead of anything existing anywhere else in the world to-day. We witnessed tests of a jet propulsion engine on a high-altitude test plant which was capable of producing wind speeds above 560 m.p.h. and altitude conditions of over 36,000 ft. The plant was superbly equipped, and remotely controlled from a sound-proof room.

The power required to deliver refrigerated air in huge quantities at high speeds, and to run all the auxiliary services, was over 10,000 kw.

The cost of this engine test plant alone was 6,000,000 marks. Extensions in hand would have raised it to 9,000,000 marks, and four other similar establishments were in course of construction elsewhere. [...]

As soon as we depart from the orthodox aircraft with piston engine and airscrew and enter the field of thermal jet propulsion, a multiplicity of possible solutions presents itself, of which the turbine jet propulsion unit, as we now know it, is only one. The Germans tackled every line likely and unlikely, and they had already obtained some wonderful research results from their bold approach and lavish expenditure, but they came just too late to avert defeat. [...]

This thoroughness is typical of the German approach to any new problem, and it was only possible to pursue this course at such a critical period of their history by reason of the large number of highly trained and experienced technicians available.

The first fruit of their labours was, of course, the flying bomb V1. [...I]t was a historic weapon which marks the beginning of the new German conception of air warfare. [...]

When the V2 rockets, travelling faster than sound, began to blast the London suburbs, the pattern of the future became clearer. [...] Right up to the time when our armies overran the launching sites, no defence had been possible against them other than bomber attacks on the factories and assembly points.

Big V2 Output

The ordeal which might have faced the British people if the land forces had not liberated France, Belgium and Holland in time may be gauged from the fact that, at one underground factory I visited, slave workers had been producing V2 rockets at the rate of 1,000 a month, despite our bombing.

It is reported that the V2 attacks were to be supplemented by long-range incendiary rockets, fired from bomb-proof emplacements, and underground rocket guns with barrels of unprecedented length were being constructed on the invasion coast for the bombardment of London.

Another new weapon which was already in production, and had been used experimentally against our bombers over Germany, was an inter-aircraft rocket, fired from an aircraft shadowing the bomber formations at a safe distance, and controlled by a wire paid out from a spool. It had a speed of 620 m.p.h. and carried a warhead of 110 lb. It could be made in ten hours and cost only 250 marks.

Guiding V3 to Target

Even more interesting was the Schmetterling or Butterly, to be known as V3. This was a rocket missile to be fired from the ground, to defend very important targets against our bombers. It was beautifully shaped, with sharply swept back wings of about 7 ft. span, and had a speed of from 560 to 620 m.p.h.

It was controlled initially by radio, but was being developed with an acoustic "ear" and photo-electric "eye," which would enable it to follow and strike down the bombers automatically, once ground control had guided it into the vicinity of the attacking formations.

The rocket motor weighed a mere 350 lb, took less than 60 hours to make, and cost about 500 marks, but for a short period it gave a thrust greater than the most powerful aero engine or jet propulsion unit in production to-day, and it was said to be effective up to 30,000 feet. It was reported to be in production at the rate of 1,000 a month at one factory alone.

At the opposite extreme, some of the German designers had found time to scheme out proposals for passenger-carrying rockets which would cross the Atlantic in under an hour, but this was the only case of any interest in peaceful aviation which I heard of during my two visits.

Huge Power at Low Cost

[...] The new German rocket motors were in effect compact and very neat editions of the big V2 rocket unit, using a mixture of nitric acid and a hydrocarbon as fuel. Their fuel consumption is enormous, and their duration correspondingly short, but they give tremendous power at negligible cost, and every possible application for them was being explored. [...]

The Me. 262, first jet-propelled fighter to go into action in the war, was a practical machine capable of well over 500 m.p.h., but with two small rocket thrust augmenters, each giving about 2,700 lb thrust in addition to the 1,700 lb thrust given by each of its main engines, it was capable of phenomenal performances for short periods and was credited with climbing to 39,000 feet in three minutes. The thrust augmenters are permanent attachments which can be used as required by the pilot as long as the fuel lasts.

All possible drive was going into the development and production of both rocket and jet propulsion units. The jet propulsion turbine units, the Jumo 004 and the B.M.W. 003, were already in series production when the war ended, and experimental work was well advanced on a new range giving much higher powers.

The most modern production plant had been assembled in new bomb-proof underground factories, and by the spring of this year jet unit production was up to between 2,000 and 3,000 a month. By the middle of 1946 production was scheduled to reach a rate of 1000,000 jet units a year.

The German jets are in several ways not as efficient as our own, but they have certain features, such as air-cooled turbine blades, and small overall diameter, which merit careful study, and they are designed for rapid production at minimum cost.

German aircraft designers were working against time to produce an entirely new range of very high-speed fighters and bombers, using turbine and rocket jets.

Rocket-Driven Fighter

The little Me. 163, the only rocket-propelled fighter of the war, although actually a failure, was a remarkable experiment and indicates the shape planned for German high-speed aircraft if the war had continued.

It has a rocket motor weighing perhaps one-tenth as much as the engine and airscrew of a conventional fighter, and costing a fraction of the price. It has no tail and its wings are sharply swept back, so that it looks rather like a boy's paper dart. Its duration is short, but it is extremely fast and represents a conception capable of great development.

Two new Messerschmitt turbine jet fighters designed to do over 600 m.p.h. were being built on similar lines, with sharply swept back wings and very small fuselages carrying equally swept back tail surfaces. I saw one of these, which was within a few weeks of flying when the war ended.

The German technicians admitted that recent research work evolved in their superb wind tunnels at Goettingen and Volkenrode, near Brunswick, had completely revolutionised their ideas on the shape of high-speed aircraft, and they were putting the new conceptions into practice with all possible speed.

A new Horten tailless fighter with two jet engines was said to be nearly ready for flight testing, and Junkers were working on a tailless bomber with four jet engines.

Meanwhile production work was being rushed ahead on new bombers of more conventional shape.

Flight at Speed of Sound

Everywhere one found the utmost enthusiasm for jet propulsion for military aircraft. Aircraft designers said it simplified their airframe design problems, and in one case it was claimed that a new jet fighter had flown within seven months of the inception of the project.

Their many high-speed wind tunnels and elaborate laboratory equipment had already yielded a fund of data with which the Germans were confidently tackling the problems of flight at sonic speeds. [...]

[For more information on the postwar British “Fedden Mission” to investigate and appropriate German technologies, see:

Roy Fedden. 1945. *The Fedden Mission to Germany: Final Report.* U.K. Ministry of Aircraft Production.

John Christopher. 2013. *The Race for Hitler’s X-Planes: Britain’s 1945 Mission to Capture Secret Luftwaffe Technology.* The Mill, Gloucestershire: History Press.]

U.S. Air Forces in Europe. 1946. [AFHRA C5098 electronic version pp. 586–602; http://www.indianamilitary.org/FreemanAAF/OperationLusty/OperationLusty-s.pdf]

At a medieval inn near Thumersbach near Berchtesgaden, early in May 1945, the German General Air Staff patiently awaited the outcome of surrender negotiations taking place in the North. They had arrived by car and plane during the past weeks, when the fall of Berlin was imminent, and had kept in contact by radio with Admiral Doenitz at Flensburg. Through the interception of one of these messages, their location, which had previously been unknown, was discovered. Within twenty-four hours Lt Col. O'Brien and his small party, representing the Exploitation Division of the Directorate of Intelligence, USAFE, had arrived, located the party and conducted the first of a series of discussions with General Koller, who was then in command. All documents and records that had been brought by the High Command were immediately turned over, and the first unearthing of buried records and documents, in and around Berchtesgaden, as well as the initial interrogation of the staff officers present, took place.

A casual remark made by a technical engineer, who stated that he had recently been offered a position in Japan, led to his being thoroughly interrogated for significant technical information. As an aside, and what he probably considered a relatively unimportant incident, he stated that less than a month ago, about the middle of April, ten submarines heavily loaded with the latest German equipment relative to aerial warfare, were dispatched from Kiel to Japan. When Lt Col. O'Brien was thus informed he immediately advised the Directorate of Intelligence, USAFE, who in turn notified the Japanese Intelligence Section of SHAFE. A cable was then dispatched to all commands.

In every theater of war, all vessels in ports and at sea were notified, and one of the biggest searches ever undertaken during the war for submarines was initiated. What route they had taken, whether they had gone alone or together, no one knew. But so extensive was the search and so carefully was it executed by warships of all Allied nations, that by the end of June, six of these ten submarines had been captured intact, some a relatively short distance away from their bases, others perilously close to Japan.

In a mountain side near the camp of the German Staff officers, an air raid shelter had been blocked up and then carefully covered and concealed with dirt. Its presence was eventually revealed by the officer who had directed this concealment, but only after he had noticed that a hole, large enough for a man to crawl through, appeared in one or the sides. Thinking that the cache had been discovered, he explained to the USAFE party the location of the shelter, informed them that he had been in charge of the burying of some extremely important records of the High Command, and would be glad to supervise their excavation. When the contents were eventually removed, one important document after another was laid out and carefully examined. One file contained correspondence from 1 Gruppe/6 Abteilung, German Air Ministry Intelligence, dated January 1943 to March 1945, concerning the supply to Japan of all types of equipment for aerial warfare, including models of Me 262 and Me 163, quantities of V1 equipment, high explosives, incendiary bombs, bomb sights, radar apparatus of all description, including models of the Wurzburg and Freya radio and signals installations, telephone, teleprinters, and so forth, and all types of aircraft parts. Another contained the precise location of every plant in Japan presently engaged in the manufacture of the latest aerial plane designs, every research institution connected with the Japanese Air Force, and, many vital targets hitherto unknown and unsuspected by Army Air Forces Intelligence officers. These volumes were flown at once to Washington, D.C., and shortly thereafter bombers of the 20th Air Force were doing precision bombing of the secret targets whose existence had been disclosed in the documents captured at Berchtesgaden.

A report reached Lt Col O'Brien's party that a "strange aircraft" had been seen in a mountainous retreat near Salzburg. Investigation quickly determined that this "strange aircraft" was a jet-propelled helicopter, the only one of its kind in the world. The inventor and his entire staff, who had laboriously worked ten years to perfect it, were present, guarding his invention as one would a precious jewel. The helicopter was examined, and a preliminary superficial interrogation of the staff was sufficient to reveal its tremendous importance. It was carefully loaded in a large truck and taken to Munich. From there it was sent across Europe to France, placed on a boat and shipped to Wright Field, together with the confiscated notes, drawings, and meticulous records of experiments conducted by the scientist and his assistants. After lengthy and detailed interrogations of these persons by technical experts assigned to USAFE, the men were sent to P/W cages. After ten years of labor they were left with only their memories of a remarkable technical achievement. The only jet-propelled helicopter in the world had been found and disposed of in such a way that it would prove advantageous to American scientists and the government.

The presence of the USAFE party at Berchtesgaden before surrender negotiations had been concluded, the interrogation of a technical engineer and the subsequent seizure of six submarines, the unearthing of a detailed list of important and unknown Japanese laboratories, plants, and factories, the finding of a jet-propelled helicopter, and invaluable documents and records of the German General Staff, was neither accidental nor the result of fortuitous circumstances, but rather the outcome of a well-defined and executed policy known as "OPERATION LUSTY", which was the code designation for a project with a priority equal to those of military operations that had been put into immediate effect in April 1945. This project was a combined effort of the Exploitation Division of the Directorate of Intelligence, USAF, and the Disarmament Division of the IX Air Force Service Command. Its mission was the complete and minute exploitation of air intelligence and technical air objectives in liberated and hostile countries, which at that time were divided up into zones either already occupied or to be presently occupied by the 6th, 12th, and 21st Army Groups.

There was a substantial foundation for the belief that the Germans had made many, if not all, of their recent scientific developments available to the Japanese. The knowledge of these developments, consequently, was vitally needed to devise effective technical and tactical countermeasures, and to insure the technical superiority of our own equipment in the war in the Pacific. In February 1945, officers at Wright Field had prepared a list of enemy equipment, which subsequently became known as the CATEGORY "A" LIST, that they desired for technical intelligence and research purposes necessary for the execution of the above needs. This list, which was later supplemented and revised in the light of discoveries made, became the guide and working manual for teams later sent into the field by the Exploitation Division to discover, guard, and dispatch material for the expressed intelligence purposes. Headquarters, Army Air Forces, also prepared a large detailed pamphlet entitled "Air Staff Post Hostilities Requirements", which was an outline of proposed studies to be written on the German Air Force from evidence subsequently to be unearthed, discovered, and captured by members of the Exploitation Division. Thus, the exploitation logically fell into two categories: Technical and Non-Technical.

The Technical Intelligence Objectives were classified in two categories: (a) equipment or documents of immediate interest and value to technical research centers in the United States for evaluation and immediate application in the war against Japan, and (b) equipment or documents of interest to technical research centers in the United States for extended period of study and development. The Non-Technical Intelligence Objectives included the obtaining of equipment and information that would fulfill, in part, the requirements as outlined in the "Air Staff Post Hostilities Requirements". In general, these included the finding of such material as would enable officers to prepare scholarly reports on every aspect of the German Air Force: Organization & Personnel, Records & Reports Systems, Tactical Employment, Training, Installations, Air Defense, Maintenance & Supply, Aviation Medicine, Intelligence Organization and Procedures, Flying Safety, and Weather.

To handle, expeditiously, captured German aeronautical and industrial equipment the Directorate of Intelligence set up three collecting points in the forward area on 1 May 1945: Merseberg, Nuremberg, and Stuttgart airfields. Additional sub-collecting points were also established to feed the main centers. Later, when Merseberg fell under British jurisdiction, after Germany had been divided into zones, it was closed, and Munich, which eventually became the chief collecting center, was opened. Each of the points was maintained by technical personnel thoroughly acquainted with the type of intelligence material desired and the necessary equipment to explore all technical intelligence targets in the areas. An ATI (Air Technical Intelligence) team control section was established at each collecting point to supervise the several hundred mobile ATI teams, which usually consisted of two to four technicians and a driver fluent in German, exploiting both technical and non-technical targets in the forward areas. Captured technical equipment was taken to one of the collecting points where it was flown either directly to Washington or Wright Field, depending upon its importance, or across Europe to shipping ports in France. Technical documents and reports were likewise sent to collecting points and from there to the Air Documents Research Center in London, which was specifically set up to receive the thousands of sheaves of documents being sent from the various collecting points in Europe.

These ATI teams, upon whom fell the often laborious task of ferreting valuable information from German civilian scientists and enemy personnel who were frequently reluctant to talk or to tell the truth, were composed of perhaps the most heterogeneous group of men ever collected in the army to execute a valuable and important job. There were Army officers and enlisted men fluent in German, Austrian, Russian and the Slavonic languages, skilled lawyers, scientists, research scholars, historians, and technical representatives from such corporations as Bell Aircraft, Jack & Huntz, Western Electric, General Electric, Standard Oil, Sperry, Packard, Boeing, Bendix, Detroit Broach, Remington Rand, and Victor Adding Machine. In six weeks of operation they had exploited more than five hundred important targets and interrogated hundreds of eminent German scientists, research professors, technicians, and workers.

The difficulties encountered by ATI teams sent into the field to investigate a target were numerous and complex, offering, in some cases, no reward, or little at all, after days of laborious travelling, often in foul weather, over deteriorated roads, and after gruelling hours of interrogation in unfavorable circumstances. The information given a team about a target, moreover, was often too vague for quick and successful exploitation, and the quest frequently turned into a sleuthing job with information so scanty that a well-trained detective would have despaired. Excerpts from several reports from such teams present a graphic picture of the discouragement and difficulties so often encountered:

"Of the 11 cases of ZWB (Central Publishing Agency for German Scientific reports) in a chapel", writes an Air Force officer in charge of a team sent to investigate German Research Installations at Schloss Pullach/Aibling in Bavaria, "5 were empty......Herr Becker explained that Herr Strohmeier, the Secretary of the Lilienthal Gesellschaft, had disposed of them....... when the latter showed up, we were able to interrogate him in Becker's presence. The result was a considerable flop on the part of both gentlemen, since Strohmeier told an entirely different story. After hours of heated interrogation, Strohmeier gave way and led us to a spot in the garden where we ultimately recovered about a ton of buried documents. There was also a smaller hoard which he yielded up."

In search of additional documents, the President of the Lilienthal Gesellschaft was interrogated at Schloss Pullach, a few kilometers away.

"He had no documents and told substantially the same story as Strohmeier that the documents had been conveyed by rail from the Schloss to a "Tischlerei" in the Mittel Zelle Church. When the French Army approached, Baeumker and Strohmeier first tried to throw the cases of documents in the lake in the hope that they would sink, but that failed. Then they got a number of people together and burned the lot on the beach. This took them two days, and they were barely able to get back to Schlagenhofen and Bibling respectively before occupation."

From Pullach the team went to Ainring in an attempt to locate the Forschungs-Fuehrung. After two days of investigation they found........

"that the greater part of the important documents was gone, and that the place had, in general, been cleared of interesting documents by occupying troops as well as looters, although a substantial quantity of peculiar airplanes and mechanisms remained on the field ....we found our main problem the necessity of locating the "Forschungs-Fuehrung, over which Georgii had presided.

After much travelling in quest of the members of the "Forschungs-Fuehrung", the team located some of them on a cart road near a swamp.

"These people were briefly interrogated and proved to have very few documents or anything else left all parties told the same story of the fate of the major portion or their records, namely, that they were destroyed by fire and bombs in a raid. The Germans in the area were thoroughly spoiled and had lost most of their rear of us."

In locating desired target intelligence, teams all too frequently found German personnel reluctant to reveal the location of missing material, which, they claimed, was usually either already burned, destroyed, or forever lost. They manifested a reluctance to speak, deliberately lied to mislead, the intelligence workers, or feigned complete ignorance of the subject under question. One team captain in a report of a trip that took his party to survey the Luftfahrtforschungsanstalt found that....

"there was always some kind of a Restkommande" Jerry waiting to give a conducted tour of whatever we were investigating; generally someone surprisingly well informed The appearance of these various individuals so ready to collaborate with us is part of a pre-arranged plot controlled by unknown parties with the following objectives:

(1) To keep a close check on our activities and to learn our purpose from our questions.

(2) To establish themselves, especially in the factories and other concerns, as a kind of quisling government, operating under our nominal and their actual control.

(3) To guide us away from really important information.

(4) To make themselves indispensable and so keep alive the framework of the IVth Reich.

(5) To sow dissension among the various allied governments. (This might easily take the form of claiming that certain vital records have fallen into the hands of another government.)"

But, on the other hand, there were many scientists willing and anxious to collaborate and work for the United States. Various team captains stated over and again in their reports that the better grade scientists were not ill-disposed toward the Allies.

"They seem to regard", one wrote, "the initial stages of the occupation as a temporary and regrettable interruption of their work, and are interested only in continuing their activities under any auspices. They do not understand why the Allies do not put them to work at once for our purposes. At Gottingen, some asked if they could not get grants of money from American institutions, such as the Carnegie Institute, for resuming their work..... There is no evidence". he concludes, ' "that the war has changed moral values; but rather evidence to the effect that the loss of the war is regarded merely as an unpleasant and passing material incident. The hazard of continuing any scientific war work in Germany, even under the closest supervision, is all too obvious.

Team members often found, after initiating the exploitation of targets, that there were clues at each target which lead to others unknown: these usually were investigated at once. Quite frequently it was discovered that the Germans had almost always abstracted the documents they considered most valuable, generally hiding rather than burning them. Under pressure, however, their presence was revealed, quite frequently in lakes, swimming pools, mines, barns, buried in closed over shelters, tucked away in attic corners or in cellars of houses scattered over the country, in jails, insane asylums, or even grocery stores.

This detailed search throughout Germany, specially made to capture technical equipment to further our war against Japan and to provide research and materials for extended periods of study and development, was responsible far the successful and quick completion of scientific developments upon which the Government had already been directly or indirectly engaged. As ATI ordnance flak, armament, electronics, and other exploitation teams, fanned out in their extensive and exhaustive searches through arsenals, laboratories, factories, supply dumps, and airdromes in Germany, one important high priority target or opportunity and one combined intelligence objective target after another were investigated and exploited to the maximum.

The targets briefly discussed below may serve as illustrative examples of the tremendous scope and nature of exploitation that took place under the name of "OPERATION LUSTY". One may reasonably be assured, moreover, that in this exhaustive intelligence search nothing of importance escaped detection, examination, and subsequent application. Practically everything of importance that was obtained and accomplished was done so during the first six operative weeks of the project, when it was so imperative that every technical effort be made to bring to a quick and successful conclusion the War in the Pacific.

(1) The Hermann Goering Aeronautical Research Establishment, located near Brunswick, yielded the greatest return in the field of research. Members of the Exploitation Division arrived on the 22nd April to organize and conduct the scientific exploitation of this establishment. Dr. von Kármán, General Arnold's personal aeronautical advisor, and his Group, remained at this place, on several occasions for periods varying from several days to a week. According to Dr. von Kármán, seventy-five to ninety per cent of the technical aeronautical information in Germany was available at this establishment, and that information on research and development which had not previously been investigated in the United States would require approximately two years to accomplish with the

facilities available there. Information obtained on jet engine developments available at the Goering establishment, it was stated, would expedite the United States development by approximately six to nine months. In less than two months, one hundred and nineteen reports were written on the facilities, the research conducted there, and on the interrogation of many of the German scientists previously employed in the various institutes. The permanent members of the organizing party recovered from localities, as far as 50 kilometers from Brunswick, large quantities of buried and hidden documents and equipment which had been removed by the Germans to prevent their falling into the hands of Allied forces.

(2) During the exploitation of the aviation fuel objective—of which the I. G. Farben Ind. at Ludwigshaven and Leuna, was the largest and most important—concealed documents were uncovered and interrogation of key personnel made with respect to the fuel for the conventional Otto-cycle aircraft engines, fuel for jet aircraft power plants, and fuel for rocket aircraft. All the basic information on these, as they existed in Germany, is now in possession of the Army Air Forces. The exploitation conducted at these objectives indicated that the Germans were more advanced in rocket fuel and chemical supercharging than the AAF, but the material now in our possession is more than sufficient to supply the necessary intelligence on these subjects. A substantial portion of the information on production of aviation fuel and lubricants has already been made available and is in the possession of U.S. agencies and corporations interested in this field.

(3) A document covering a complete source of instruction in the handling of plastic welding, a process which had been employed by the German aircraft industry, was located at Halle. This novel method of fabrication provided for the joining of plastics by flame gas welding and enabled the sections joined together to possess the same strength at juncture as the original material. This information was reported to the AAF for joint study with the Office of Scientific and Research Development.

(4) An acoustic-controlled guided missile research development program, together with operating personnel; was located at Bad Kissingen. The experimental control system developed there contained four electrical circuits that are activated by sound with the intended purpose of launching a rocket-propelled missile into the space occupied by a heavy bombardment formation, and constantly correcting the missile's course by means of incoming sound waves from the aircraft engines. The group of scientists who were engaged upon this development were detained in American custody at the laboratory to develop the program for Allied use.

(5) Athodyd (Lorin Engine) units that developed thrust in excess of 1500 kilograms were uncovered, and sufficient data was in our possession in May 1945 to permit immediate application in the field of high-speed aircraft. production.

(6) High-altitude engine test beds, the most elaborate in the world, which were capable of supplying refrigerated low-pressure air both for engine cooling and combustion, thus simulating atmospheric conditions at approximately 40,000 feet, were found at the BMW plant the largest German plant engaged In manufacturing aircraft engines. The application of these test beds for experiments, intended to assist 'our own manufacturers and thus improve the of efficiency of our aircraft, was initiated at once.

(7) Complete information on the Freya and Reise "G" Wurtzburg and of the Jagdschloss radar equipment was uncovered at the research laboratory located at Koethen.

(8) After the Aerodynamic-Ballistics Research Station at Kochelsee was discovered about 15 May

1945, the Directorate of Intelligence, USAFE, assigned personnel to exploit fully this important target. Over one hundred and ninety German civilian research specialists under their original director, Dr. Herman, continued their work, the results of which, however, were turned over to us More than one hundred detailed reports concerning the station were prepared. The "Kochel Wind Tunnel" located there, had the largest testing sections and the greatest air flow of any known supersonic wind tunnel. It was considered by Army Air Forces of such exceptional importance for research in connection with jet fighter and fighter bomber priority projects that the War Department directed that it be dismantled at once and shipped to the United States. Approximately twenty key German scientists, including Dr. Herman, the director, were removed to America to assist in the reassembling of the tunnel.

(9) Documents of all descriptions and nature were eventually discovered. The records of the German Patent Office, for instance, were found buried 1500 feet underground in a potash mine near Bacha. There were approximately 225,000 volumes, which included secret files. An attempt had been made to destroy them but the resulting explosions brought down a mass of debris which had served to smother the fire. Eventually, the files were evacuated and studied.

(10) Five hundred and eleven microfilm rolls of copies of records of the Oberkommando der Luftwaffe, which was the supreme air force command, were recovered from a mine near Hildescheim where they were hidden. They comprised, for the most part, records of the GAF personnel office, together with statistics on climate at GAF airdromes.

(11) The records of a department of the Speer Ministry, the German Ministry of Production, which dealt with the secret weapons program, particularly V-weapons, rockets and jets, was seized and evacuated through air channels, together with Dr. Rickhei, who was charged with the primary responsibility for the program.

(12) The GAF main equipment depots at Schwein and Kolleda were exploited. The former depot was found dispersed to 53 sub-depots, and although a large proportion of the records was destroyed, sufficient documents were obtained to initiate studies into the GAF system. The Administrative and Quartermaster records of the GAF were recovered from hiding places near Berchtesgaden. The Flying Personnel records, included about 50,000 pilots' qualification cards, together with weather staff records, which were discovered in a swimming pool at Stradtroda. The pilots' cards are of particular value, from an intelligence viewpoint, for future control measures of German air force flying personnel.

(13) Practically the latest type of every German aircraft, some of which never saw combat, eventually were located intact, or a sufficient quantity-of available parts discovered for German mechanics to assemble a certain-type. Usually these were sent across Europe to France, where they were shipped to Wright Field. Occasionally some were flown back. At least one, in some cases as many as ten, of the following, which represent only a fraction of the types, were located, some only after extensive searching throughout Germany, and forwarded to the United States for extended study and development.

> The Messerschmitt aircraft series 1101, 1106, 1110, 1111 and 1112, a series particularly interesting in that it illustrates a phase of coordinated aircraft design into which American aircraft is only now entering; seven rocket-propelled piloted aircraft specifically designed for anti-bomber interception work; a jet-propelled helicopter;
>
> Flettner 282 helicopter;

Horton 9, a flying winged glider;

Ju 88, a radar equipped twin-engine night fighter;

Ju 290, four-engine long range transport;

seven Me 163s, rocket-propelled interceptor fighters;

ten Me 262s, twin jet-propelled fighter-interceptors;

HE-162, single place fighter powered by jet engines;

flying bombs, type V1 single and dual piloted;

Lippisch P-13 Jager, a tailless twin rocket-propelled wing for supersonic speeds;

designs and models of small rocket-propelled piloted aircraft created-for bomber interception work;

three sets of FX-1400, a radio controlled bomb,

and seven complete A-4 rockets (V2s).

Numerous types of aerial equipment and instruments of all models of latest designs were obtained and likewise quickly dispatched for evaluation and study. A specimen of the German secret weapon, the X-4 rocket-propelled, winged, flight-controlled anti-aircraft missile, intended for launching from fighter aircraft against United States heavy bombardment daylight formations, and the new anti-aircraft missile Hs-117, which was launched from the ground, were found and sent to the British Air Ministry for examination.

However great in quantity and extensive in scope the captured equipment, documents, and records of industrial concerns and technical research laboratories were, greater still was the extensive scope of information and salient facts gathered from eminent German scientists, technicians and factory managers through personal interrogations. During the early phase of "OPERATION LUSTY", ATI teams and skilled American aeronautical engineers and scientists investigating intelligence targets carried out such detailed and extensive interrogations that a wealth of technical information of extreme importance was extricated from brilliant minds once directed to our own destruction. A typical team report submitted after a field trip, vividly illustrates the nature of such interrogations that took place. One team, composed of C. W. Chilson, representing Curtis Wright Company, and E. G. Haven and S. R. Puffer, from General Electric, prepared the following reports after an inspection of the BMW Company and interrogation of their key German personnel:

(a) Outline of Jet Propulsion Development Program Being Actively Followed in Germany.

(b) Outline of Entire Program of Non-Reciprocating Power. Plants Under Development in Germany.

(c) Metallurgical Data Used by BMW on Gas Turbines.

(d) Information on Gas Turbines for Propeller and Jets.

(e) Description of BMW 003 Jet Jumo, Together with the Rocket Assist for the Same Unit.

(f) Description of BMW 801 High Altitude Engine, with Turbo Supercharger and Automatic Control, Together with a Performance Report.

Interrogation reports flowed into the Directorate of Intelligence, USAFE, on such topics as Hollow Steel Jet Turbine Blades, Wind Tunnel Blades, Mica Substitutes, Ceramics, Lacquers, Cements, Buna Rubber, Rocket, Propellants (Fluid and Solid), German Aircraft Engine Types, Safety Fuels, Interferometer Measurements of Pressure Distribution of Wind Tunnel Models, Safety Fuels, Navy Torpedo Models, Temperature Controls on Me Planes, Electrical Controls on Me Planes, Production Design and Manufacturing, Technique Covering Hard Rubber Used in Aircraft Magnetos, Oxygen and Pressurized Cabin Control Equipment. Such reports were immediately prepared and forwarded to Washington for dissemination to various industrial concerns and laboratories for further study and development. Quite frequently it became necessary to keep in custody for extended periods groups of German scientists whose extensive information of the particular subjects precluded the possibility of obtaining for intelligence purposes in one or two interrogations the essence of their knowledge. For this reason, Albert Speer, Director of the German Ministry of Production, together with key members of his staff: Dr. Wurster, designer of the Great Enzian, a rocket-propelled guided missile capable of operating at 53,000 feet with speeds approximating the speed of sound; Professor Willi Messerschmitt; five technical research professors from Darmstad Technische Hochschule; Dr. Alexander Lippisch, who had accomplished important work on aerodynamic designs and supersonic speed flying wings; Dr. Kurt Tank, President and Chief designer of Focke-Wulf; fifteen brilliant scientists and technicians of the Peenemunde Research Institute; and scores of others equally as proficient in their Individual scientific accomplishments, were indefinitely retained for interrogation purposes. When the nature of the work being carried out in German research laboratories was of such vital importance that its completion would materially assist the U. S. Government, moreover, either in the prosecution of the war or in protecting her interests against future aggression, it was found expedient and wise to allow the research professors and technicians to execute their work under American supervision. This was accomplished both in Germany itself and in America, where many scientists were quickly sent during the early summer of 1945. Certain technical objectives, such as The Hermann Goering Aeronautical Research Establishment, the Aerodynamic-Ballistics Research Station, the Aerodynamic Institute & Kaiser Wilhelm Institute, and the Bayerische Motoren Werke, were of such outstanding importance that investigation by specially chosen teams, over extended periods, will be required if everything about them is to be completely exploited.

To catalogue and file the thousands of tons of German documents that were rapidly being discovered throughout the country and then forwarded to one of the three collecting points, the Assistant Chief of Staff (A-2) USAFE, together with the Chief of Technical Intelligence Division, set up in London in June 1945, an Air Documents Research Center, which became the temporary repository for all German air documents. This Center was housed in a six-story building containing approximately 28,000 square feet of usable space. All air documents from the British and American occupation zones in Germany and Austria flowed to this Center. In three months time, alone, over 111,000 tons of such documents were flown from Germany to the Center for processing before being sent elsewhere to one or more agencies interested in the subject.

As the documents poured in, enlisted personnel with a good knowledge of the German language, separated them into technical and non-technical categories. All non-technical documents were then distributed to their proper agencies, while the technical documents received a detailed processing. Each was subsequently catalogued, examined, their worth assessed, and then filed or distributed according to their importance. To assist in the proper screening, it was necessary to prepare a technical German-English dictionary, and a cataloguer's handbook to bring up-to-date the U. S.

Aeronautical Index. Two British agencies of the Air Ministry, A. D. I (K) and A.I.2(g), which were partially housed in the Center, not only met the responsibilities assigned to them by the Air Ministry, but materially assisted in the processing and cataloguing of documents. The U.S. Navy Bureau of Aeronautics also assisted in processing by supplying personnel, microfilm equipment and operators, and film-processing facilities, while twenty-five prominent American scientists and aeronautical engineers, such as Jean Piccard and Dr. John Akerman, University of Minnesota, Dr. Ernest Robischon, California Institute of Technology, Dr. Paul E. Hemke, Rensselaer Polytechnic Institute, and Dr. Richard Hartenberg, Northwestern University, acted in a consulting and advisory capacity. Individual unit libraries within the Center were set up to handle documentary material belonging to giant German concerns. Such libraries existed for the Messerschmitt Company, the ZBW, an organization which existed in Germany for the cooperation and dissemination of all formal technical aeronautical reports, the BMW, the Daimler-Benz, and others. Libraries, as well as sections, were set up to file documents of similar technical nature, such as Aircraft, Armament, Engines, Turbines and Propellers, Electronics, Rockets, Jets, and Guided Missiles. Once the documents were indexed and given a permanent library number, the laborious job of microfilming everything of importance, needed both in England and America, took place. The positive copies of the original microfilms were then sent to U. S. Army Air Forces, U.S. Navy, and British Agencies for further distribution. That which did not lend itself to reproduction by-this method was either photographed, photostated, or blueprinted. Eventually, a German Technical Air Documents Card Index will be prepared and copies distributed throughout Gt. Britain and the United States to Using Agencies, which include the aeronautical industry, government agencies, research establishments and educational institutions. At present, there are two hundred of these using agencies in the United States alone that have already made extensive use of captured German technical information gathered originally by ATI teams-from industrial firms, research institutions, and universities in Germany.

Non-technical documents after leaving the Documents Center were delivered to a combined research agency of USAFE, and Air Ministry known as “A.I.12/USAFE”. This section was created in the fall of 1944 to meet the requirements of Post Hostilities planning staffs, and in anticipation of Air Intelligence requirements for the disarmament and demobilization of the German Air Force, as well as a comprehensive long range study of all phases of the GAF. The library on the German Air Force that had slowly been built up by British specialists and American officers under the Directorate of Intelligence, USAFE, prior to “OPERATION LUSTY”, became suddenly augmented to such an extent by quantities of documents located by ATI teams that the staff of officers and enlisted men had to be substantially increased. In spite of the tremendous work involved—cataloguing, microfilming, photo-stating, translating, and preparing detailed library lists and reports for dissemination to interested agencies—the staff handled the work in a thorough and expeditious manner. By the time the first Air Force officers arrived from the United States in June to prepare staff studies on aspects of the German Air Force, practically all of the necessary material had been collected and catagorized so that work could immediately. commence.

Eventually, over two hundred officers, chosen, for the most part, by Hq Army Air Forces, from various air force commands in the United States, were engaged in scholarly research to fulfill their assigned requirements. Working from offices located in London and under the direction and guidance of the Assistant Chief of Staff A-2, USAFE, the officers exploited every available pertinent document located in repositories in London, A.I.12/USAFE, Air Documents Research Center, British and American Navy and Army libraries, and the British Museum. It was soon discovered, however, that in spite of the tremendous quantity and excellent quality of captured material available, too many questions remained unanswered and too many enigmas concerning various aspects of the enemy's air force unsolved. It became imperative, consequently, for field trips to be made into Germany in an attempt to fulfill the exact and comprehensive requirement's laid down, not only by Hq Army Air Forces, but by the staff officers themselves, who, through a desire to accomplish a superior research job and obtain for future-reference every iota of information relative to their enemy's strength, weakness, and ambitions of the past and future, refused to satisfy themselves with incomplete answers and results.

Officers preparing a study of German Air Defenses visited the Flak defenses at Bremen, Hamburg, Munster, Nuremberg, and Augsburg, interrogated General von Axthelm, Chief of German Air Force flak units, and his staff, as well as members of various flak organizations, such as the 8th Flak Division, and 8th Flak Brigade. A detailed study was made of the Air Force at Grove, Denmark, where a complete fighter defense installation was captured intact with plotting center and all-key personnel necessary for its operation. Similarly, officers preparing other staff studies made trips that took them as far south as Austria and as far north as Norway in their quest for the desired facts and figures, inspecting supply dumps, aerodromes, and other installations and interrogated appropriate German P/W officers located both in British and American zones.

Most of the detailed interrogations conducted by staff study offices were of members of the German Air Ministry Staff (OKL), which had been captured and held at Berchtesgaden as a combined USAFE/Air Ministry intelligence exploitation target, and of high ranking German army officers detained in P/W cages. When it became evident that many such interrogations would be necessary to fulfill the requirements, the OKL party was removed in toto to a camp close to London. Similarly, important German Ground Officers were likewise sent to England to further the project. Hundreds of detailed interrogations were conducted. To enumerate such German Officers interrogated would be comparable to listing a roster of the German Air Force. The following, most of whom were high ranking officers, is illustrative of the scope covered:

Reichsmarshall Goering.

Oberst von Brauchitsch, Goering's Aide.

General der Flieger Koller, Chief of General Staff.

Major Hermann, Administrative Officer.

Oberst Wolter, General Koller's advisor.

General Maj. von Rohden, Historian of the GAF.

Min. Dir Dr. Benkendorf, Chief Meteorological Service.

General Martini, Signals.

General Lt. von Criegern, General Quartermaster.

Oberst Fritz Nebel, ZRadar Inspector.

General Maj. Hitschold, Chief Ground Attack Operations.

Generalleutnant Galland, Chief Fighter Operations.

Generalleutnant von Massow, Gen. der Fliegerausbilding.

Gen. Oberstabsarzt Dr. Schroeder, Medical Services.

General Maj. Morzik, Luftransport Chef der Wehrmacht.

General Lt. Dahlmann, Flying Safety.

General Galland, a 33-year old flyer, who received his first battle experience in Spain and who has obtained a reputation among Allied officers as perhaps the most brilliant general in the German Air Force, prepared an historical narrative of fighter tactics employed for all campaigns, beginning with the Spanish and ending with the last concerted attacks against Allied fighters and bombers in 1945. This included, in part, a rather comprehensive history of the GAF. General von Rohden and his assistants, under the direction of the historical section, USAFE, prepared a lengthy dissertation on the history of the German theories of the application of air power. General Marzik and his assistants wrote up every airborne ' campaign the Germans had executed, or planned, such as the air invasions of Malta and England. Similarly, to satisfy the Post Hostilities requirements, German officers prepared detailed treatises on every topic intelligence officers wished discussed: medicine, training devices and procedures, weather, flak defenses, fighter defenses and attacks,. photo intelligence, provost marshal system, methods used to evade the Treaty of Versailles, methods used to indoctrinate Nazi principles in the Luftwaffe, and many others.

The first staff study prepared in compliance with the Air Force Post Hostilities Requirements was finished on. the 12 August 1945, the last on January 3, 1946. The list of scholarly studies below, comprising forty-five thick volumes, includes, it is reasonable to state, far more information concerning the German Air Force than the Germans themselves had ever collected during the war:

Communications.

Aviation Medicine.

Flying Safety.

Inspection.

Provost Marshall.

Personnel Administration.

Supply.

Maintenance.

Patent Activities.

Air Defense.

Propaganda in the Luftwaffe.

Records & Reports System, Statistical Controls & Planning Methods.

Tactical Employment: Liaison Operations.

Troop Carrier Operations.

Tables of Organization and Equipment.

Coordination between the GAF Air and Ground Forces. Controlled Missile Program.

Night Fighter Operations.

Emergency Sea Rescue.

Fighter Tactics employed against Allied fighters, fighter bombers, and heavy bombardment formations.

Photo Intelligence.

Copies of these reports were given to the British Air Ministry and disseminated in America to every interested military command. They will eventually be studied in Staff and Command Schools and the War. College, and may serve as a nucleus for future historians interested in the aerial aspects of the second World War, or, in particular, of an air force once reputed to be the greatest and most efficient ever assembled. The military mistakes made by German Air Force generals, the clash of strong personalities that was so detrimental to their cause and purpose, the magnificent military plans created but never executed, tactics employed, principles of air power devised and used, adopted method of communications, supply, and training, are all lucidly and scholarly presented. In these documents lies the essence, so to speak, of a once sinister and destructive force now so hopelessly crushed that its rebirth appears highly improbable.

"OPERATION LUSTY" is now dead. No longer do ATI teams scour the German countryside exploiting intelligence targets. This work has been completed. The requirements, both technical and non-technical, have been fulfilled: equipment and documents of immediate interest and value to technical research centers in the United States for evaluation and immediate execution towards the war against Japan was expeditiously collected in the early weeks of the project's existence; Air Staff Post Hostilities Intelligence Requirements were fulfilled; equipment and documents were sent to technical research centers for extended periods of study and development to increase the efficiency of United States aircraft, equipment, and research establishments. There still exists however, strict supervision of eminent German scientists and their assistants, and corporation directors and managers, technical workers, and university professors, who were once employed in scientific research. Many of such personnel are still actively engaged both in the United States and Germany in the furthering of inventions, technical discoveries and formulation of new scientific processes that they were doing directly or indirectly for the German government when hostilities ceased. Certain important corporations such as those previously mentioned, moreover, are still working though the war had never ended; the results of their labors, however, now benefit the United States rather than Germany. If necessary and advantageous, this aspect of exploitation will continue indefinitely. The results that have already been obtained and those that are certain to appear in the immediate future, compensate over and again for the time, effort, and money expended in extricating from the brains of brilliant German scientists every particle of information and knowledge they possess that in any way further the interests of our government.

Nazi Technical Papers Form Research File: Captured Documents Provide Complete History of Air Program. ***The Lima News*** **(Lima, Ohio) 21 November 1947 p. 12.**

DAYTON, Nov. 21—(AP)—Any student who ever tried to wade thru just a single page of German translation will appreciate this one:

What were once 1,500 tons of German documents—a complete history of the Nazi air research program from 1933 to 1945—have been evaluated, classified, catalogued, indexed and published in microfilm by air intelligence experts at nearby Wright field.

As a result, American aircraft industries have at their call products of the most intensified aeronautical development program the world ever has known.

Engineers estimated the actual research contained in the captured documents would cost between two and three billion dollars if reproduced today in this country.

The air documents division of the AAF air materiel command's intelligence department discarded 1,450 tons of lesser papers at the beginning of project index. But it handled 55,000 Nazi documents, all written in technical German and using at least 110,000 new German aeronautical terms familiar only to German scientists.

Included were tons of top secret details on the world's first production jet-engine fighter, the Messerschmitt-262; design, production and test information needed to duplicate the deadly V-1 and V-2 missiles, plus hundreds of other ideas ranging from swept-back wings for supersonic flight to formulas for making heat-resistant dyes and synthetic rubber for airplane tires.

Moving spirit behind the job has been a young AAF officer, Col. H. M. McCoy, West Point graduate and holder of two graduate degrees from the California Institute of Technology.

It was McCoy who evolved what seemed a fantastic idea in 1945 when the project actually got down to the work of abstracting and filing.

Colonel McCoy wanted to catalog German documents so they would form a nucleus of a huge file embracing the entire science of aeronautics, a ready-reference catalog which would save millions of dollars and hundreds of thousands of man-hours by avoiding duplications, costly literature searches and wasted efforts.

Suppose an American firm wanted to begin research on a particular type of guided missiles without having previous experience. Suppose that company went thru months of study and costly experimentation, only to find near the final test stage their missile already had been tried elsewhere and found impractical.

With an air catalog such as McCoy envisioned, the firm could have turned to a central government agency before experimentation began and learned the idea was impractical before they wasted time and money.

Colonel McCoy's index dream is in process of being realized. The Institute of the Aeronautical Sciences, under joint Air Force-Navy contract, is compiling the standard aeronautical index, considered the most radical innovation in classification history.

Wright field is serving in a similar manner with its German information. By August, 1947, the air documents division had furnished more than 10,000,000 index cards from its master file to 35 qualified government, scientific and industrial organizations thruout the nation, plus hundreds of thousands of documents in microfilm to 2,500 governmental agencies and contractors.

All captured Nazi documents are microfilmed. From its index, a qualified organization need only ask for a copy of a needed document.

Within 48 hours the requested document is on its way. In an emergency, that time can be cut to a few minutes.

[See the related photograph on p. 2118.

See related descriptions from other sources on p. 2140.

The above article was also published as:

Nazi Files Reveal Research Secrets: Data in Captured Documents Indexed for Air Industry. *The Malakoff News* (Malakoff, Texas) 23 January 1948, p. 4.

Nazi Files Reveal Research Secrets. *Pueblo Indicator* (Pueblo, Colorado) 24 January 1948, p. 4.]

E.2 Advanced Liquid Propellant Rockets

[Official histories acknowledge that Germans designed a two-stage liquid propellant intercontinental ballistic missile, A-9/A-10, during the war, but state that the project never progressed further. For example, Michael Neufeld, Senior Curator at the Smithsonian National Air and Space Museum, wrote: "The A-9/A-10 was never more than a drawing-board concept and was shelved in 1942" [Neufeld 1995, p. 283]. Neufeld also wrote that it was not possible to upgrade single-stage rockets during the war: "Emergency improvisations had less of an impact on the A-4, because its relative technical maturity puts limits on how much further improvement could be extracted in a short period of time" [Neufeld 1995, p. 251].

This section presents evidence that the A-9/A-10 rocket was much more than a paper design, as well as evidence for other wartime work on advanced liquid propellant rockets:

- There were several reports of upgraded wartime A-4 rockets that apparently had been lengthened (and therefore carried more propellant and presumably had higher-thrust engines to compensate) from the standard 14 meters long to 18 or 21 meters, and German teams in the United States, Soviet Union, and France readily built such upgraded versions after the war (pp. 5794–5799).

- David Irving wrote of the giant underground rocket launch complex that Germany built at Wizernes, France during 1943–1944: "The remaining site, at Wizernes, caused some anxiety, as it was not obviously aligned on any city in Europe. One interpreter caused a high degree of alarm early in the year when he discovered that one facet of the workings was within half a degree of the accurate Great Circle bearing on New York. [...I]t is a remarkable fact that the enormous bombproof doors and handling gear were all capable of handling a rocket about twice the height of the A 4[...]" (p. 5311).

- A 26 October 1944 U.S. report derived from a German prisoner of war indicated that there were advanced rocket installations near Erfurt, that two-stage rockets had already been tested up to a maximum altitude of 360 km, that an upper-stage rocket engine had successfully used liquid hydrogen and liquid oxygen, and that research was being conducted on ion rocket engines (p. 5311).

- In July 1944, U.S. Army Air Forces General Henry Arnold stated that the Germans were currently developing "large 75 ton rockets," over five times the weight of an A-4 (V-2) rocket (p. 5316.

- A 14 December 1944 U.S. report derived from another German prisoner of war stated: "Two types of V-2 have been built: Type A 1, which is about 23 m long and 4.5 m in diameter, and Type A 4, which is about 18 m long and 2.5-3 m in diameter. Only the latter is in mass production... PW heard that German technicians intended to launch them to an altitude of 120 km, which would have permitted them to reach NEW YORK." The description of the first type does not match the very small and decade-old A-1, but does match the A-10 if a "0" was dropped somewhere along the way (p. 5334).

- On 5 January 1945, Colonel Lowell Weicker at the Headquarters of the U.S. Strategic Air Forces in Europe wrote: "Germany... is leading the world... in long range missiles... A large part of her manufacturing facilities have gone underground and she is bending every sinew for the last stand on the Vaterland frontiers" (p. 5336). A 19 January 1945 report from the Headquarters of the U.S. Strategic Air Forces in Europe further stated: "The V-2, or rocket projectile, with a warhead of approximately one ton, and a current range of 225 miles, is being fired at London at the rate of 180/250 per month, and against Continental ports at the rate of approximately 300 per month... Larger rockets (68 feet in length as against 45 feet) are known to exist, and may appear in small quantities during the year. They would have a considerably larger warhead." The larger rockets "known to exist" sound like an enlarged V-2/A-4 or an A-10, despite the conventional historical narrative's denials of both possibilities (p. 5337).

- According to numerous press accounts on 26 January 1945, the German "head of an experimental station for V-bombs in Jutland" had just defected to Sweden and revealed that the V-3 was "an improved version of V-2," and the V-4 rocket, which could reach New York and other eastern U.S. cities from Europe, was "now in production" (p. 5341).

- In a transcript of her testimony before an East German government inquiry on 16 May 1962, Cläre Werner, a wartime lookout at the Veste Wachsenburg castle near Ohrdruf, reported watching the launch of a large new type of rocket on 16 March 1945 near Rudisleben, as well as being informed of the historic nature of the launch by visiting military and SS officials (p. 5344). In transcripts from the same 1962 East German inquiry, three witnesses (Werner Kasper, Albin Kummer, and Alfred Gründler) who worked at the Rudisleben complex reported seeing the 16 March 1945 rocket prior to its launch and described it as a two-stage rocket over 30 meters tall and over 4 meters in diameter at the base (pp. 5344–5347). Several U.S. intelligence documents mentioned the existence of very large military complexes at Rudisleben and Ichterhausen (pp. 5348–5351).

- In his 1995 autobiography, Otto Skorzeny, who had been a very prominent SS officer during the war, wrote: "Included in the V-weapons program was the construction of a rocket capable of bombarding New York or Moscow. This rocket was practically finished at the end of March 1945 and could have gone into series production beginning in July" (p. 5352). In his 2000 autobiography, U.S. "Mercury Seven" astronaut Gordon Cooper said that Wernher von Braun and his fellow team member Joachim "Jack" Kuettner had privately told Cooper that shortly before the end of the war, Germany had fully prepared a manned rocket capable of reaching New York (p. 5353). In 2000–2002 interviews, Heinrich Himmler's chief adjutant, Werner Grothmann, stated that prototypes of the two-stage "America rocket" were completed during the war, and that a prototype of some sort of large rocket was successfully test-launched on 16 March 1945 in Thuringia (pp. 5355–5359).

- Henry Picker, a close confidant of Hitler, wrote that before the war ended, prototype fission bombs and prototype A-9/A-10 intercontinental rockets were completed and ready, and that facilities for mass-producing the bombs and rockets had been built (pp. 4635–4639).

- A 7 April 1945 U.S. Army report stated that a German prisoner of war "was told by an ordnance man stationed at OHRDRUF that from here a new secret wpn will shortly rise (wird steigen)" (p. 5363). A 9 April 1945 U.S. Army report stated that near Ohrdruf was a large "underground plant. French workers... were escorted by armed guards, not allowed to look right or left... considered to be very important production area" (p. 5363).

- Several 8 April 1945 U.S. Army intelligence documents reported: "...underground factory ... employs some twenty to thirty thousand Russians, Poles, French, etc. They are making the V-4, which is a two man rocket of some sort... weapon then is sent to Weimar..." Another report from the same date clarified that the "gadget holds 2 men" (pp. 5365–5373). 18 April 1945 articles in French and British newspapers gave the accounts of French workers who had just been released from a 24-square-kilometer underground factory, where they had been building V-4 rockets. They also mention that the V-3 was a known, improved, and enlarged version of the V-2 (p. 5376–5377).

- Captain Heinz Stoelzel, a close associate of Wernher von Braun and Walter Dornberger at Peenemünde, was apparently relocated to near Erfurt, Thuringia no later than 3 November 1943, and fled to Switzerland at the end of the war to avoid Allied capture. Shortly after the war, he hand-copied detailed drawings showing the planned A-9/A-10 trajectory to New York and the design of an A-9 with a two-man crew to pilot it to its target. Most of his papers were destroyed after his death, including any information on the A-10 he may have had (pp. 5384–5388).

- A Russian description of German technology captured in 1945 showed a diagram of a complete A-9 upper stage on an A-10 lower stage (p. 5389). At least two A-9 or A-4b rockets were test fired without the A-10 booster in December 1944 and January 1945, and more A-9 rockets were known to have been built (p. 5390). According to a 1947 U.S. Army Air Forces report, one of the German scientists employed in the United States after the war had been developing "a guidance system for the transoceanic A-10 surface-to-surface missile when the war ended" (p. 5398).

- In a 13 May 1945 speech, Winston Churchill said: "When the Americans captured vast stores of rockets of all kinds near Leipzig, ...and when all the preparations being made on the coasts of France and Holland could be examined in detail ... only just in time did the Allied armies blast the viper in his nest. Otherwise the autumn of 1944, to say nothing of 1945, might well have seen London as shattered as Berlin" (p. 5398). Newspaper articles from 14 June 1945 reported that according to Allied investigators and German scientists, 3000-mile-range rockets would have been mass-produced by fall 1945, or even sooner if Allied bombing had not delayed the program (pp. 5402–5403).

- On 26 June 1945, Henry Fowler, Director of the Enemy Branch of the U.S. Foreign Economic Administration, testified to a U.S. Senate committee: "According to recent reports from Germany, it appears that if the Germans could have held out only 6 months longer they would have been able to smash New York City with improved V-2 bombs... It is not necessary here to elaborate upon the terrifying scientific discoveries which our economic and industrial intelligence is gradually uncovering as we work beneath the lid in Germany. With the memories of her new V-weapons fresh in our minds, little needs to be added except to point out that they just didn't appear out of thin air." It would be impossible to go from paper plans to deployed intercontinental ballistic missiles within six months, so the rockets must have been far beyond the paper design phase in May 1945 (p. 5206).

- On 27 August 1945, Consolidated Vultee Aircraft Corporation (Convair) stated in *Life* magazine: "Especially in the last months of the war, our margin of safety was slimmer than most of us suspected. Just how slim it was is known best to certain American military experts who have since inspected some of Germany's underground research laboratories and war plants. Here they saw secret weapons in various stages of development... weapons which might conceivably have turned the trick for the Nazis if they could have used them boldly in a last desperate gamble. Some of these things can now be revealed. Others cannot—yet... In a V rocket plant, burrowed 800 feet deep in limestone rock, our technicians found blueprints for a fearful V bomb with an estimated range of 3000 miles. 'We planned to destroy New York and other American cities starting in November,' said a German rocket engineer" (p. 5208).

- On 29 August 1945, Secretary of the Navy James Forrestal announced that Germany had been actively developing "at least two or three rockets which represented advances over what we call V-2" (p. 5441–5443). A 15 September 1945 U.S. intelligence report stated that "experiments had already been conducted on piloted models" of long range missiles, and that the missiles were intended to carry atomic explosives (p. 5444–5445).

- In October 1945, U.S. Army Air Forces General Henry H. Arnold testified to Congress that "German V-2 bombs alone, perfected with wings, radar and electronic devices, can now travel over 3000 miles and at 2000 miles hit a target on the button" (p. 5454. In December 1945, U.S. Army Air Forces General Carl Spaatz wrote regarding rockets: "The Germans were readying a transatlantic model when the war ended" (p. 5465). In General Arnold's 1949 autobiography, he wrote: "The V-10 (A-10), a very large rocket intended especially for New York, was being built" (p. 5466).

- In November 1945, numerous newspapers reported that a Swedish spy who had been working undercover in the German rocket programs provided detailed evidence that Germany had been developing the "V-10, which... was to cross the Atlantic in thirty-five minutes and devastate American industries and cities," and also "it should be possible to cruise around in space under human control" (p. 5458–5459).

- In a 7 March 1946 presentation to the Society of Automotive Engineers, U.S. Army Air Forces Colonel Donald L. Putt, who was in charge of the aerospace engineers, documents, and prototypes brought back from Germany, stated: "The Germans were preparing rocket surprises for the whole world in general and England in particular, which would have, it is believed, changed the course of the war if the invasion had been postponed for so short a time as six months... The most highly publicized missile of the Germans was the V-2, or as the Germans themselves knew it, the A-4. There were 10 variations of this weapon... Three were prototypes. Four were improved models. One was a launching device intended to increase the already great range to 5000 km. Interestingly enough, one of the improved models was to be equipped with wings, wheels, a pressurized cabin, and to carry a pilot" (p. 5472).

- A U.S. Army card catalog of intelligence documents shows that the U.S. government once possessed a complete history of the A-9/A-10 trans-Atlantic rocket, written two years after the war's end, but that this history was either destroyed or not transferred to NARA with the other files; no copies of this report have ever been located. If the A-9/A-10 never entered active development during the war, why would the U.S. government have commissioned a detailed history of its development in 1947, and why would the government have later ordered that history to be suppressed? Does the fact that the Army Assistant Chief of Staff for Intelligence specifically filed this report under "Nuclear Physics (Atomic Energy)—Uses" indicate that the A-9/A-10 had a nuclear warhead (p. 5485)?

- In December 1946, many newspapers reported that Wernher von Braun said that before the war ended, he and his team had been developing a rocket with a launch mass of 100 tons (approximately seven times larger than an A-4 or V-2 rocket) that was specifically designed to carry a mysterious explosive payload of six tons from Germany to the United States (pp. 5496–5497). A six-ton payload would have been beyond the capability of even an A-9/A-10, so was this an even more powerful rocket? Why was it so important to carry a six-ton payload? Even a fission bomb would be smaller. Was the intended payload a hydrogen bomb?

- A number of 1945–1947 U.S. intelligence reports indicated that Soviet forces had restarted production in German rocket factories including wartime rocket factories in the Erfurt area, plants producing hydrogen as well as oxygen, and factories producing manned A-9 rockets apparently manned. The reports also mentioned rockets called the V-3 and V-4 that were larger than the V-2, had longer ranges than the V-2, and were successfully produced in Germany and/or Bohemia during the war. From the described dimensions, these V-3/V-4 rockets were apparently not the A-9/A-10, but rather some roughly comparable long-range rockets that had been designed and produced in parallel with the A-9/A-10 (pp. 5503–5572).

- A 1957 U.S. Air Force report stated: "A program known to the Germans as the A9/A10 development was designed to use a winged V-2 rocket as the second stage of a two-stage system. This vehicle was under development and test by the Germans when the war ended" (p. 5603).

These large wartime liquid propellant rockets and their creators led directly to the postwar development of large liquid propellant rockets in Allied countries, including modern intercontinental ballistic missiles (the second component of the nuclear triad) and launch vehicles for satellites and spacecraft.]

Ernst Klee and Otto Merk. 1963. *Damals in Peenemünde—Ein Dokumentarbericht.* Oldenburg: Gerhard Stalling. p. 99

Die Interkontinentalrakete, heute eine Selbstverständlichkeit, schwebte den Peenemünder Wissenschaftlern und Ingenieuren bereits 1940 vor—lange, ehe das Aggregat 4 überhaupt flog. Aus ersten Überschlagsberechnungen entstand das Projekt A 9/10, dessen hier wiedergegebene Zeichnung vom 10. Juni 1941 stammt. Das gesamte zweistufige Aggregat hatte ein Höhe von 26 Meter, war also größer als die heutigen amerikanischen ICBM. Das Startgewicht sollte 85.3 Tonnen betragen, wovon auf die zweite Stufe—eine ungeflügelte oder eine geflügelte A 4—16.2 Tonnen entfielen. Flugbahnberechnungen, die man damals anstellte, deuten darauf hin, daß man mit einer weiterentwickelten zweistufigen Kombination von West-Frankreich oder Portugal aus über den Atlantik hinweg Nordamerika zu erreichen hoffte. Da man jedoch nur einen Sprengkopf von 925 Kilogramm hätte befördern können, wäre dies militärisch ein ziemlich sinnloses, weil zu aufwendiges Unterfangen gewesen—höchstens geeignet, einen moralischen Effekt zu erzielen. Aber wie bei allen Projekten kam es den Peenemündern auch hier nicht unbedingt nur auf die Waffe an. Daß sie die ersten waren, die den Gedanken einer von Kontinent zu Kontinent fliegenden Rakete faßten, bleibt ihr Verdienst.

The intercontinental rocket, today a matter of course, was already in the minds of Peenemünde scientists and engineers in 1940—long before the Aggregate-4 even flew. The first estimated calculations resulted in the project A-9/A-10, the drawing of which shown here [p. 5271] dates from 10 June 1941. The entire two-stage aggregate had a height of 26 meters, which was larger than today's American ICBM. The take-off weight was to be 85.3 tons, of which the second stage–an A-4 without or with wings—comprised 16.2 tons. Flight trajectory calculations made at the time indicate that a developed two-stage combination could hopefully travel from Western France or Portugal to North America across the Atlantic. However, since only a 925 kilogram warhead could have been carried, this would have been a rather pointless military endeavor, as it would have been too costly—to achieve an effect on morale at most. But as with all projects, the Peenemünde people did not necessarily only care about the weapon. That they were the first to grasp the idea of a rocket flying from continent to continent remains their credit.

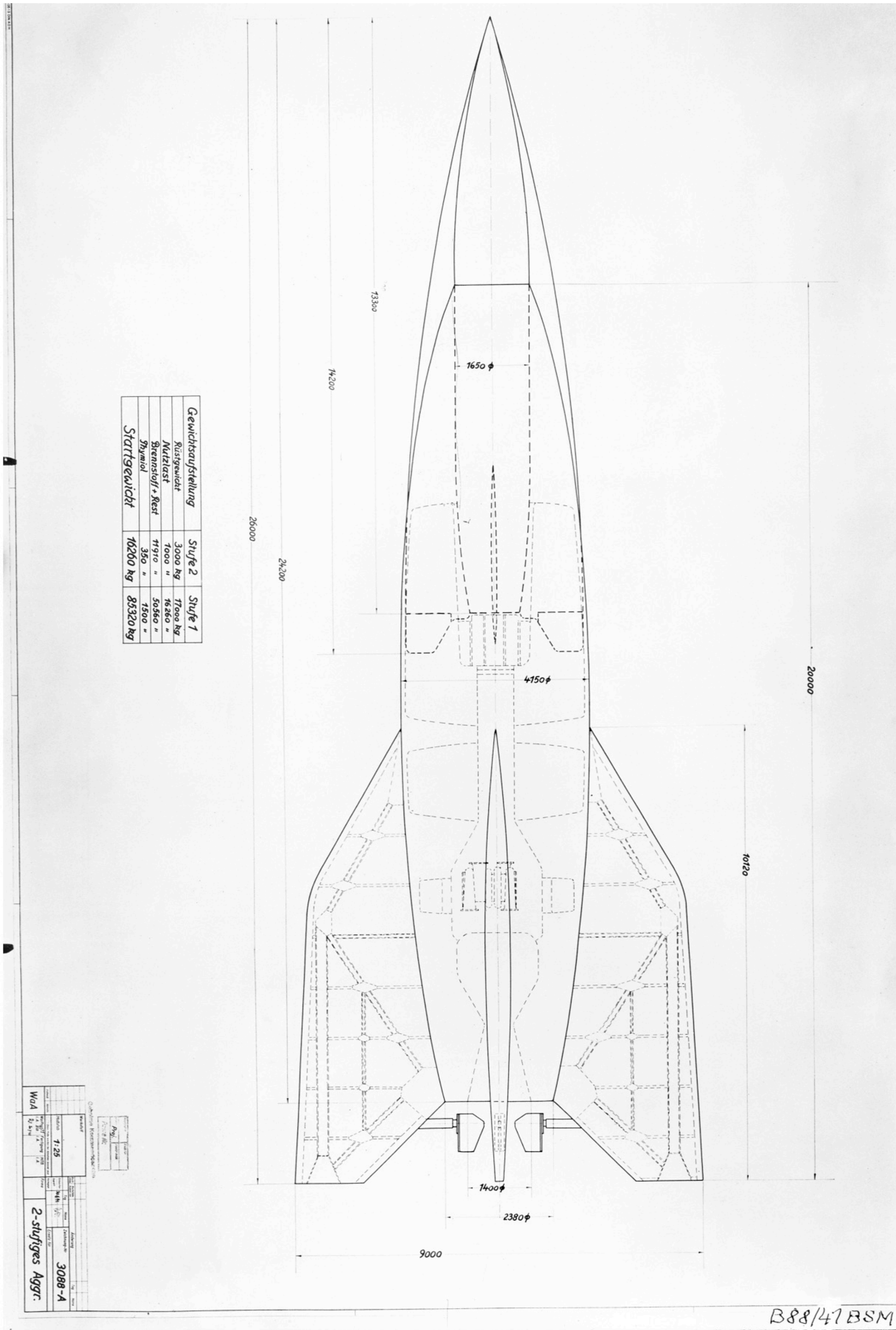


Figure E.25: 1941 design for A-9/A-10 two-stage intercontinental rocket [Deutsches Museum Archive, photo 9664].

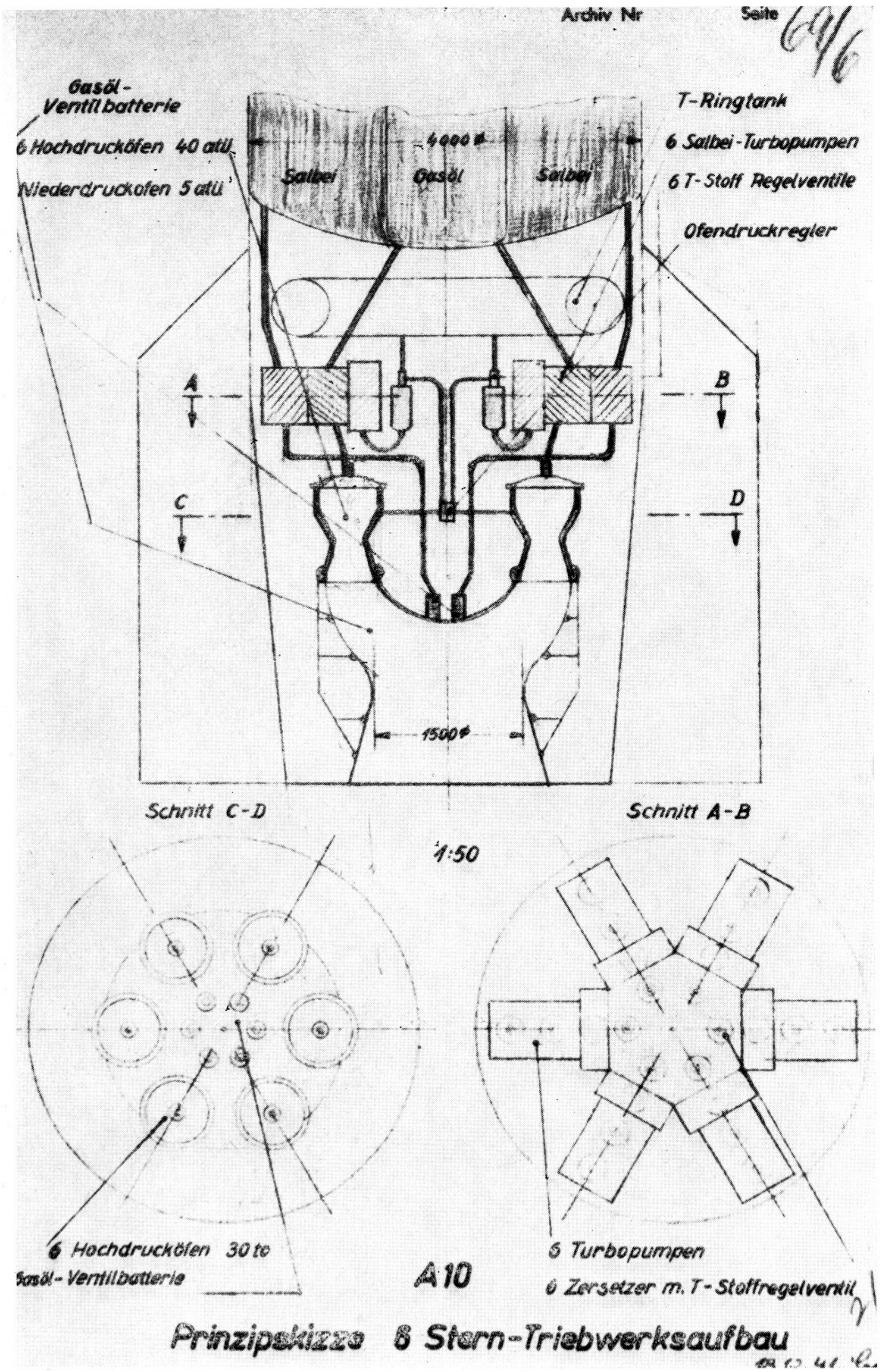


Figure E.26: A-10 rocket engine design using six A-4 engines connected to one large shared exhaust nozzle [Deutsches Museum Archive, photo 32307; Klee and Merk 1963, p. 100].

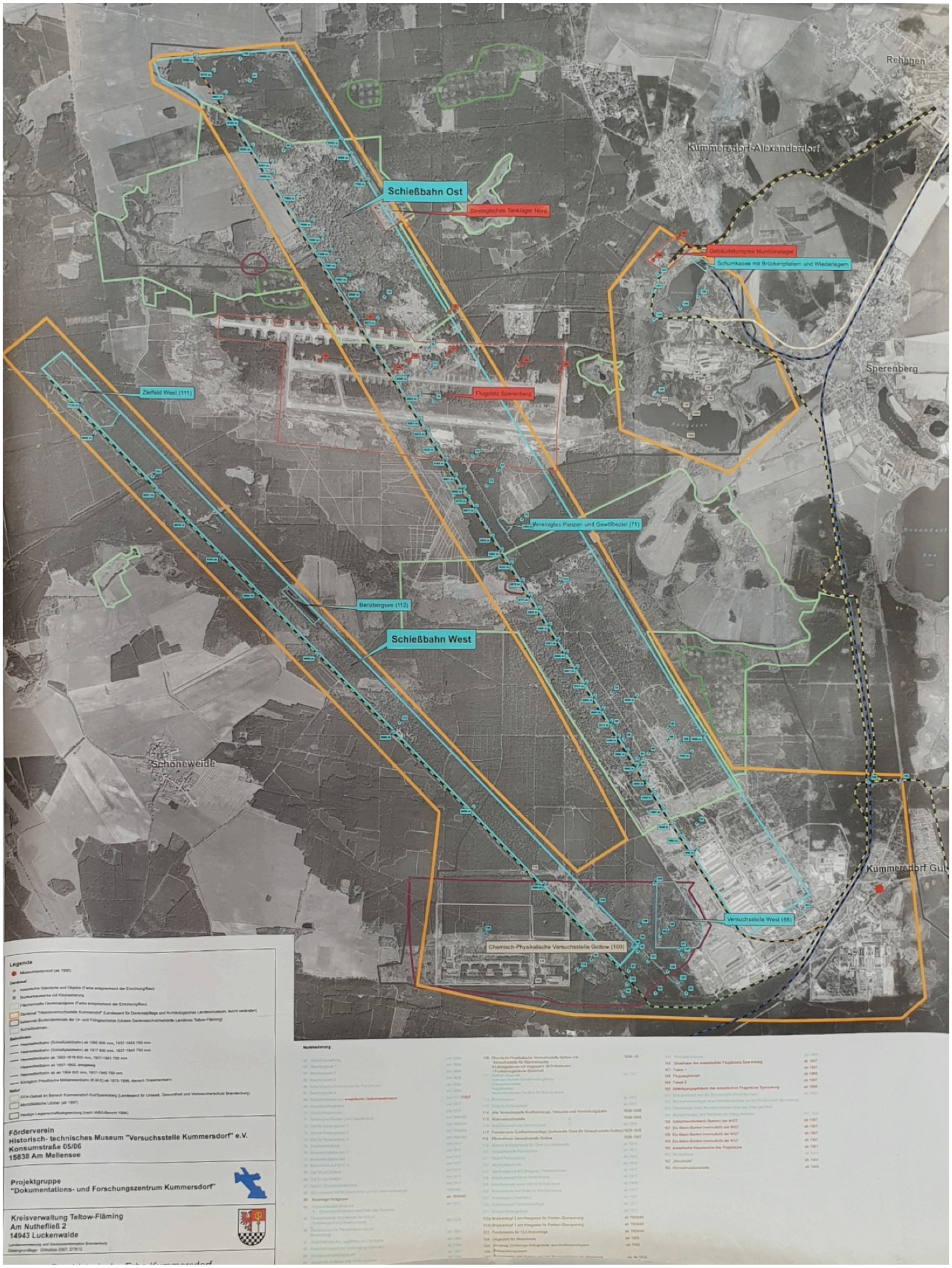


Figure E.27: Map at the Historisch-Technisches Museum Versuchsstelle Kummersdorf.

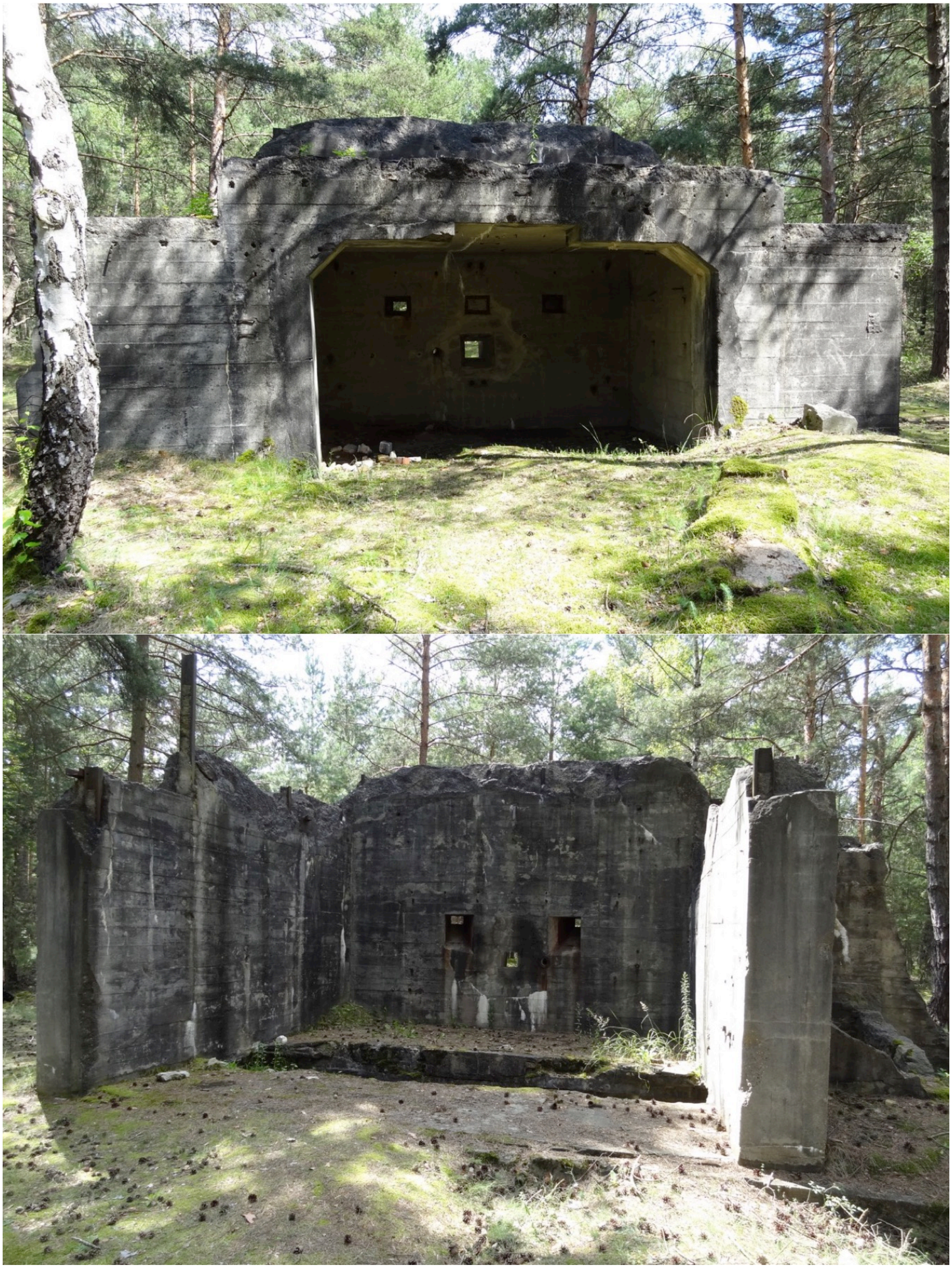


Figure E.28: Historisch-Technisches Museum Versuchsstelle Kummersdorf: A-3 rocket test stand and control bunker.

Figure E.29: Historisch-Technisches Museum Versuchsstelle Kummersdorf: Rocket engine test building large enough to accommodate test firings of A-4 engines (upside down with the exhaust vented through the roof).

Figure E.30: Historisch-Technisches Museum Versuchsstelle Kummersdorf: Model showing vehicle assembling building, railroad track for crawler, and launch pad (above); railroad spikes from the crawler track at the launch site (below).

Figure E.31: Map at the Historisch-Technisches Museum Peenemünde.

Figure E.32: A-4 (V-2) rocket launch at Peenemünde in 1943.

Figure E.33: Historisch-Technisches Museum Peenemünde: the former power plant and a reconstructed V-1 launch ramp.

Figure E.34: A-4 (V-2) rocket at Historisch-Technisches Museum Peenemünde.

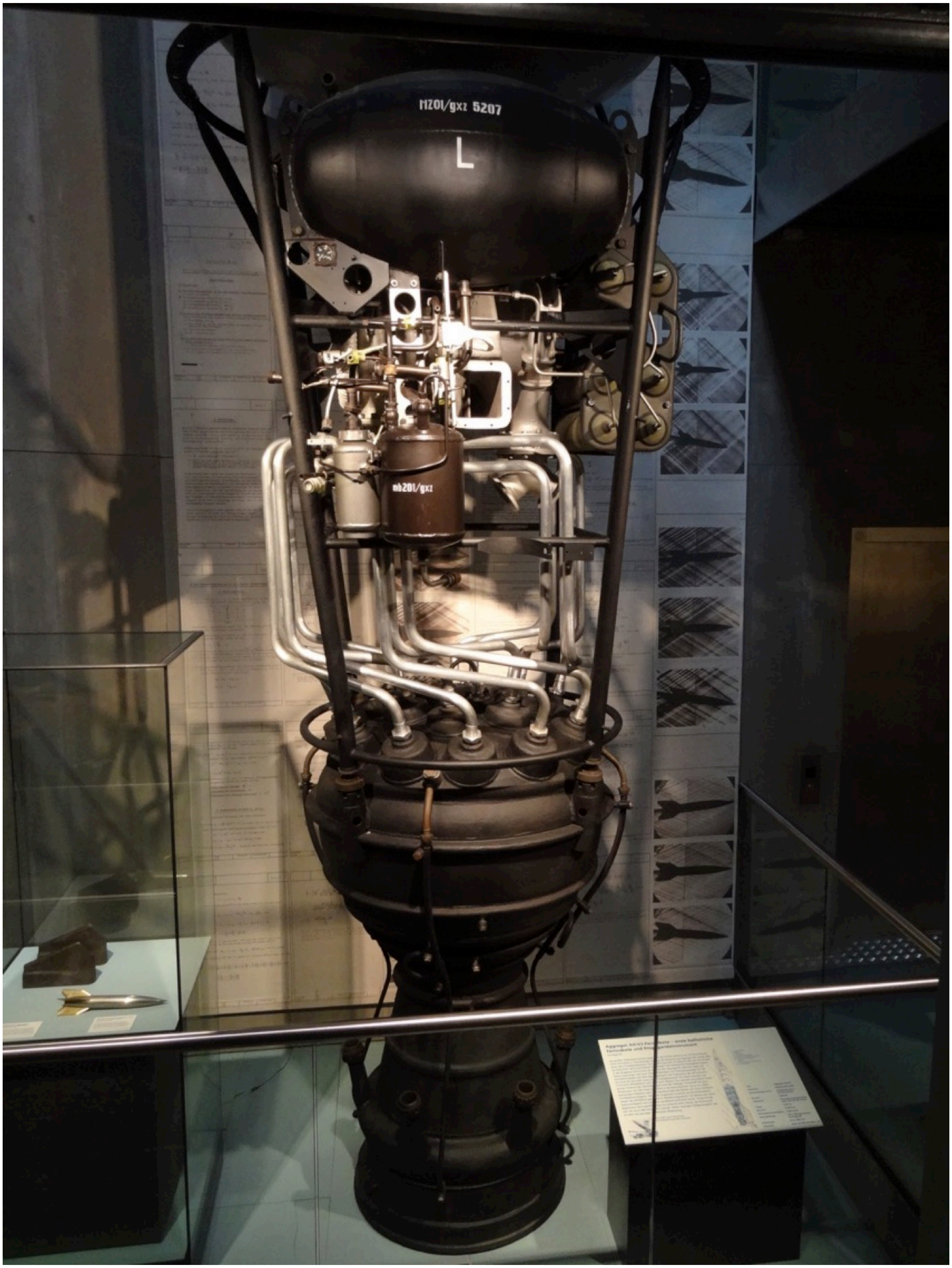


Figure E.35: A-4 rocket engine in Deutsches Technikmuseum Berlin.

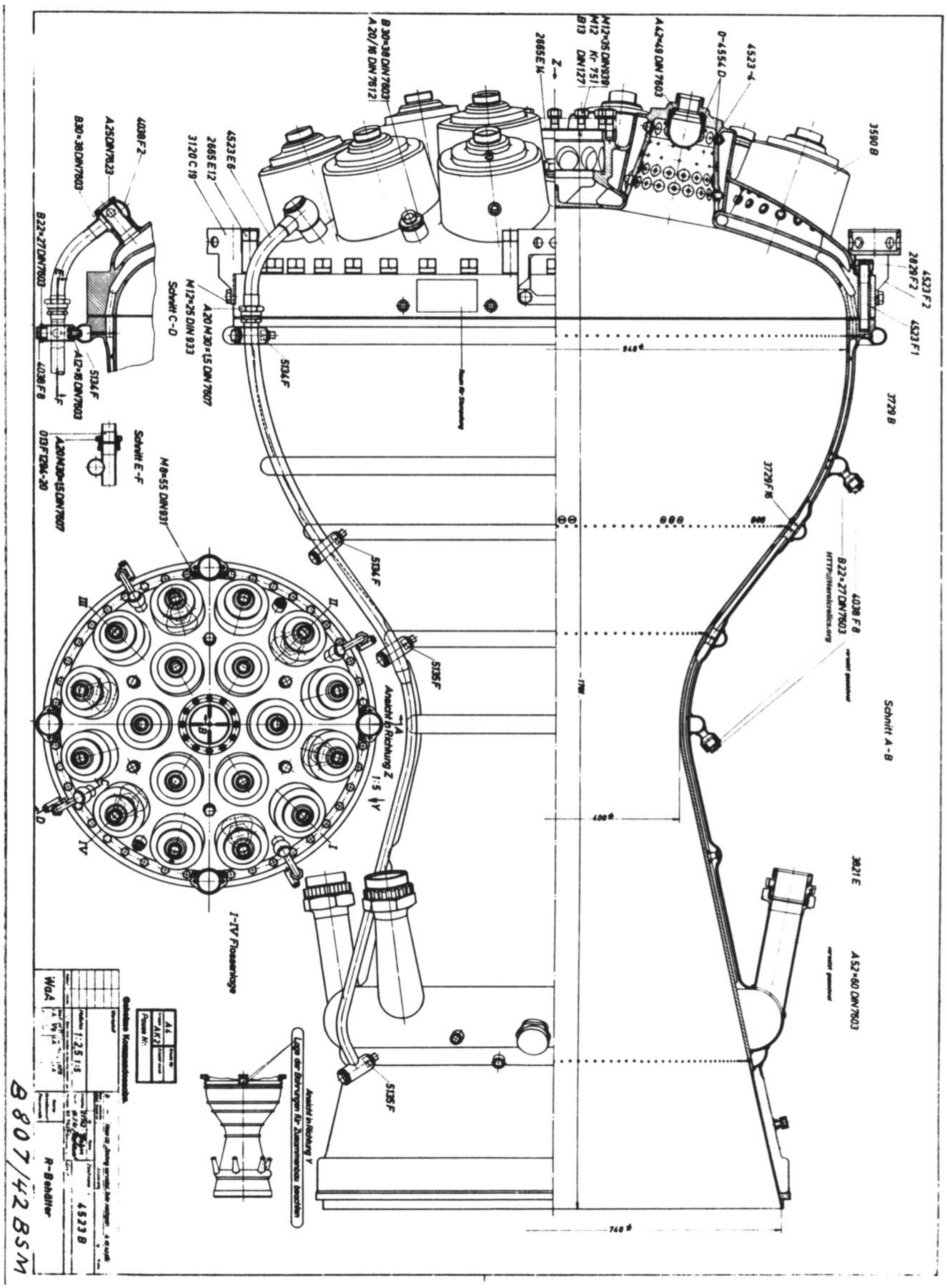


Figure E.36: Standard A-4 rocket engine design with propellant injection cups on top.

Figure E.37: Standard A-4 rocket engine with propellant injection cups on top.

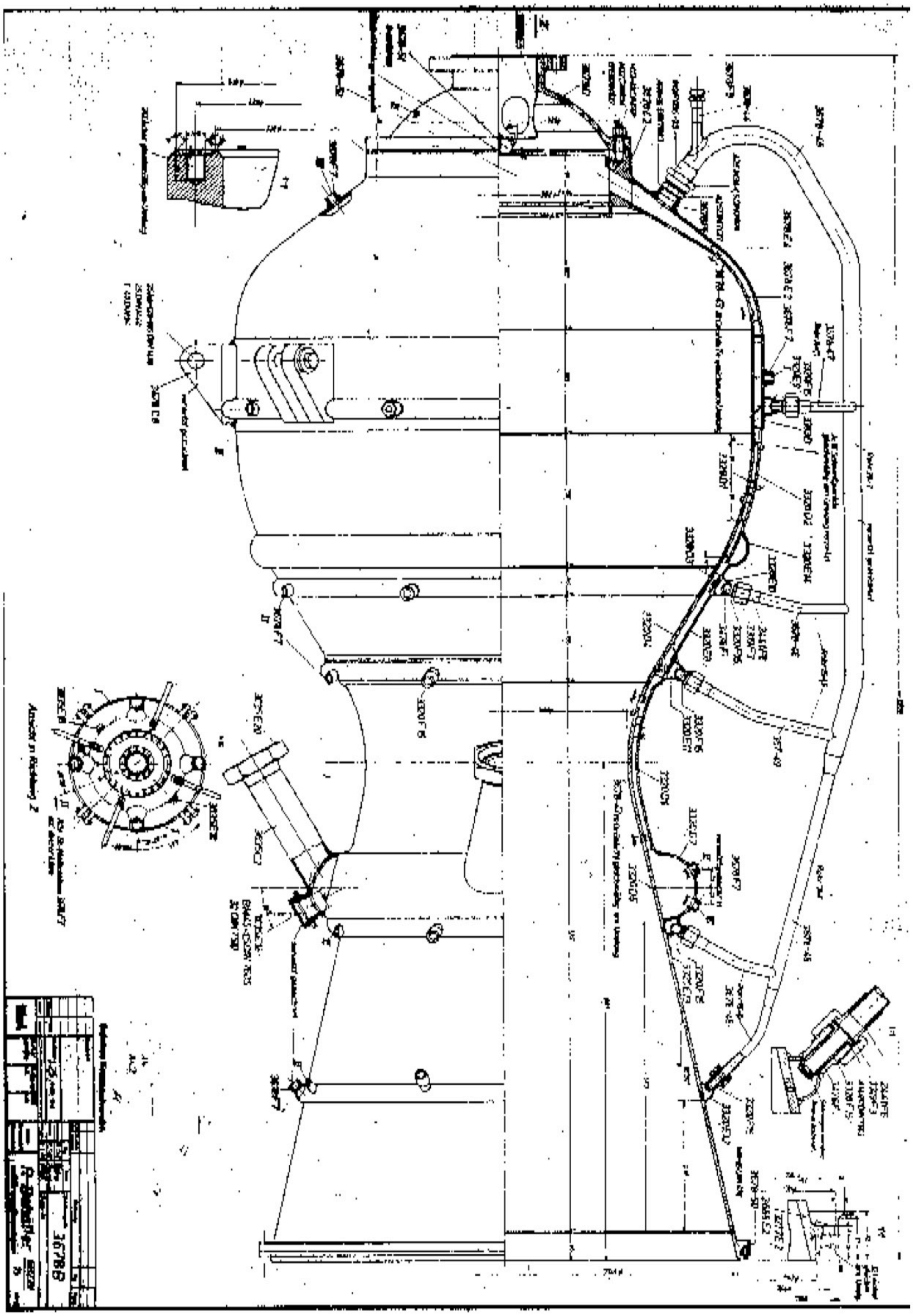
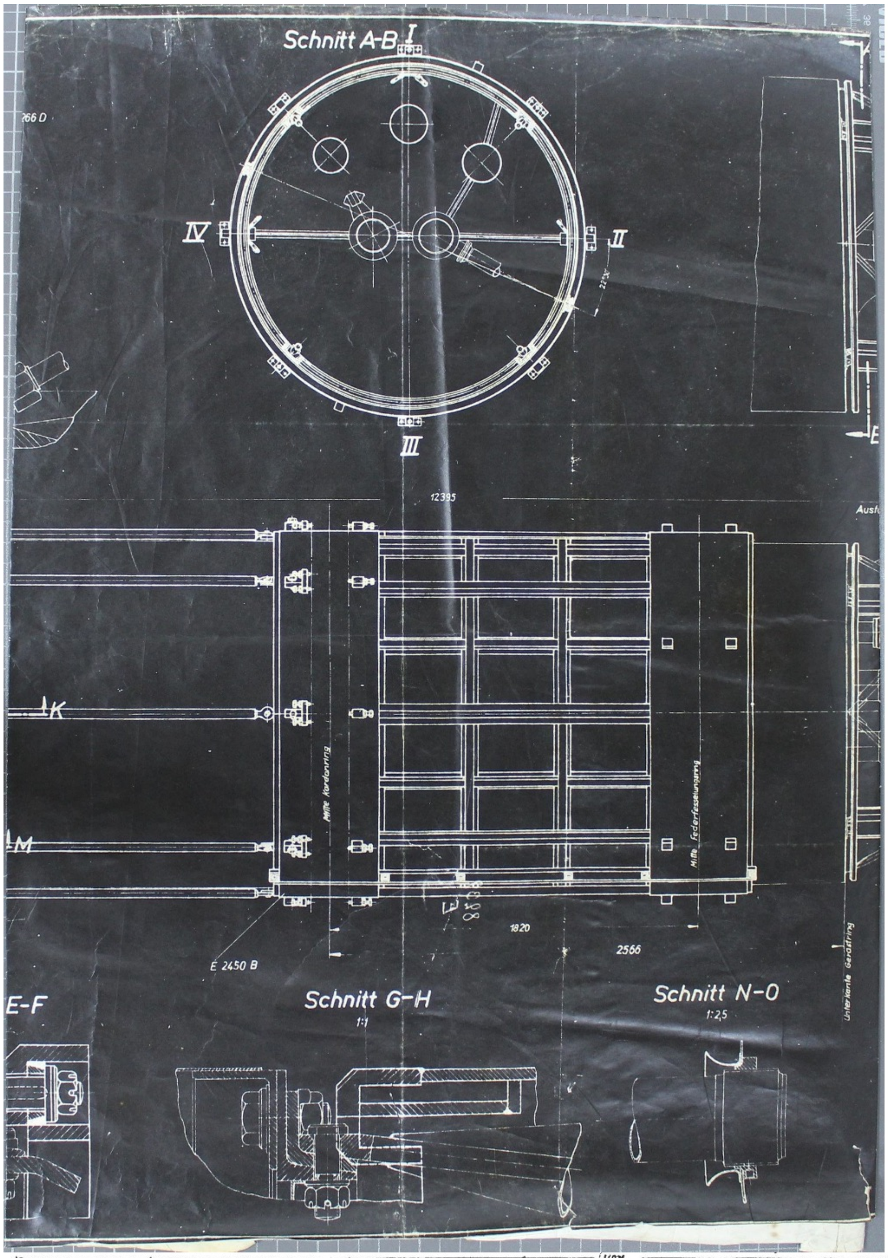


Figure E.38: Advanced A-4 rocket engine design with propellant injection plate on top.

GERMAN A-4 ROCKET COMBUSTION CHAMBER (PRODUCTION)

Figure E.39: Advanced A-4 rocket engine with propellant injection plate on top. According to the caption in the U.S. report, apparently this advanced engine was actually mass-produced during the war. [http://heroicrelics.org/info/v-2/a-4-combustion-chamber.html; Klee and Merk 1963, p. 31]



Central payload compartment (?) for a modified A-4 rocket

TNA (Kew) AVIA 40/717. March 1943.

See also: Philip Henshall. 2000. *The Nuclear Axis: Germany, Japan and the Atom Bomb Race 1939-1945.* Phoenix Mill, UK: Sutton. p. 123.

Standard A-4

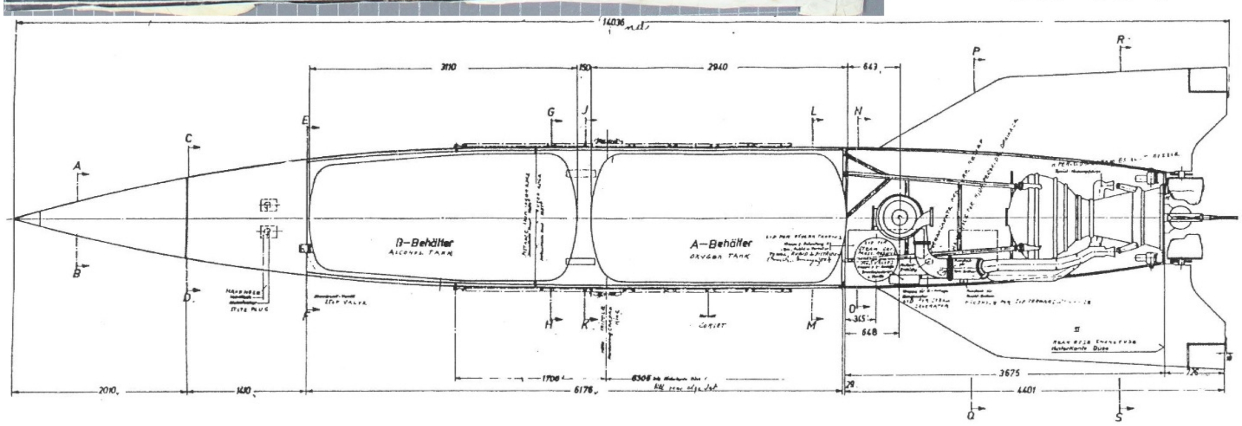


Figure E.40: March 1943 blueprint showing what appears to be a central payload compartment for a modified A-4 rocket [TNA AVIA 40/717, courtesy of Michael Haupt]. It may have been advantageous to carry a heavier-than-initially-planned payload (perhaps the 2-ton Thuringian device [p. 5157]?) closer to the rocket's center of mass instead of in the nosecone. [See Henshall 2000, p. 123.]

Figure E.41: Historisch-Technisches Museum Peenemünde. Above: A-4 rocket nosecones. Below: the current entrance building to the museum, formerly a bunker and control center for the power plant.

Figure E.42: Historisch-Technisches Museum Peenemünde. Above: window flaps in the entrance bunker. Below: instrumentation in a control room of the power plant.

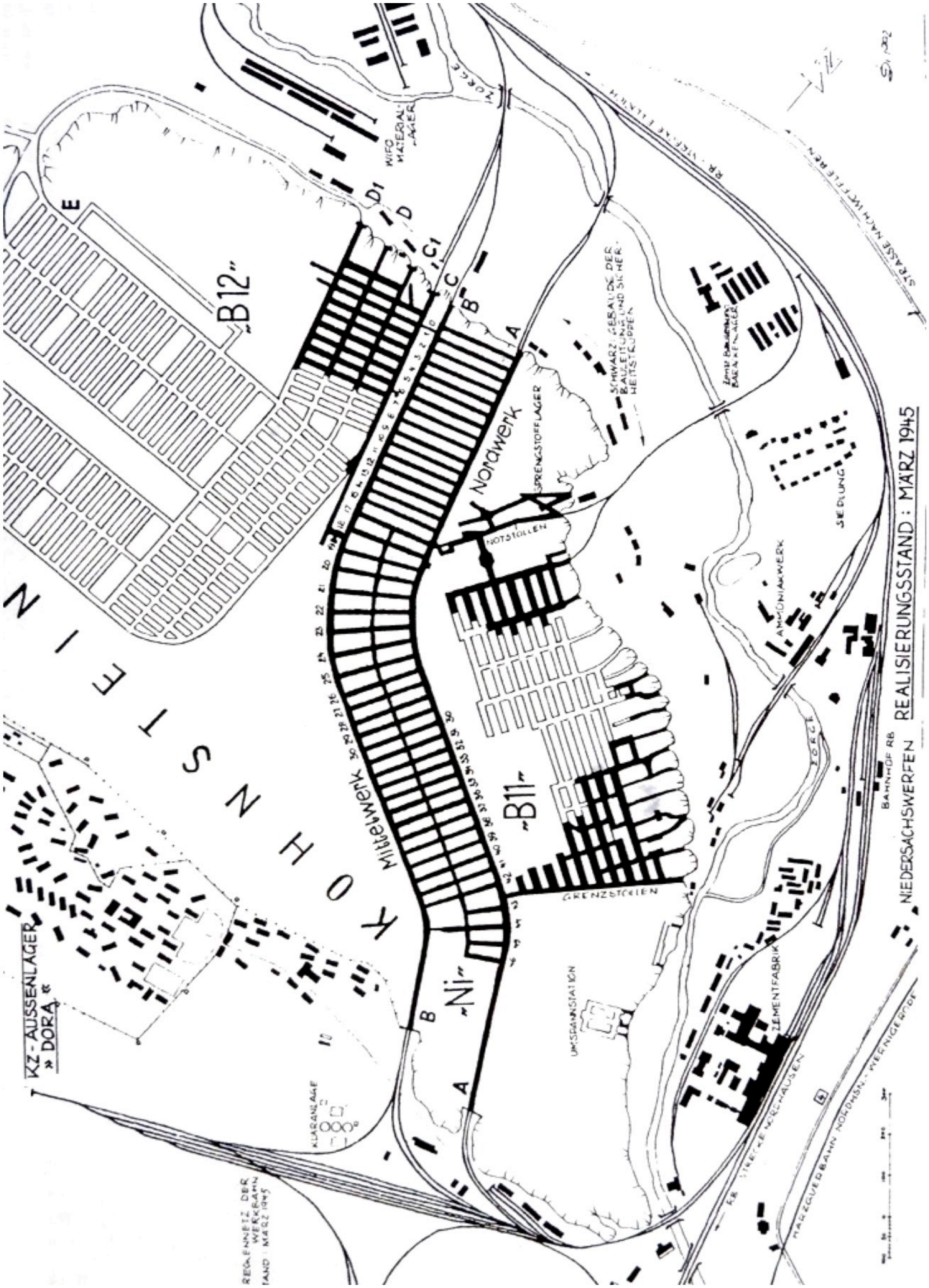


Figure E.43: Map of the Mittelbau tunnel complex in Nordhausen.

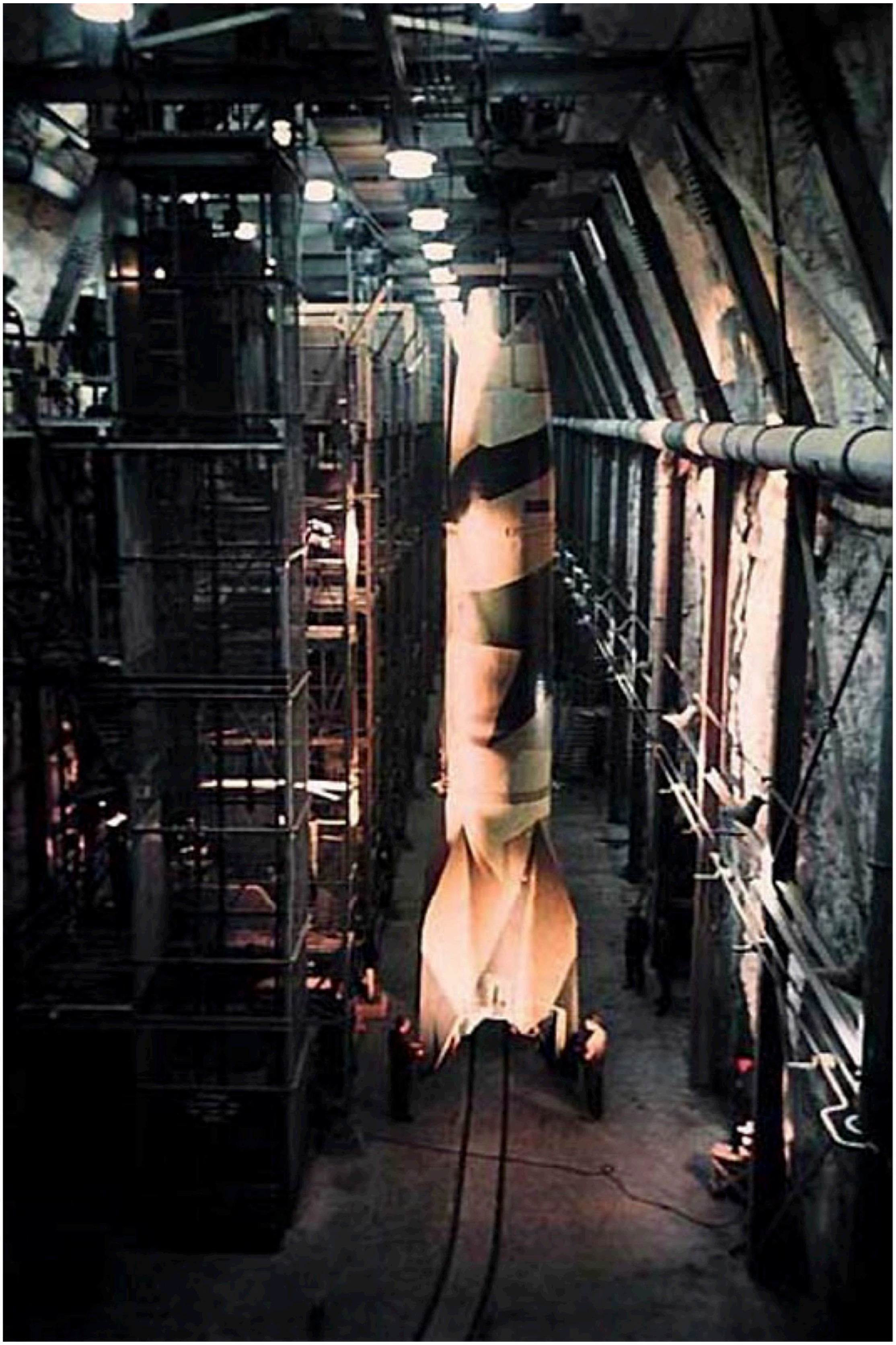


Figure E.44: The Mittelbau tunnel complex in Nordhausen when operational, circa 1944.

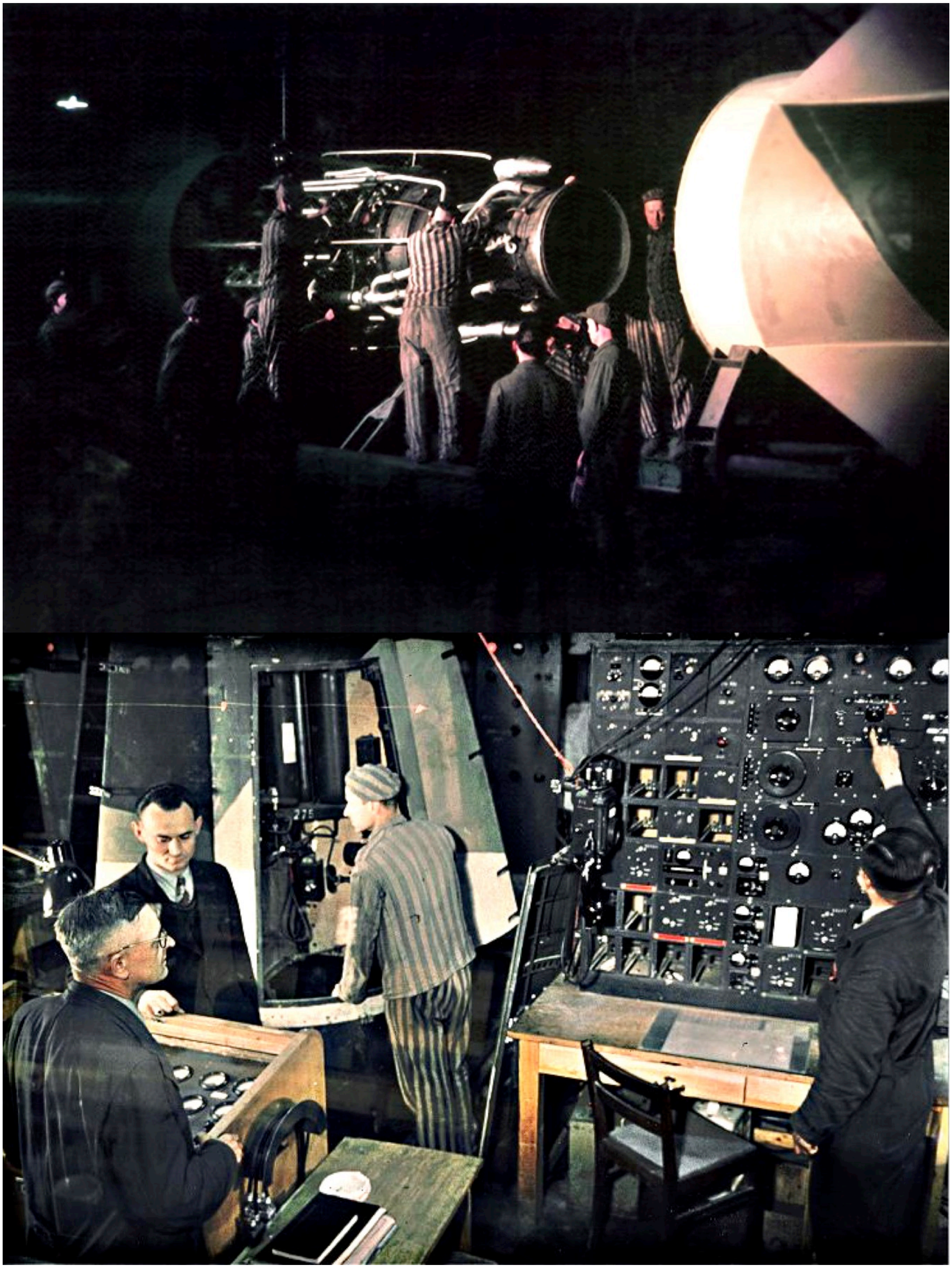


Figure E.45: The Mittelbau tunnel complex in Nordhausen when operational, circa 1944.

Figure E.46: The Mittelbau tunnel complex in Nordhausen now. In the foreground below is a V-2 (A-4) rocket engine.

Figure E.47: The Mittelbau tunnel complex in Nordhausen now.

Figure E.48: The Mittelbau tunnel complex in Nordhausen now. In addition to the V-2 (A-4) rocket, the V-1 cruise missile was mass-produced here. Above are housings for V-1 magnetic compasses and below are V-1 tails.

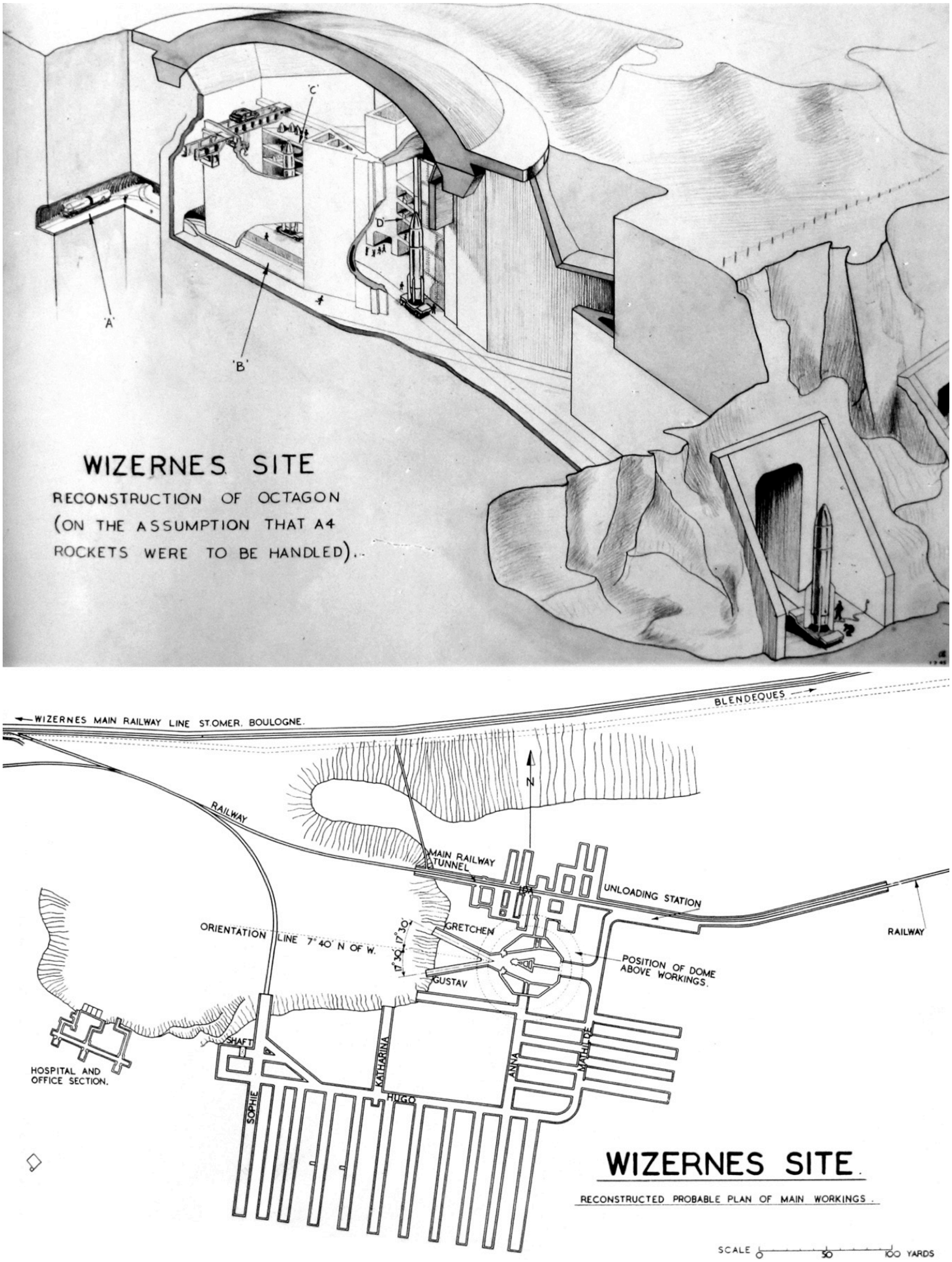


Figure E.49: Layout of the Wizernes underground missile silo/bunker complex on the coast of northern France (built 1943–1944).

Figure E.50: The remains of the Wizernes underground missile silo/bunker complex on the coast of northern France are now a museum.

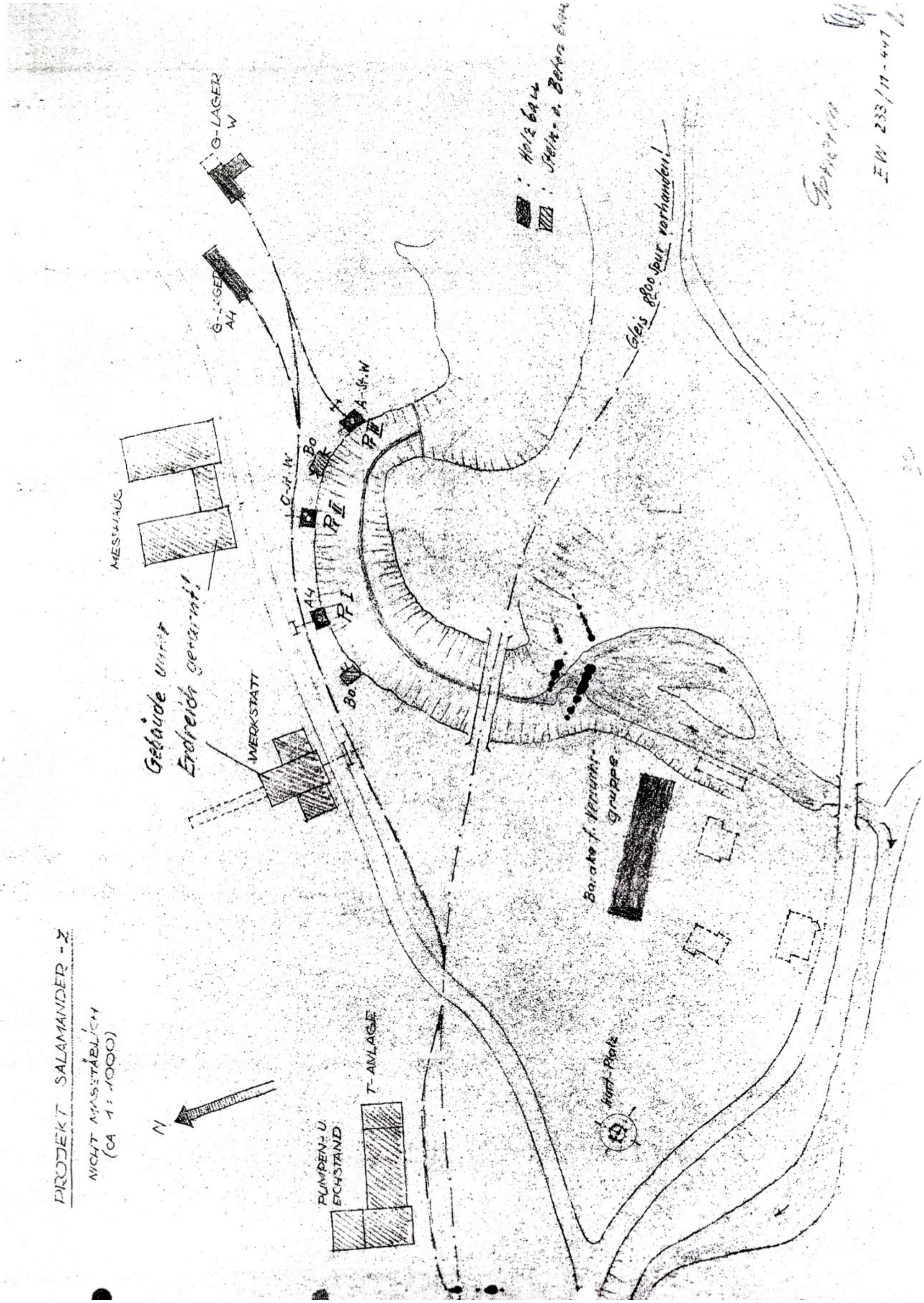


Figure E.51: Wartime sketch of the Salamander Z test site, one of several locations around Ebensee, Austria where it was planned to produce, test, and launch A-9/A-10 rockets.

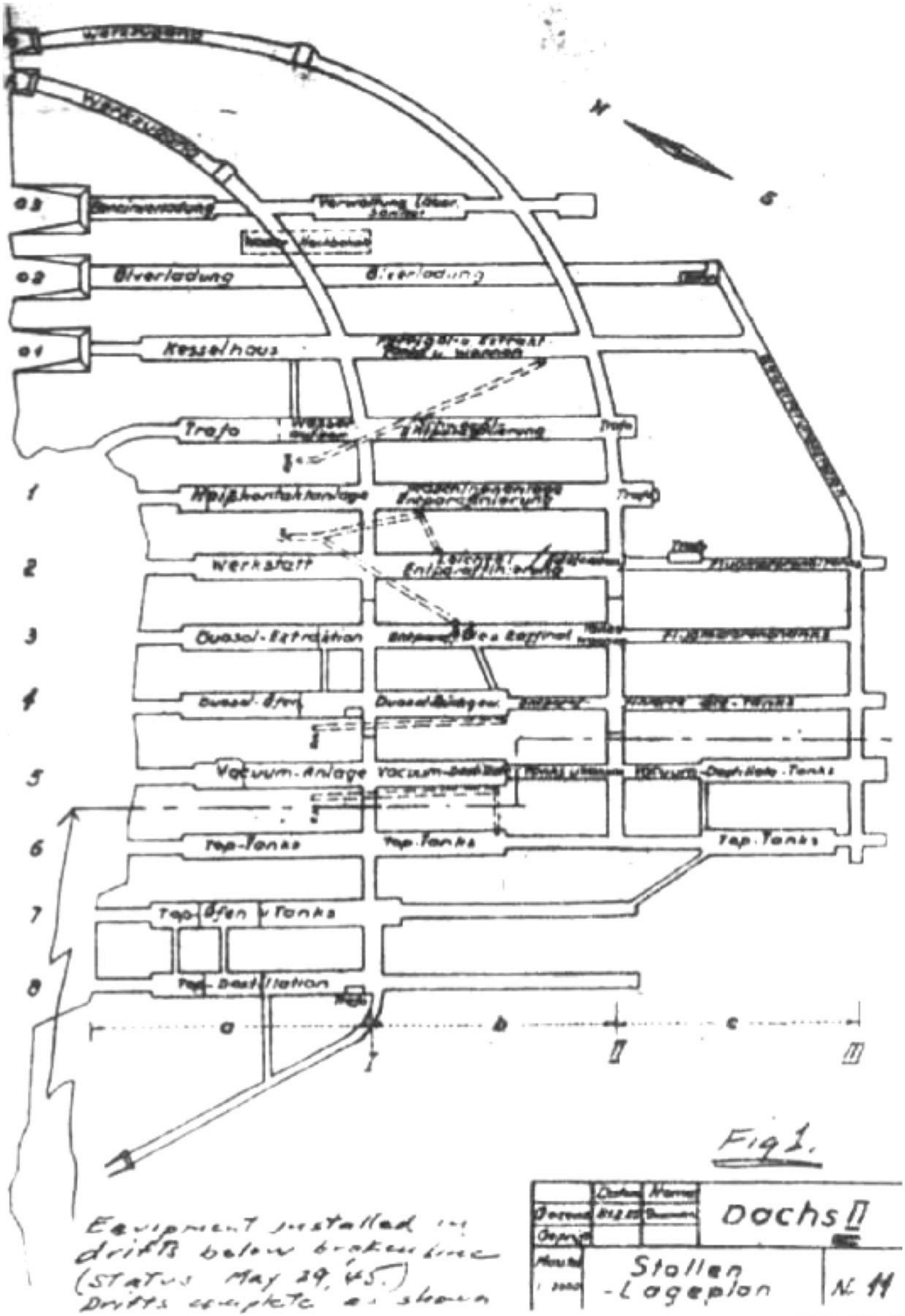


Figure E.52: Map of the Dachs II or Zement tunnel complex, one of several locations around Ebensee, Austria where it was planned to produce, test, and launch A-9/A-10 rockets.

Figure E.53: The remains of some of the Ebensee tunnels as they look now.

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PW Intelligence Bulletin No 1/57

3. OKW Kraftstoff Transport Regt (Continued)

Personalities:

GERADEWOHL	Obstlt	OC OKW Kraftstoff Transport Regt
MACK	Hptm	Adj
KNIPPENBERG	Hptm	OC 1 Bn
FISCHER	Kapitänlt	OC 3 Coy

(Source: Gren Karol CEPLY Pole 3 Coy OKW Kraftstoff Transport Regt captured 30 March vic HAREN)

4. WEFA (Wehrmacht Fahrt Coy)

Because transportation of vital and urgent deliveries to war industries by RR was becoming increasingly hazardous, eleven WEFA (Wehrmacht Fahrt Coys) were organized to take over some of the loads previously hauled by RR.

1, 2, and 3 Coys had 110 men and 23 8,000 liter petrol tank trucks. Trucks were camouflage-painted. Coys hauled petrol from producers to secret dumps and from dumps to industrial and military consumers.

Coys 4-11 each had 50 hy trucks. They were employed in hauling half-finished parts and finished products for the automotive and aircraft industry, and occasionally for secret weapon plants.

WEFA covered all of Germany. Its principle was to make the most economical use of time and space by avoiding every empty mile.

(Source: Gefr Peter HERZOG 11 WEFA Coy captured 28 March WALSUM)

5. V-2 Organization

Preamble

Four PWs, members of the HQ having administration over launching of V-2, were interrogated separately and IO is satisfied of their sincerity.

The four PWs belonged to 1191 Nachrichten Abteilung, the liaison and message unit of Div z V. They left the Div CP in a Volkswagen and travelled appr 100 km to the Allied lines in order to surrender, 1800 hrs, 2 April at FRECKENHORST. PW SAUER was an exchange operator and supervised teletypes. PW FISCHER and PLUM were teletypists. PW NOACK was a teletype mechanic.

Organization

The purpose of Div zV (sic) was the construction, supply, and administration of V-2 launching sites. The preparation for the use of V-2 was done by 191 HARKO, Genmaj METZ prior to 8 Sept 44. The HQ of 191 HARKO was in MESNIL-LE-ROI nr ST GERMAIN and in MAISON LAFITTE (PARIS District). It later moved VILLAINES, LILLE, and finally to GHENT. All four PWs came to 191 HARKO, March 44, when 724 Nachr Coy (mot) was enlarged and reorganized to form 1191 Nachr Abt (mot). Div zV consists of 485 Arty Regt, 300 SS Werfer Tp, 1191 Nachr Abt, and Sicherungs Gruppe HEISTERMANN under Hptm HEISTERMANN (assigned to div later than other units). The Arty regts have an HQ Tp and 10-12 launching tps. March 45, the Arty regts changed their numbers.... 485 became 902 Arty Regt zV, and 836 became 901 Arty Regt zV.

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Figure E.54: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

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5. V-2 Organization (Continued)

Genmaj METZ was removed after the launching of the first V-2, 8 Sept. He was blamed for the fact that preparation had been too slow and that his officers spent their time in PARIS, instead of at their duties.

On 26 Jan 45, 5 Flak Div (GAF), which handled V-1s, joined Div zV with the consent of GÖRING. Both units remained as separate entities, but were subordinate to a new higher HQ (formed 26 Jan) AK zV, which had its HQ in HAXBERGEN nr HENGELO. It later moved to vic WIEDENBRÜCK and finally BAD ESSEN.

Area of Sites

836 Regt (later 901) was known by the code name of "Gruppe SÜD" and had its sites nr ALTENKIRCHEN, and nr EUSKIRCHEN. 485 (later 902) Regt was called "Gruppe NORD" and had sites in the area of BURGSTEIN-FURTH nr the Dutch border. Part of 485 Regt, called "KG Holland" had sites nr UTRECHT.

Reorganization

Appr 25 March 45 an order appeared preparing Div zV for committment as Inf. Gruppe SÜD was issued Inf equipment and although still under the administration of Div zV was committed as Inf. Shortly before Easter, KG Holland and Gruppe NORD were withdrawn and committed as Inf for the defense of the WESER sector. Two-three Schiesszüge had to remain fully equipped (in 902 Regt) after 30 March in order to be ready to resume launchings should the tide of battle turn. V-2 launching equipment had to be destroyed or used as tk obstacles. 28 March an order appeared subordinating the whole AK zV to the Reichsführer der SS.

HQ of 5 Flak Div, Div zV, and AK zV had to move to SOLTAU (S end of LÜNEBURGER HEIDE), 1 April, to await further instructions.

Flight of PWs

All four PWs together with O/Gefr PUHL (son of Vice Pres of Reichsbank) were on duty, night of March 31-April 1. Men of the Signal Bn had been discussing desertion to the Allies because of the hopelessness of the situation and because of the commitment of the Div as SS Inf. The SS "big shots" were planning a last stand if Germany were defeated, and PWs wished no part of it, therefore they planned to break away from the convoy which was to leave the following day. However, on the night of 31 March, upon learning that an officer was to ride in their shop truck, they decided to leave. They printed false trip tickets, took a Volkswagen and drove W. They waited in a farm vic FRECKENHAUSEN for the arrival of the Allies.

At NIJMEGEN, at the time of the Allied Para invasion, Uffz RISCH and O/Gefr KOIDL of the Medical pl of HQ dressed as civilians in order to desert.

Production of V-2

All V-2 production plants bear code names. The main assembly, as far as PWs know was in the SAARGEBIET. Another chief place of production was in the THÜRINGEN Forest in a factory referred to as MUNHAUSEN". On 31 March, an order was sent by KAMMLER via teletype: 'In Anbetracht der Lage ist sofort die Produktion von V-1 und V-2 vorüber gehend einzustellen. Die

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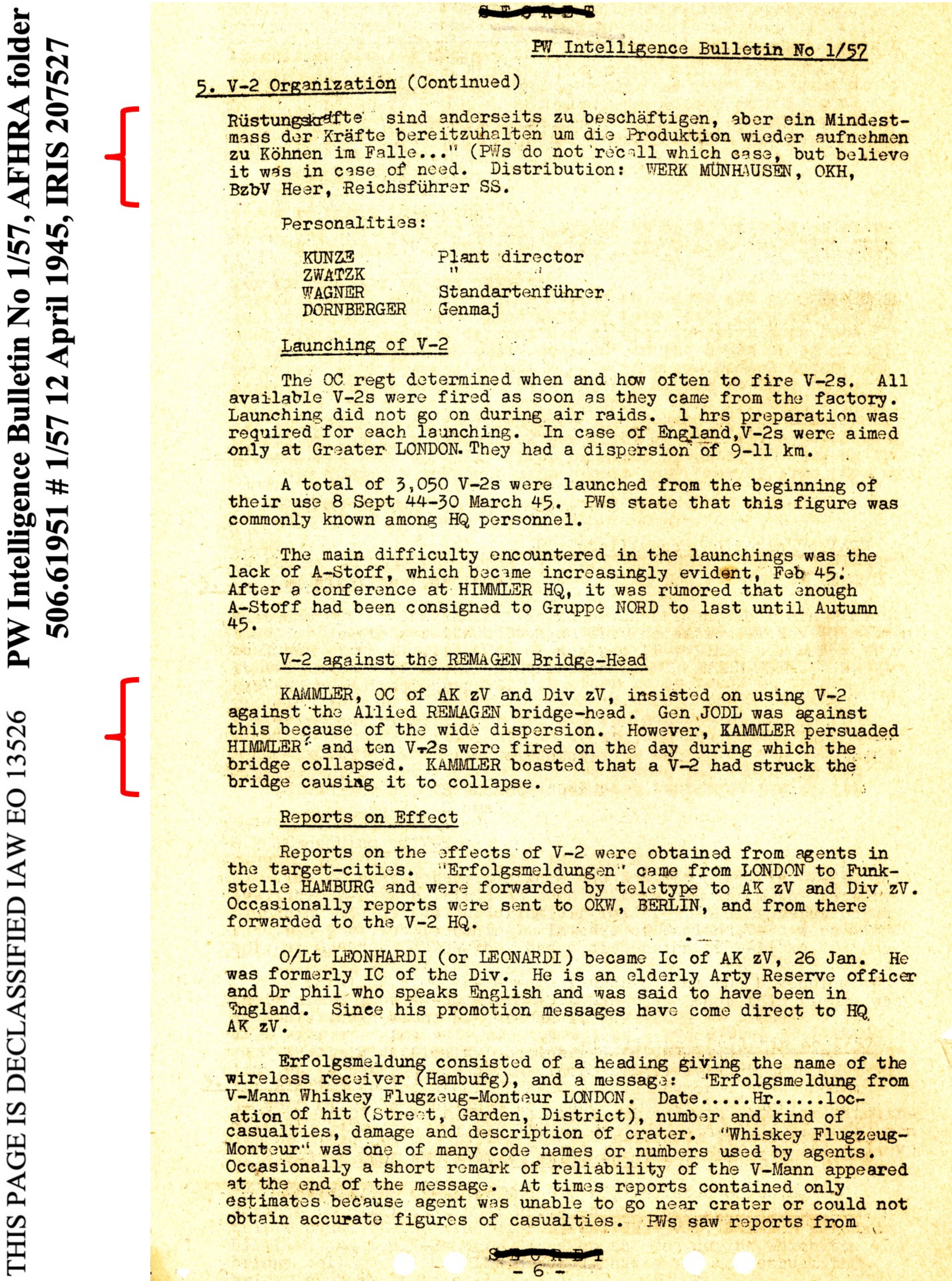
Figure E.55: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].



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5. V-2 Organization (Continued)

Rüstungskräfte sind anderseits zu beschäftigen, aber ein Mindestmass der Kräfte bereitzuhalten um die Produktion wieder aufnehmen zu Köhnen im Falle..." (PWs do not recall which case, but believe it was in case of need. Distribution: WERK MÜNHAUSEN, OKH, BzbV Heer, Reichsführer SS.

Personalities:

KUNZE	Plant director
ZWATZK	"
WAGNER	Standartenführer
DORNBERGER	Genmaj

Launching of V-2

The OC regt determined when and how often to fire V-2s. All available V-2s were fired as soon as they came from the factory. Launching did not go on during air raids. 1 hrs preparation was required for each launching. In case of England, V-2s were aimed only at Greater LONDON. They had a dispersion of 9-11 km.

A total of 3,050 V-2s were launched from the beginning of their use 8 Sept 44-30 March 45. PWs state that this figure was commonly known among HQ personnel.

The main difficulty encountered in the launchings was the lack of A-Stoff, which became increasingly evident, Feb 45. After a conference at HIMMLER HQ, it was rumored that enough A-Stoff had been consigned to Gruppe NORD to last until Autumn 45.

V-2 against the REMAGEN Bridge-Head

KAMMLER, OC of AK zV and Div zV, insisted on using V-2 against the Allied REMAGEN bridge-head. Gen JODL was against this because of the wide dispersion. However, KAMMLER persuaded HIMMLER and ten V-2s were fired on the day during which the bridge collapsed. KAMMLER boasted that a V-2 had struck the bridge causing it to collapse.

Reports on Effect

Reports on the effects of V-2 were obtained from agents in the target-cities. "Erfolgsmeldungen" came from LONDON to Funkstelle HAMBURG and were forwarded by teletype to AK zV and Div zV. Occasionally reports were sent to OKW, BERLIN, and from there forwarded to the V-2 HQ.

O/Lt LEONHARDI (or LEONARDI) became Ic of AK zV, 26 Jan. He was formerly IC of the Div. He is an elderly Arty Reserve officer and Dr phil who speaks English and was said to have been in England. Since his promotion messages have come direct to HQ AK zV.

Erfolgsmeldung consisted of a heading giving the name of the wireless receiver (Hambufg), and a message: 'Erfolgsmeldung from V-Mann Whiskey Flugzeug-Monteur LONDON. Date.....Hr.....location of hit (Street, Garden, District), number and kind of casualties, damage and description of crater. "Whiskey Flugzeug-Monteur" was one of many code names or numbers used by agents. Occasionally a short remark of reliability of the V-Mann appeared at the end of the message. At times reports contained only estimates because agent was unable to go near crater or could not obtain accurate figures of casualties. PWs saw reports from

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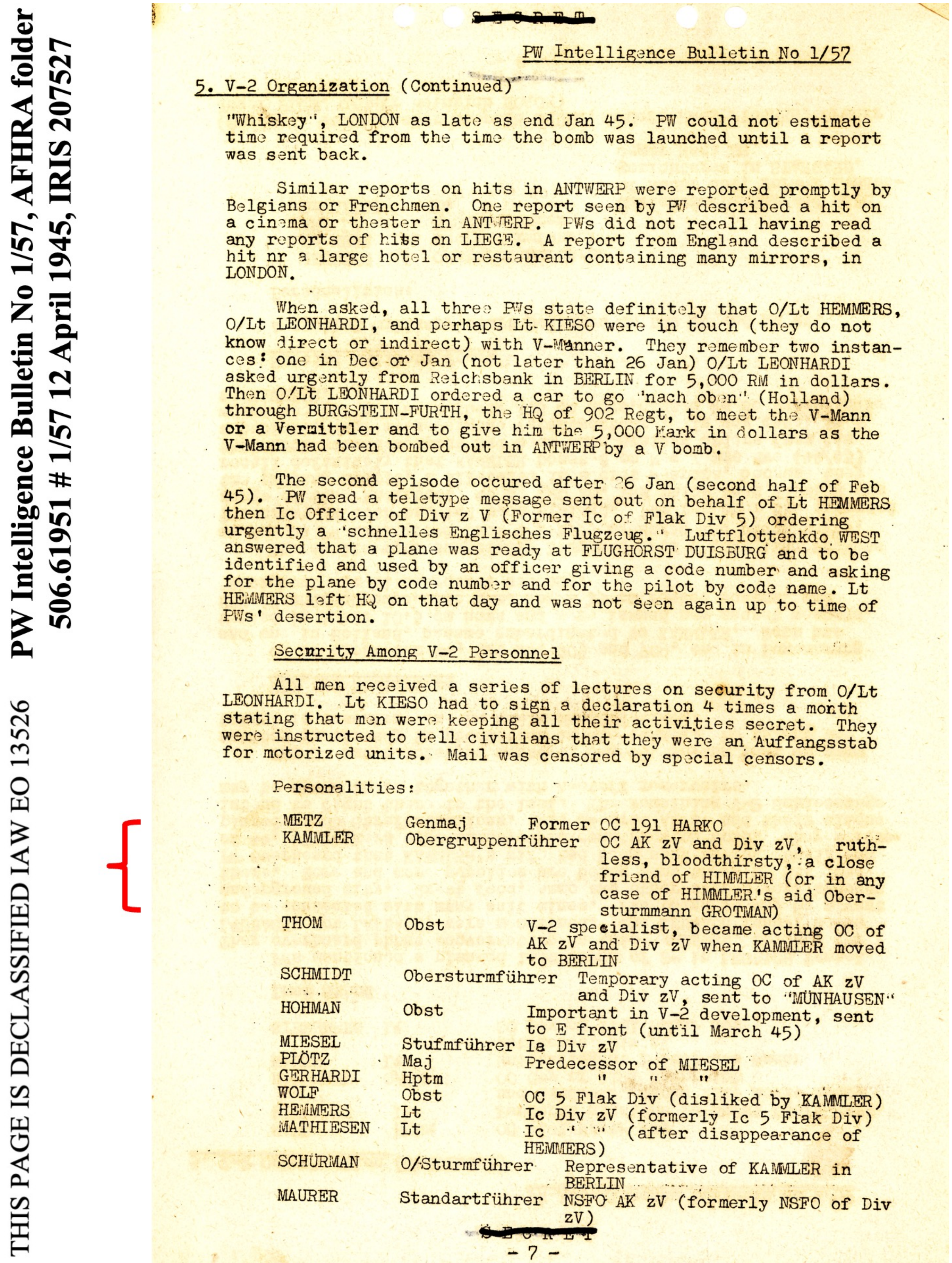
Figure E.56: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].



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5. V-2 Organization (Continued)

"Whiskey", LONDON as late as end Jan 45. PW could not estimate time required from the time the bomb was launched until a report was sent back.

Similar reports on hits in ANTWERP were reported promptly by Belgians or Frenchmen. One report seen by PW described a hit on a cinema or theater in ANTWERP. PWs did not recall having read any reports of hits on LIEGE. A report from England described a hit nr a large hotel or restaurant containing many mirrors, in LONDON.

When asked, all three PWs state definitely that O/Lt HEMMERS, O/Lt LEONHARDI, and perhaps Lt KIESO were in touch (they do not know direct or indirect) with V-Männer. They remember two instances: one in Dec or Jan (not later than 26 Jan) O/Lt LEONHARDI asked urgently from Reichsbank in BERLIN for 5,000 RM in dollars. Then O/Lt LEONHARDI ordered a car to go "nach oben" (Holland) through BURGSTEIN-FURTH, the HQ of 902 Regt, to meet the V-Mann or a Vermittler and to give him the 5,000 Mark in dollars as the V-Mann had been bombed out in ANTWERP by a V bomb.

The second episode occured after 26 Jan (second half of Feb 45). PW read a teletype message sent out on behalf of Lt HEMMERS then Ic Officer of Div z V (Former Ic of Flak Div 5) ordering urgently a "schnelles Englisches Flugzeug." Luftflottenkdo WEST answered that a plane was ready at FLUGHORST DUISBURG and to be identified and used by an officer giving a code number and asking for the plane by code number and for the pilot by code name. Lt HEMMERS left HQ on that day and was not seen again up to time of PWs' desertion.

Security Among V-2 Personnel

All men received a series of lectures on security from O/Lt LEONHARDI. Lt KIESO had to sign a declaration 4 times a month stating that men were keeping all their activities secret. They were instructed to tell civilians that they were an Auffangsstab for motorized units. Mail was censored by special censors.

Personalities:

METZ	Genmaj	Former OC 191 HARKO
KAMMLER	Obergruppenführer	OC AK zV and Div zV, ruthless, bloodthirsty, a close friend of HIMMLER (or in any case of HIMMLER's aid Obersturmmann GROTMAN)
THOM	Obst	V-2 specialist, became acting OC of AK zV and Div zV when KAMMLER moved to BERLIN
SCHMIDT	Obersturmführer	Temporary acting OC of AK zV and Div zV, sent to "MÜNHAUSEN"
HOHMAN	Obst	Important in V-2 development, sent to E front (until March 45)
MIESEL	Stufmführer	Ia Div zV
PLÖTZ	Maj	Predecessor of MIESEL
GERHARDI	Hptm	" " "
WOLF	Obst	OC 5 Flak Div (disliked by KAMMLER)
HEMMERS	Lt	Ic Div zV (formerly Ic 5 Flak Div)
MATHIESEN	Lt	Ic " " (after disappearance of HEMMERS)
SCHÜRMAN	O/Sturmführer	Representative of KAMMLER in BERLIN
MAURER	Standartführer	NSFO AK zV (formerly NSFO of Div zV)

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Figure E.57: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

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5. V-2 Organization (Continued)

KAHL	Hptm	OC 1191 Nachr Abt
BOHLMANN	Lt	Performs missions in mufti (tall, dark, and handsome, looks like movie star)
HARTMANN	O/Lt	OC Coy of 1191 Nachr Abt
KAUSS	Lt	Unintelligent leiter des Nachr Betriebes, Div zV
GIERSBERG	Lt	OC coy of 1191 Nachr Abt

Last Stand

PWs mentioned a planned last stand of SS in LEUBACH Tunnel. They overheard phone conversation on this subject, LOIBACH (or LEUBACH, not LAIBACH) were mentioned. The LEUBACH Tunnel seems to be connected with many salt mines. PWs think it may be a vast underground city. Great food, ammo and other stores were brought there. More and more supplies are being sent there by SS. One PW overheard that KAMMLER's wife had been sent there. Until end of 44, CT workers were employed in construction work. They were replaced by SS Strafbattalions. All SS from AK zV and their clique intend to fight there to the last. The remaining V-2 Schiesszüge may be moved there together with A-Stoff reservoirs.

One PW saw a teletype message, Jan 45, saying that an ammo factory is already in production in the tunnel. He thinks the tunnel is somewhere in the SALZKAMMERGUT-TIROL.

HDP and Rheinboote

On or about Dec 44, Art Abt 705 and 709, one in Luxembourg and one in Holland, became subordinated to KAMMLER. Both bns turned in their 10.5 cm hows and were issued new secret weapons, HDP (Hochdruckpompe, code name for a 15 cm rocket weapon, and "Rheinboot" (a 21 cm rocket weapon).

The shells were supposedly launched from a tube like rockets as far as PW understood from teletype messages and phone talks. The crews of both bns had been trained. PWs remember the supposed range of the "Rheinboot" to be 120 km. PWs think that KAMMLER was the guiding spirit, a diletante in secret weapons, because they recall definitely that KAMMLER boasted on New Years Eve (44/45) that both secret weapons had been used against orders from his superiors, "auf meine eigene Verantwortung". In any case, in 3 weeks the bns got back their 105 cm hows, ceased to be subordinate to KAMMLER.

Special Military Court

A special military court belonged to Div zV and AK zV.

Personalities:

WEZLING	O/Sturmbannführer	
Dr MERZ	Hauptsturmführer	
ANHALT	U/Sturmführer	
Dr KIESO	Lt	Gerichtsoffizier and NSFO of Nachr Abt, former Landesgerichtsrat in STARGARD, eager Nazi SS

(Source: Wachtmeister Leopold SAUER, O/Gefr Paul FISCHER, O/Gefr Josef PLUM, O/Gefr Heinrich NOACK)

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Figure E.58: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

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MFIU NO 1, 12 April 45 PW Intelligence Bulletin No 1/57

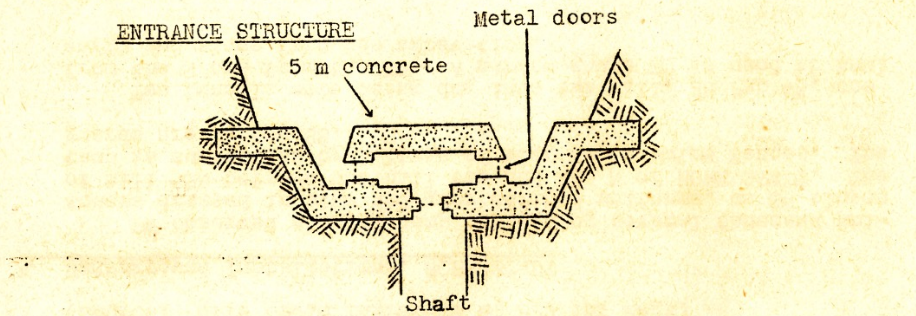
Military Installations

6. Führer HQ Tunnels

PW is familiar with the construction of a Führer HQ at WÜSTEGIERSDORF. He assumes that tunnels at BERCHTESGADEN, based on the same specifications issued by Gen Bauleiter Obst v BELLOW do not differ from those at WÜSTEGIERSDORF. Sketches are according to PW's memory of the master plan. The tunnels have been constructed along RR GLATZ-WALDENBURG NE of WUSTEGIERSDORF. They were to be completed for use March-July 45. Labor is done by OT, but principally by inmates from a S Hungarian concentration camp who receive brutal treatment at the hands of SS guards.

Construction

Above the surface are 3 bunkers, 6 stories high, with 7 m thick roofs and 5 m thick walls. A defense tower is at each corner. Below the surface are passageways containing offices, message centers, radio equipment, and machinery, all capable of operating for three days without contact with the surface. Underground halls are 6 m wide, 40 m below the surface. Entrance shafts are 2.20 m wide of reinforced concrete. A wall, 3.50 m thick protects the mouth of the tunnel. The roof covering the shaft is 5 m thick and increases to 7 m as the tunnel goes beneath a cliff. A stairway then leads to a lower level. Side entrances are closed by metal doors 2.07 x .95 m, (thickness unknown).



The defense towers contain gun positions mounting SMGs or 2 cm Flak. Doors are of metal 2.07 x .95 m (same as above). Passages in the defense works are 3.50 x 2.20.

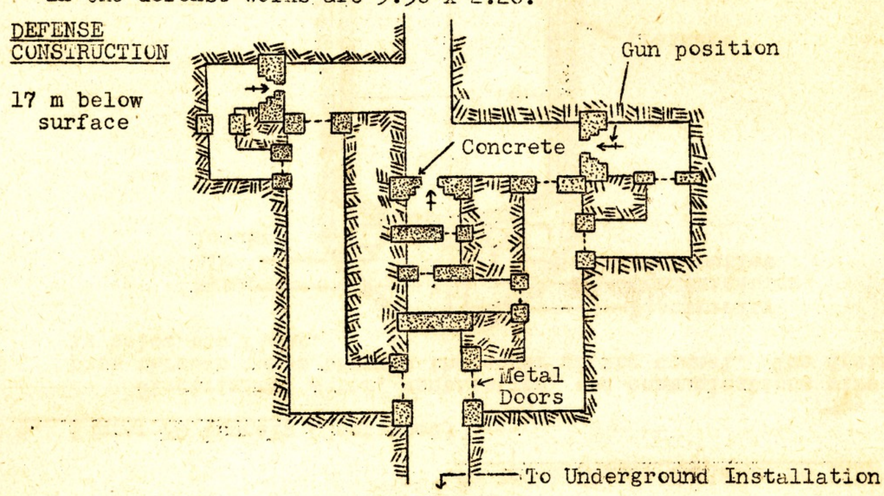


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Figure E.59: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

PW Intelligence Bulletin No 1/57, AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527

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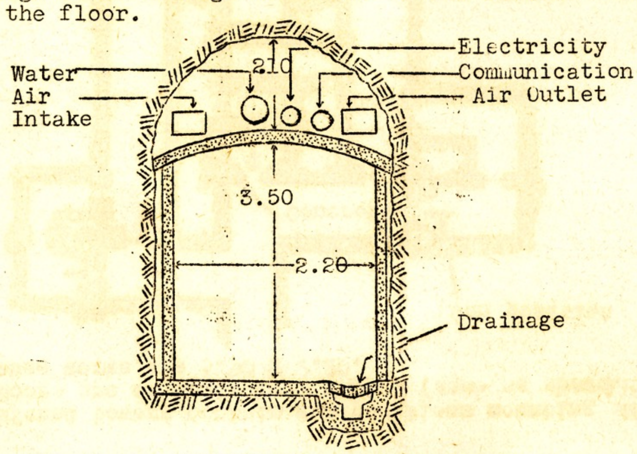
PW Intelligence Bulletin No 1/57

6. Führer HQ Tunnels (Continued)

Electricity, water, ventilation, and communications wire pass through tubes through the cover of the tunnel. The drain is below the floor.



(Source: Uffz Erwin TREPOTETZ HQ 827 Inf Regt)

7. Underground Installations, HOHENSTADT

PW observed a large camp containing several thousand prisoners dressed in blue and grey striped uniforms, on SW slopes of hill 578 between the hill top and RR, N of HOHENSTADT. The camp is surrounded by 3 lines of high barbed-wire fences. The guards are Waffen SS.

Two tunnels were being dug into the hill, 28 Feb 45, one from the S one from the NW. A narrow gauge RR is used to haul earth and stone from the excavation.

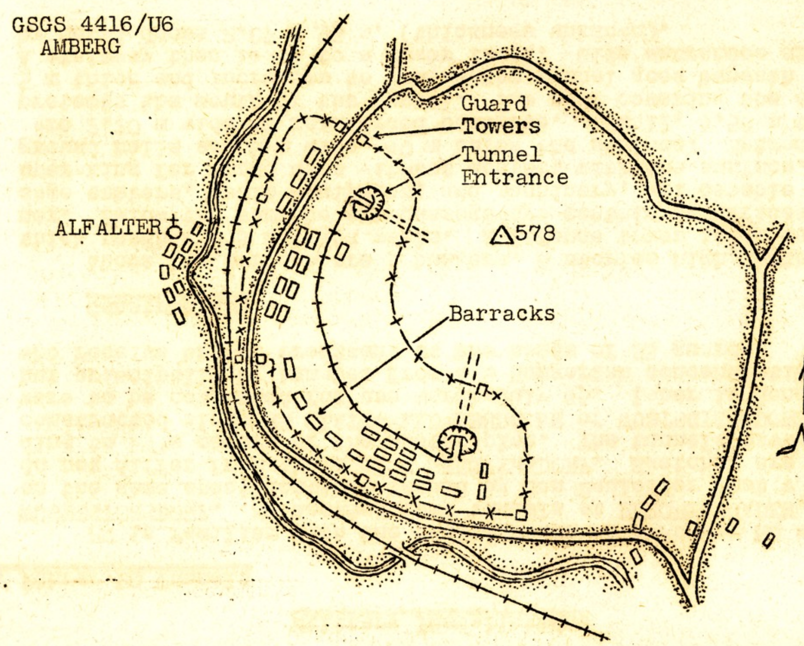


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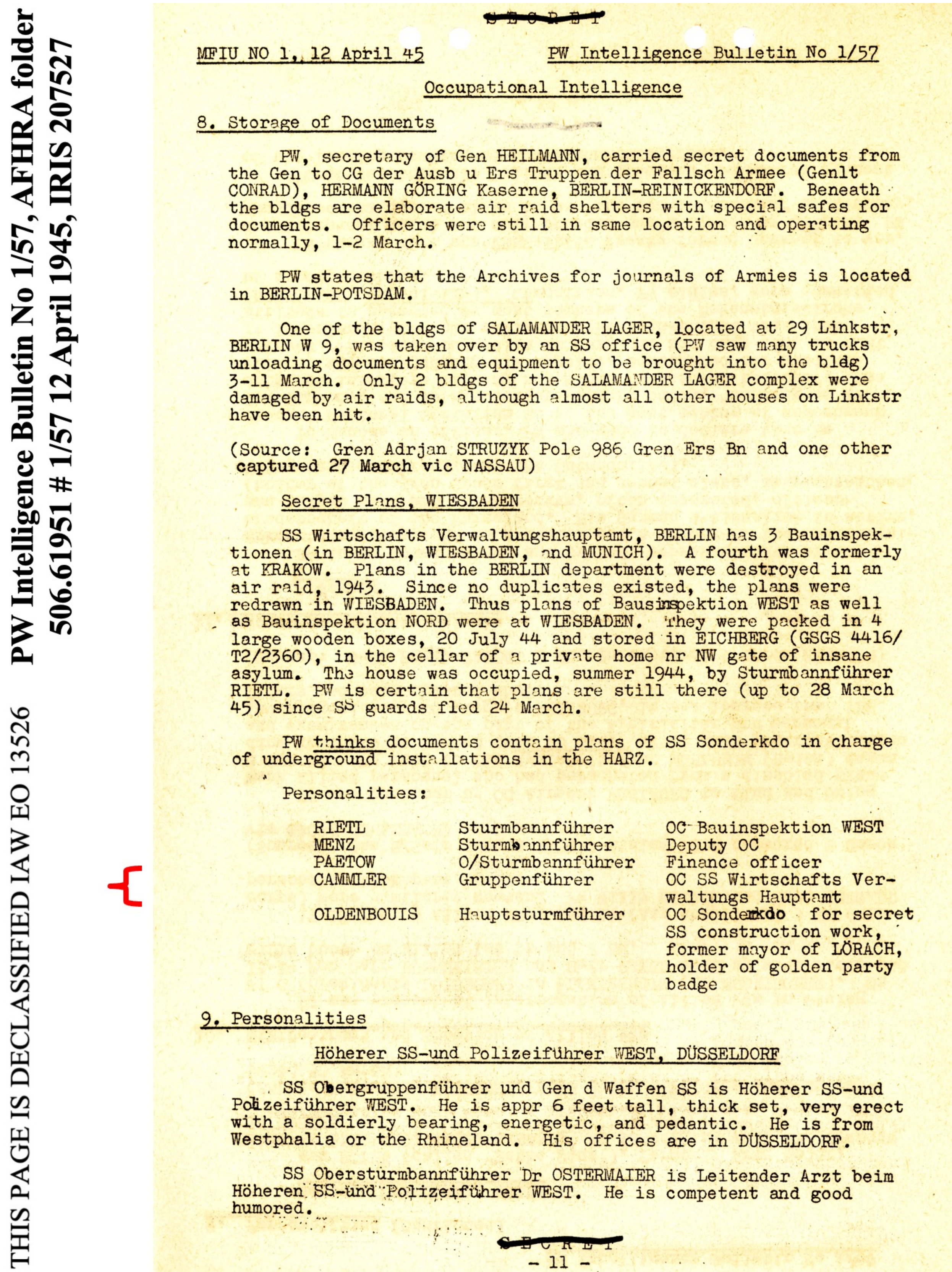
Figure E.60: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].



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MFIU NO 1, 12 April 45 — PW Intelligence Bulletin No 1/57

Occupational Intelligence

8. Storage of Documents

PW, secretary of Gen HEILMANN, carried secret documents from the Gen to CG der Ausb u Ers Truppen der Fallsch Armee (Genlt CONRAD), HERMANN GÖRING Kaserne, BERLIN-REINICKENDORF. Beneath the bldgs are elaborate air raid shelters with special safes for documents. Officers were still in same location and operating normally, 1-2 March.

PW states that the Archives for journals of Armies is located in BERLIN-POTSDAM.

One of the bldgs of SALAMANDER LAGER, located at 29 Linkstr, BERLIN W 9, was taken over by an SS office (PW saw many trucks unloading documents and equipment to be brought into the bldg) 3-11 March. Only 2 bldgs of the SALAMANDER LAGER complex were damaged by air raids, although almost all other houses on Linkstr have been hit.

(Source: Gren Adrjan STRUZYK Pole 986 Gren Ers Bn and one other captured 27 March vic NASSAU)

Secret Plans, WIESBADEN

SS Wirtschafts Verwaltungshauptamt, BERLIN has 3 Bauinspektionen (in BERLIN, WIESBADEN, and MUNICH). A fourth was formerly at KRAKOW. Plans in the BERLIN department were destroyed in an air raid, 1943. Since no duplicates existed, the plans were redrawn in WIESBADEN. Thus plans of Bausinspektion WEST as well as Bauinspektion NORD were at WIESBADEN. They were packed in 4 large wooden boxes, 20 July 44 and stored in EICHBERG (GSGS 4416/T2/2360), in the cellar of a private home nr NW gate of insane asylum. The house was occupied, summer 1944, by Sturmbannführer RIETL. PW is certain that plans are still there (up to 28 March 45) since SS guards fled 24 March.

PW thinks documents contain plans of SS Sonderkdo in charge of underground installations in the HARZ.

Personalities:

RIETL	Sturmbannführer	OC Bauinspektion WEST
MENZ	Sturmbannführer	Deputy OC
PAETOW	O/Sturmbannführer	Finance officer
CAMMLER	Gruppenführer	OC SS Wirtschafts Verwaltungs Hauptamt
OLDENBOUIS	Hauptsturmführer	OC Sonderkdo for secret SS construction work, former mayor of LÖRACH, holder of golden party badge

9. Personalities

Höherer SS-und Polizeiführer WEST, DÜSSELDORF

SS Obergruppenführer und Gen d Waffen SS is Höherer SS-und Polizeiführer WEST. He is appr 6 feet tall, thick set, very erect with a soldierly bearing, energetic, and pedantic. He is from Westphalia or the Rhineland. His offices are in DÜSSELDORF.

SS Oberstürmbannführer Dr OSTERMAIER is Leitender Arzt beim Höheren SS-und Polizeiführer WEST. He is competent and good humored.

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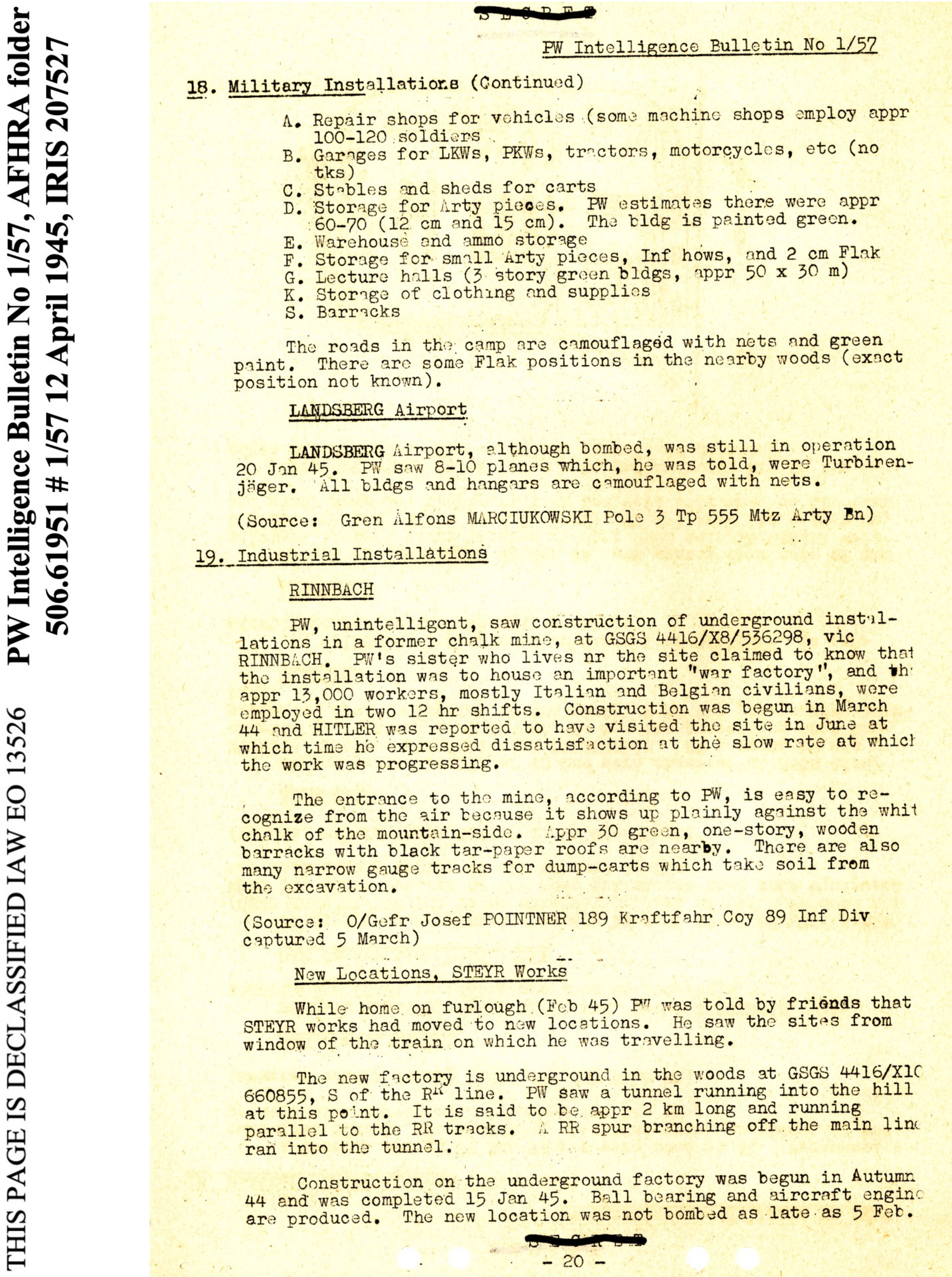
Figure E.61: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].



THIS PAGE IS DECLASSIFIED IAW EO 13526 PW Intelligence Bulletin No 1/57, AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527

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PW Intelligence Bulletin No 1/57

18. Military Installations (Continued)

A. Repair shops for vehicles (some machine shops employ appr 100-120 soldiers
B. Garages for LKWs, PKWs, tractors, motorcycles, etc (no tks)
C. Stables and sheds for carts
D. Storage for Arty pieces. PW estimates there were appr 60-70 (12 cm and 15 cm). The bldg is painted green.
E. Warehouse and ammo storage
F. Storage for small Arty pieces, Inf hows, and 2 cm Flak
G. Lecture halls (3 story green bldgs, appr 50 x 30 m)
K. Storage of clothing and supplies
S. Barracks

The roads in the camp are camouflaged with nets and green paint. There are some Flak positions in the nearby woods (exact position not known).

LANDSBERG Airport

LANDSBERG Airport, although bombed, was still in operation 20 Jan 45. PW saw 8-10 planes which, he was told, were Turbinenjäger. All bldgs and hangars are camouflaged with nets.

(Source: Gren Alfons MARCIUKOWSKI Pole 3 Tp 555 Mtz Arty Bn)

19. Industrial Installations

RINNBACH

PW, unintelligent, saw construction of underground installations in a former chalk mine, at GSGS 4416/X8/536298, vic RINNBACH. PW's sister who lives nr the site claimed to know that the installation was to house an important "war factory", and the appr 13,000 workers, mostly Italian and Belgian civilians, were employed in two 12 hr shifts. Construction was begun in March 44 and HITLER was reported to have visited the site in June at which time he expressed dissatisfaction at the slow rate at which the work was progressing.

The entrance to the mine, according to PW, is easy to recognize from the air because it shows up plainly against the white chalk of the mountain-side. Appr 30 green, one-story, wooden barracks with black tar-paper roofs are nearby. There are also many narrow gauge tracks for dump-carts which take soil from the excavation.

(Source: O/Gefr Josef POINTNER 189 Kraftfahr Coy 89 Inf Div captured 5 March)

New Locations, STEYR Works

While home on furlough (Feb 45) PW was told by friends that STEYR works had moved to new locations. He saw the sites from window of the train on which he was travelling.

The new factory is underground in the woods at GSGS 4416/X10 660855, S of the RR line. PW saw a tunnel running into the hill at this point. It is said to be appr 2 km long and running parallel to the RR tracks. A RR spur branching off the main line ran into the tunnel.

Construction on the underground factory was begun in Autumn 44 and was completed 15 Jan 45. Ball bearing and aircraft engines are produced. The new location was not bombed as late as 5 Feb.

[redacted]

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Figure E.62: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

PW Intelligence Bulletin No 1/57, AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527

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PW Intelligence Bulletin No 1/57

19. Industrial Installations (Continued)

A friend told PW of another underground factory for STEYR under construction at REDL-ZIPF (nr VÖCKLABRÜCK). The installation was scheduled to be ready for occupancy in Spring 45.

(Source: Gefr Josef HILGERT 365 Gren Ers u Ausb Bn captured 3 March BONN)

Underground Factory, LAMBACH

(Supplementing PW INTELLIGENCE BULLETIN 2/44 Item 4)

PW who was in LAMBACH as late as 21 Jan 45 reports a factory, partly underground, in the woods between ROITHAM (GSGS 4416/X8/5354) and STADL PAURA (GSGS 4416/X8/5660). Construction of tunnels was begun as early as 1941, and the main rd ROITHAM-STADL PAURA was closed to all traffic in 1942. Traffic was rerouted via a rd E of the single track LAMBACH-GMUNDEN RR.

PW thinks that the factory is a GAF project because all military personnel in the area wore GAF, SS, or SA uniforms. SA seems to be in charge of guarding the installation. Men and women from the surroundings were employed in the factory in 1941 and 1942 when Arty ammo was manufactured and stored in the area. At that time barracks construction and excavation work was in progress.

Since 1942 local labor is employed only in that part of the installation which serves as an ammo depot, while Russian PWs worked in a section which was closed to all civilian workers. The Russians (men and women) live in the restricted area and are completely cut off from communications with the outside. Nothing was known regarding the type of work performed in the restricted section, even to the workers in the adjoining ammo storage.

Large box-car type trucks operated and serviced by GAF personnel are stationed at LAMBACH. Large, heavy wooden boxes are hauled from LAMBACH RR station into the closed off area by the trucks which also serve for transportation, particularly to a special RR station inside the area. A spur from LAMBACH RR station runs along the TRAUN river into the restricted section. Only box cars were seen entering and leaving.

(Source: Gefr Ernst LÖBERBAUER 11 Pz Gren Regt captured 25 March ASBACH)

Power Plant, ZELL/a See
(Supplementing PW INTELLIGENCE BULLETIN 2/44 Item 4)

A power plant has been under construction in the KAPRUN valley (SW of ZELL/a See) since 1938. A dam was being constructed in the upper part of the narrow valley. Workers' barracks are located along both sides of the valley rd whereever the terrain permits.

PW, who was at the location as late as 8 Feb, states that work was still in progress and material was being transported on the single track R^R from BRUCK. PW estimated that not more than 5,000 workers (mostly foreigners including PWs) were employed.

(Source: O/Gefr Ernst KAVCIC 11 Pz Gren Regt)

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Figure E.63: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

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PW Intelligence Bulletin No 1/57, AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527

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PW Intelligence Bulletin No 1/57

19. Industrial Installations (Continued)

Pressluft Factory, TRAUN SEE

30,000 prisoners, mostly from concentration camp MAUTHAUSEN, have been employed since Dec 43 in the construction of 4 tunnels into mountains S of the TRAUN SEE. Entrances are located on the NW slope of the HASLERGUPF mountain, between RIMBACH and ROTH. RR spurs lead to all four entrances. Tunnels are said to be 2 km long.

Work on the tunnels is supervised by SS who are also in charge of production which was begun in the underground installation appr Nov 44. The plant is reported to produce both compressed and liquid air. PW saw (Nov 44) appr 50 storage tanks, each having an estimated capacity of 50,000 liters, and some heavy machiners of unidentified type stored nr the tunnel entrances.

(Source: Fahrer Franz STUMMER Transportation Coy SPEER captured 21 March LINZ)

20. Defenses

Outer Defenses, Austro-Hungarian Frontier

As early as middle of Jan 45 Army personnel and civilians were employed in the construction of A-tk ditches along the Austrian-Hungarian-Yugoslav border, between the towns MOGERSDORF, ST MARTIN, MINIHOF-LIEBAU. The Volkssturm was activated and one rifle was issued for every five men. PW states that the population was more incensed against the Nazis than against the prospective invaders.

(Source: Gefr Gustav SCHAFFER 188 Füs Bn captured 24 March DINSLAKEN)

Preparations, vic BERCHTESGADEN

PW, who prior to his induction (Apr 44) was in charge of a childrens' evacuation camp reported, building activities vic BERCHTESGADEN which led to rumors among the population that the BERCHTESGADEN-FREILASSING district was planned as a vital point in the last-ditch defense.

The famous underground salt-mine (GSGS 4416/Y7/967071) was closed to the public and was reported to be converted into a huge storage place for all types of supplies, including ammo. New barracks were under construction on the airport. A second track was added to the BERCHTESGADEN-OBERSALZBERG-SCHELLENBERG-SALZBURG RR line. A tunnel (appr 400 m long) linking BERCHTESGADEN with the OBERSALZBERG depot runs between points 955059 and 958063. HITLER's RR train is known to be parked in this tunnel while HITLER is in the area. Many foreigners were employed on the RR constructions.

Large bunkers were blasted into the sides of the mountains, one at GSGS 4416/Y7/940060, facing the GMUND bridge, another across from the church at GSGS 4416/Y8/953061, a third in the NONN section. Others were planned.

(Source: Fahnj Helmut PASSEK 2 SS Pz Div DAS REICH captured 7 Jan)

Demolition Plans, Austria

An order from Deputy Gen Kdo XVII specified that by

[redacted]

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Figure E.64: Several German prisoners of war captured by the Allies mentioned Hans Kammler and the rockets and underground facilities that were under his control. PW Intelligence Bulletin No 1/57. 12 April 1945 [AFHRA folder 506.61951 # 1/57 12 April 1945, IRIS 207527; AFHRA A5185 frames 1029–1047].

David Irving. 1965. *The Mare's Nest.* Boston: Little, Brown. pp. 219–220

The remaining site, at Wizernes, caused some anxiety, as it was not obviously aligned on any city in Europe. One interpreter caused a high degree of alarm early in the year when he discovered that one facet of the workings was within half a degree of the accurate Great Circle bearing on New York. Whether the Germans planned this out of sheer mischief is not known; certainly Albert Speer denied after the war that there was ever any intention of firing their New York rockets from Wizernes; but it is a remarkable fact that the enormous bombproof doors and handling gear were all capable of handling a rocket about twice the height of the A 4, if necessary.

W. L. Heiberg. 26 October 1944. Franz Peter (Austrian), Germany–Inventions–Rockets. [NARA RG 38, Entry 98C, Box 3, Folder TSC #1001–1100]

1. Source states he is an Austrian refugee, 22 years of age, and that he arrived in Sweden in August, 1944, where he has been in an internment camp. He claims to have been a rocket specialist for the past eight(!) years, and to have worked at the Rheinmetall-Borsig plant in Sömmerda (NNE of Erfurt, Germany) from December, 1943, to May, 1944, after which he fled to Sweden. He worked in section WKbt of the Sömmerda plant, which, he states, is concerned with the manufacture of Germany's rocket weapons.

2. Source expresses a desire to go to Great Britain or U.S.A. to work on rockets for the United Nations, and has shown a 114-page (page 43 missing) manuscript in substantiation of his claim to intimate knowledge of Germany's "V" weapons. The manuscript has been photographed, and the negative is forwarded as enclosure (A). Enclosure (B) is a table of contents compiled in this office after summary study. [...]

5. Chapter thirteen discusses the principle of the multiple or tandem rocket. The rear or "booster" rocket (Schubrakete) has ten times the mass of the forward or "main" rocket (Hauptrakete). The booster carries the rocket part-way to the target, until the fuel is exhausted; then after launching the main rocket, it falls away. Source claims altitudes of 360 kilometers (223.7 miles) had been reached by such rockets before he fled from Germany in the summer of 1944, and that at this altitude the main rocket could be expected to have a range of 500 to 700 kilometers (310 to 434 miles). (Source did not divulge how altitude was determined.) Such rockets are not launched by catapult, but from a launching track and under their own power. The booster uses gasoline and liquid oxygen as fuel, while the main rocket uses liquid hydrogen and liquid oxygen. (Rockets of this type with a series of boosters were mentioned by Source in course of conversation. He claims an Atlantic rocket, to bomb New York, was calculated to require fifty-six minutes in flight.)

6. Chapter fourteen describes a revolutionary method of electric propulsion which Source claims as his own invention. He stated it was demonstrated at the Kaiser Wilhelm Institute at Potsdam in late spring or early summer, 1944, with good results. This method does away with large fuel tanks, affording more space for useful load, and is much more powerful than present fuels. Electric energy at ten million volts is generated within the rocket by the ionization of a salt solution according to what Source calls the "Kesselring" process, which is described with accompanying diagrams. (Source states this process was discovered by a German scientist in 1937.) This high voltage is discharged in the rocket's exhaust tube, causing a vapor or gas (unidentified) to explode violently,

giving a propulsive exhaust impulse of 1,000 kilograms per second per square centimeter, of 78,590 kilograms (ca. 78 tons) per second, with a ten centimeter (2 1/2") exhaust tube. (Source stated orally that discharges occurred twenty times per second.) Source claims this process could also be used in propelling units for all types of transportation.

[Franz Peter's claim to have been working on rockets since age 14 is not unreasonable. Wernher von Braun began experimenting with rockets at age 12, and many other German-speaking students became interested in rockets at young ages in the 1920s and 1930s. Moreover, with most fighting-age men sent to the front lines, it was not unusual to employ younger individuals in war-related work at home, including rocket development (p. 5313).

Rheinmetall-Borsig is known to have made major advances in developing and demonstrating multi-stage, relatively large solid propellant rockets. See p. 5663. They may well have been involved in other rocket-related work.

Numerous other reports also stated that there were large rocket development and testing programs in the greater Erfurt area.

Franz Peter appeared to be very knowledgeable about rockets, and he appeared to have been involved with actual German rocket development programs for a considerable period of time. He claimed that prior to his leaving in May 1944, the German program had:

- Launched a rocket to an altitude of 360 km. The A-4 (V-2) rocket had a maximum altitude of approximately 200 km if launched vertically. Thus if Peter's claim is true, it describes a more advanced rocket.
- Launched two-stage liquid propellant rockets. If that claim was true, the simplest explanation may be that an A-4 (V-2) or similar rocket had been used as the first stage, and a much smaller rocket had been mounted on top of that as a second stage. Several such rockets, dubbed the Bumper series, were tested in the United States after the war (p. 5314). Those may have been based on successful wartime German experiments, if Franz Peter's information was accurate.
- Launched a rocket that used liquid hydrogen as fuel, a major advance over known German rockets that used ethanol or other hydrocarbons as fuel. As a very new and experimental technology, that would be consistent with the possibility of first testing just a very small hydrogen-powered rocket, for example mounted on top of a much larger A-4 rocket.
- Experimented with ion rocket engines. While Peter's claims for the performance of ion rocket engines and his own contributions to them may have been overstated, German scientists such as Ernst Stuhlinger did invent ion rocket engines, conduct at least some experiments during the war, and ultimately fully develop them in the United States after the war.

The above document mentioned a film negative containing Franz Peter's 114-page manuscript. That film roll was still stored in a canister alongside this document in the NARA file box. Unfortunately, due to the passage of time, the film is fused together and crumbling, and appears to be unreadable, as shown on p. 5315.]

Figure E.65: Two boys working at Peenemünde in early 1942 [Deutsches Museum Archive, photo CD61663].

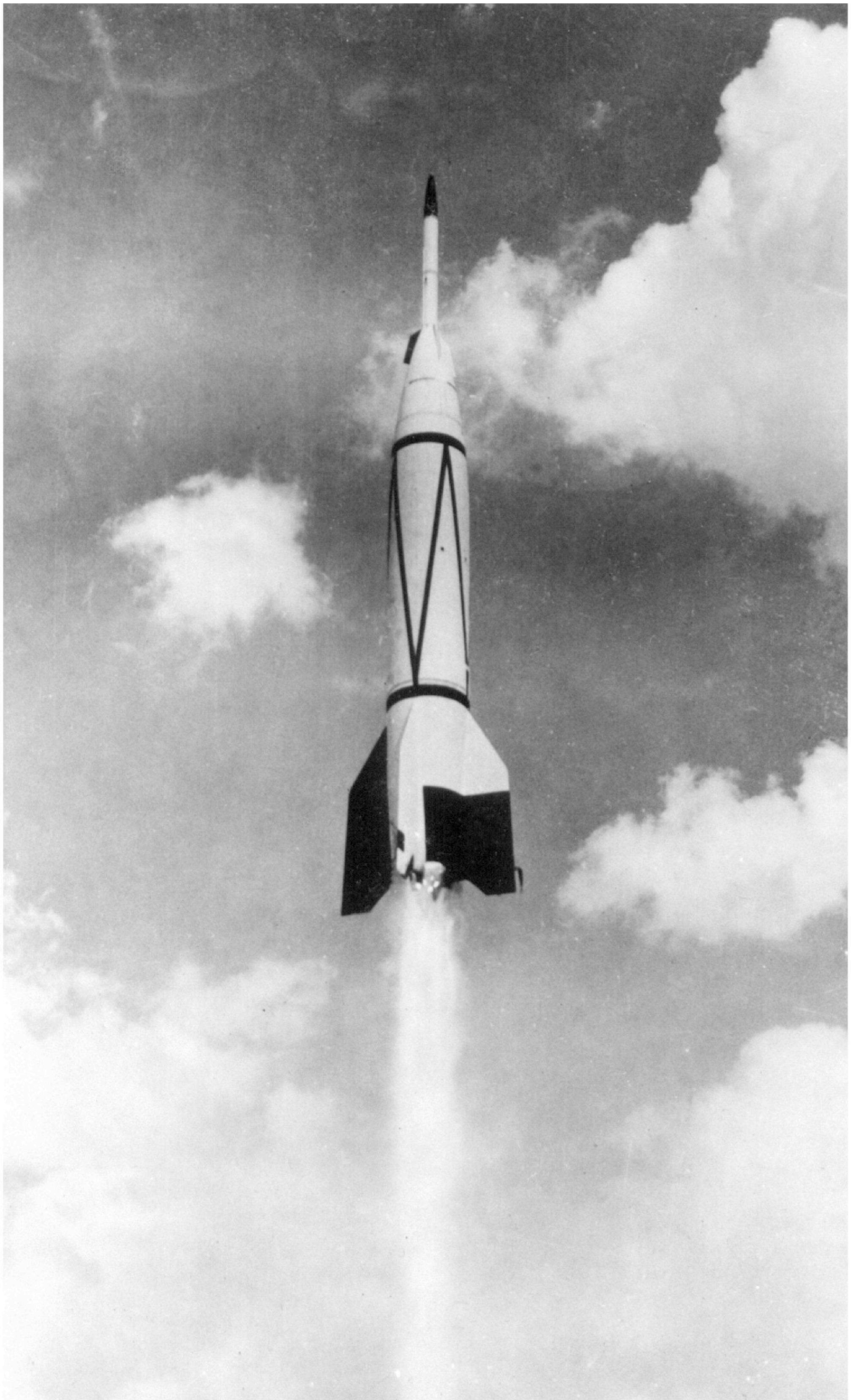


Figure E.66: Bumper 5, an A-4 (V-2) first stage with a small WAC Corporal second stage, was launched in the United States on 24 February 1949 and attained a maximum altitude of 393 km. It may have been based on successful similar wartime German experiments.

Figure E.67: Unfortunately the film containing Franz Peter's 114-page manuscript on advanced rockets is fused together and crumbling, and appears to be unreadable due to the passage of time [NARA RG 38, Entry 98C, Box 3, Folder TSC #1001–1100].

Cable CM-IN-2077 from Naval Research Lab to NRL Field Group. 9 October 1946. [NARA RG 77, Entry UD-22A, Box 160, Folder In & Out July 16, 1946–Jan. 1947].

From: Naval Research Lab (Electrical Div)
To: NRL Field Group (for Dr Ernest H Krause) White Sands
Proving Ground Las Cruces New Mexico (War pls pass)
DTG: 092040Z NCR 9735 9 October 1946

Request you interview most prominent German rocket scientists to establish professional reputation and personal reliability of German rocket scientist Franz Peder, presumed to have worked on "Electrical Rocket" (Kesselring Process) at Erhfurt Experimental Weapon Station; also establish what work done and what success achieved by Peder or others on this electrical rocket.

End

Note: This message has been relayed to Las Cruces, N Mex.
ACTION: R&D
INFO: AAF, ID, P&O, Gen Groves

John A. O'Mara to Lowell P. Weicker. 14 June 1944. Headquarters, U.S. Strategic Air Forces in Europe, Office of the Director of Intelligence [AFHRA A5734 frames 1369–1370]. [See document photos on pp. 5317–5318.]

[...] Investigation quickly disclosed that there was a group of party technicians in the Wehrmacht experimenting with a very large conventional type of rocket with a total weight in the neighborhood of 68 tons. Another group of scientists in the GAF technical development section were working on a jet-propelled pilotless aircraft and both organizations were testing some of these weapons at Peenemünde, on the shores of the Baltic.

On the 17th of August 1943 construction on a number of strange sites located on the Cherbourg Peninsula and in the Calais area were discovered. Work on these sites progressed at a snail's pace. It took some little time before it was definitely established that these were the so-called secret weapon sites and were linked to the long range weapon experiments at Peenemünde. Ninety-six of them were constructed for the launching of pilotless aircraft and seven were for the launching of giant sized rockets. [...]

The reported explosions at Maidstone of giant conventional rockets turned out to be nothing but long range, eight inch, naval shells, so that as yet there is nothing upon which to assess the actual value of the projected 68 ton conventional rocket. [Not yet deployed in combat.]

Arnold Deeply Concerned with the German Developments of Robots, Rocket Torpedoes, and Jets—July 1944 [AFHRA 43811 electronic version pp. 962–963].

[...] Arnold was most concerned. "If this rocket procedure is allowed to be developed uninterrupted, there may come a time when these large 75 ton rockets land in England, in occupied France, or possibly if they are radio-controlled, in the United States. We must use everything in our power to prevent any such occurrences."

[The A-4 or V-2 rocket weighed 14 tons. Yet the highest levels of U.S. intelligence reported with great confidence that rockets weighing 68–75 tons were also under active development and experimentation through 1943 and 1944. What evidence did U.S. intelligence have? Note that an A-10 rocket by itself, with no A-4 upper stage or payload, would have weighed around 69 tons (p. 5800).]

AFHRA folder 519.6522-4

HEADQUARTERS
UNITED STATES STRATEGIC AIR FORCES IN EUROPE
Office of the Director of Intelligence

AAF 586
APO 633
14 June 1944

MEMORANDUM:

TO : COL. L. P. WEICKER

In the face of continued reverses and diminishing manpower and materials during the Spring of 1943, it became very apparent that very drastic steps had to be taken if the German Government even hoped to stave off defeat. We are just now beginning to appreciate what some of those drastic steps were. One such step is the attempt to develop a substitute for planes and pilots and this was the story behind their much publicised (so-called) secret weapons.

In January 1943 General Galland, at that time in charge of GAF technical development acknowledged the declining strength of the Luftwaffe before a large audience of Military and high Party officials. He said the plans had been made for a new air force and promised greatly increased performance for new planes which would be ready for the Spring campaign. Production was increased slightly on improved models, but the performance of these new planes didn't begin to live up to the promises. Just when this became self evident high officials of the Wehrmacht and the GAF started talking of "Secret Weapons".

Investigation quickly disclosed that there was a group of party technicians in the Wehrmacht experimenting with a very large conventional type of rocket with a total weight in the neighborhood of 68 tons. Another group of scientists in the GAF technical development section were working on a jet-propelled pilotless aircraft and both organizations were testing some of these weapons at Peenemunde, on the shores of the Baltic.

On the 17th of August 1943 construction on a number of strange sites located on the Cherbourg Peninsula and in the Calais area were discovered. Work on these sites progressed at a snails pace. It took some little time before it was definitely established that these were the so-called secret weapon sites and were linked to the long range weapon experiments at Peenemunde. Ninety-six of them were constructed for the launching of pilotless aircraft and seven were for the launching of giant sized rockets.

By the constant attacking of these sites chiefly by planes under the control of USSTAF, practically all of the original pilotless aircraft or ski sites and two of the large rocket or large sites have been neutralized. However, recently the GAF has hastily erected 66 modified pilotless aircraft sites of which forty-two are in the Calais area, four in the Calvados and the rest in the Cherbourg area. With bombing having practically neutralized the old ski sites and the Allied invasion having interfered with all but the forty-two modified sites in the Calais area, the question is just what is the potential danger from these sites still available and workable by the GAF.

Figure E.68: John A. O'Mara to Lowell P. Weicker. 14 June 1944. Headquarters, U.S. Strategic Air Forces in Europe, Office of the Director of Intelligence [AFHRA folder 519.6522-4; AFHRA A5734 frame 1369].

AFHRA folder 519.6522-4

-2-

At approximately one o'clock on the morning of 12 June 1944, the Germans launched an estimated 18 pilotless aircraft from the Hesdin area of France. Just the day before it had been reported through intelligence sources that a train had passed through Lille transporting a number of pilotless aircraft. On the same day it was confirmed that new launching rails had been placed on four modified sites in the vicinity of Hesdin.

By means of radar detection, devices stationed on the British coast, the track of these 18 pilotless aircraft was plotted and only four appeared to make landfall. One was tracked to Stone and another to Cuckfield, neither of which did any real damage. The third one hit the London N.E. railroad bridge at Bethnal Green badly damaging the bridge and three adjacent houses. Casualties were two killed and twenty-eight injured from the blast which blew out windows and tore off signs for half a mile in all directions. At the village of Platt a careful examination of the bits and pieces of exploded secret weapon established the fact beyond any further doubt that it was none other than the one known as the Peenemunde 20 previously photographed at the German Experimental Station at Peenemunde on the Baltic. This pilotless aircraft has a 20 foot span capable of lifting 8,000 pounds, but it must have been lightly loaded for the first attempted attacks on England. This examination also reveals that this weapon is the same as the one that landed at Bassup, Sweden two weeks ago but did not explode and has been carefully examined by the technical experts of AI2(g).

From the examination of the Swedish weapon and the examination of the parts salvaged from the attack on England it has been definitely established that this pilotless aircraft is not at present controlled by radio but by a Patin compass and an automatic pilot coupled together. It is jet-propelled and the jet works for 15 minutes on 1,000 pounds of fuel which is sufficient for the 130 mile trip from the launching point near Hesdin, France to Platt, England. The crude construction of the weapon bears out the belief that these weapons would only take about a tenth the man hours to build a single engine fighter, but their value is to be more than ever questioned. The launching platforms from which these weapons must have been started are known to be aimed at London, and only one reached the London area, three reached England and fourteen did not make landfall. Of the four that made landfall the damage was no more than from four 500kg bombs dropped at random. Even an expected 100% improvement in performance would not be a reason to credit them with any military advantage. They are more of a liability to Germany than a potential danger to us because of the time and trouble consumed in their effort to produce a substitute for pilots and planes.

The reported explosions at Maidstone of giant conventional rockets turned out to be nothing but long range, eight inch, naval shells, so that as yet there is nothing upon which to assess the actual value of the projected 68 ton conventional rocket.

JOHN A. O'MARA
Lt. Col. A.C.
Ass't. to the D of I

Figure E.69: John A. O'Mara to Lowell P. Weicker. 14 June 1944. Headquarters, U.S. Strategic Air Forces in Europe, Office of the Director of Intelligence [AFHRA folder 519.6522-4; AFHRA A5734 frame 1370].

Henry Arnold to Carl Spaatz. 22 July 1944. Outgoing Classified Message WAR 69061. [Franklin Delano Roosevelt Library, Hyde Park, New York. Map Room Files, Box 49. Folder Rocket Bombs 1944]

I agree with you that everything possible must be done in order to determine ways and means of preventing the large German rockets from ever reaching their destination or causing damage to US. This in reply to your 65292. Doctor Bowles and his assistants are working on this problem and have been working on it for some time, particularly from the radio countermeasures viewpoint. Doctor Fraenckel has brought back from England information of great value in our countermeasure work and has already met with McClelland and others to formulate a specific program including proper search facilities and jamming equipment. We will keep you posted on techniques and on schedules of equipment which we propose to supply. As soon as suitable jamming materials are developed they will be sent to you posthaste. Doctor Fraenckel will return to England within a very short time and be prepared to give you such aid and advice as he can. He should be able to leave here not later than July 30th. If you have any other ideas as to how we can help you let us know.

War Cabinet. "Crossbow" Committee. "Big Ben" Sub-Committee. 17 August 1944 [AFHRA A1263 frame 1404]

Despite the reported lack of supporting evidence it was generally felt that the Swedish rocket [Peenemünde A-4 rocket that crashed in Sweden] had been designed to take more than one weight of warhead. It was pointed out that, within the suggested specification, an α of .62 would carry a charge of about 2 tons to a range of approximately 120 miles.

H. L. Morrow. 10 November 1944. Intelligence Information from Stockholm. [AFHRA C5095 frames 1496–1498]

The following observations constitute a resume of information received via the Italian "I" Office from the Air Attaché with the Italian Legation, Stockholm, together with a summary of his conversation with a Swedish Engineer, JOHANSON, representative of the Swedish Air Force in Italy, who returned to Sweden from MILAN at the end of September last. [...]

"V-1" is to be perfected in order to increase its range and size. When that is accomplished it will be known as "V-2", the chief difference being that "V-2" is to have a destructive power equal to 50 tons of explosive. In this connection important experiments are being made on the heights of Mount Gausta (1,900 m) near RJUKAN, Norway, where there is a probable launching site. Experiment on "V-2" has not so far evolved final adjustment of direction control and damage power (eg: its strike causes such excessive penetration that the explosive effect is less than "V-1"). Therefore the major German effort is now directed towards the development of "V-3"—a large chemical incendiary bomb (deflagrazione). This latter is constructed in two parts—actually two bombs—each loaded with different chemical compounds which ignite with devastating effect upon contact with air. [...]

[This was apparently a delayed report of intelligence from summer 1944, after the V-1 cruise missile had been publicly named and utilized but before the V-2 (A-4) rocket had been officially named and used in combat. That timing explains the confusion over whether the V-2 and V-3 were upgraded versions of the V-1 cruise missile or entirely different weapons. The upgraded warheads sound like Zippermayr-type fuel-air explosives or something else similar. The report of secretive German work on Mount Gausta in Norway may be the most interesting part of this report. The report also provided intelligence details about new jets, submarines, and tanks that appear relatively accurate in hindsight, so this V-2/V-3/Gausta report should also be taken quite seriously.]

Newcastle Morning Herald and Miners' Advocate
3 October 1944 p. 1

Nazi Secret Weapon Site in Norway

LONDON, Oct. 2. A.A.P.—The carting of large quantities of steel and concrete to the top of the 6060 feet high Gausta Mountain, in Telemark Province, and the banning of the whole area around the mountain to Norwegians, has led to the belief that the Germans are preparing to send large flying-bombs or a similar weapon against Britain from the south of Norway, says the British United Press correspondent at Stockholm.

The Germans are reported to be experimenting with a new powerful explosive derived from heavy water from the Jukan plant, a few miles from Gausta Mountain.

Argus
18 August 1944 p. 16

MOUNTAIN RAMP FOR ROBOTS

Erected By Germans In South Norway

From GODFREY BLUNDEN, "Argus" Special Correspondent
STOCKHOLM, Thursday

The Germans are reported to be building a flying bomb site on the top of 5700ft high Mt Gausta, Southern Norway. From there they hope to launch flying bombs on Britain, between 500 and 600 miles away.

For some time Norwegians have seen the Germans bringing sand and cement to this mountain top. At first it was assumed they were building fortifications. Later reports, however, say the construction has taken the shape of the large flying bomb platforms discovered in Normandy, and described by Allied correspondents.

Mt Gausta is the highest mountain in Southern Norway, and overlooks a wide expanse of country. It is about 65 miles west of Oslo and more than 100 miles east of the Atlantic coastline—well out of reacn of commando attacks.

A railway line runs from the foot of the mountain about 80 miles to the port of Kragero, on the Skagerrak, 100 miles south-west of Oslo. Thus flying bombs could be transported to the mountain without great difficulty. Pictures in the latest issue of the Berlin *Illustrierte Zeitung* show how flying bombs are packed and assembled at bases.

The bombs are packed like crated torpedoes. Wings and jet engine are attached only after arrival at the firing base. Two long bars are fitted on either side of the bombs. The wings are slotted on to these and bolted to the sides of the bomb.

Gausta mountain near Vemork in Norway

Figure E.70: Gausta mountain in Norway was the site of a very secretive German installation that may have been designed to launch and/or control long-range rockets.

Harry Vosser. Germans Are Still Striving to Perfect New V Weapons. *New York Times*. 22 October 1944, p. E5.

[...] If Hitler can get the necessary breathing space by holding the invading Allied armies on the borders of the Reich for from three to six months more, he may enable the scientists to complete their work.

V-2—a rocket projectile—was reported by the Germans to be ready some time ago. This was confirmed by neutral sources which said that rockets had landed in Sweden and Poland from the firing point at Peenemünde. [...]

Hitler is said to have stopped the production of that type of rocket and to have ordered scientists to concentrate on the production of bigger and more powerful ones. At least four of these latest experimental rockets are reported to have landed in Sweden and many more have crashed into the Baltic sea off Sweden's southeast coast. [...]

V-3 is reported to be the atom bomb. Dr. Goebbels has until now kept quiet regarding this one, but it is said that German scientists credit the weapon with having enormous possibilities.

Neutral sources describe the atom bomb as resembling an airplane in shape, with complicated machinery for steering and propelling the bomb to its target. The rest of the space is filled with explosives and fuel, the amount of explosives being governed by the amount of fuel necessary to carry to the bomb to its selected target.

An electric shock from a small instrument set to operate at a given time detonates explosive and atom simultaneously. The expansion caused by a normal explosive substance, such as dynamite when it becomes a gas, is increased by the force of the disintegrating atoms.

[...I]t is significant that two or three sources have reported the existence of the weapon. It is interesting too to note that a report from the Berlin correspondent of a Swedish newspaper describes V-3 as "the America Bomber and the biggest and best of all Hitler's secret weapons." The correspondent said that successful experiments had been completed in Austria and that the weapon would carry two members of Himmler's recently founded SS air force. He finished his article with the words "America will soon known what war is."

[...] There is no possible doubt that the Germans are straining every nerve to complete it and put it to use before the forthcoming onslaught by the Allied armies.

[This remarkably early article, based on several independent sources, publicly reported important details that were later confirmed by a number of additional sources:

- Germany was building a rocket that was "bigger and more powerful" than the V-2, "resembling an airplane in shape" (with wings), that "would carry two members of Himmler's recently founded SS air force" from its launch point in Europe to America (see all the other documents in Sections E.2 and E.3, but especially pp. 5365–5388 and 5600–5603).
- The rocket would deliver an atomic bomb that simultaneously used high-voltage electricity (a high-voltage fusion neutron initiator) and the detonation of surrounding conventional explosives (implosion) to release large amounts of energy from fission fuel ("the force of the disintegrating atoms"). See pp. 4485–4501 and Sections D.8 and D.15.5.

Where are the official reports on large rockets that were recovered outside Germany during the war, as well as any that were discovered after the war? Where are the reports on the "successful experiments" that "had been completed in Austria"? Can those be located and declassified?]

Aftontidningen (Stockholm), 2 December 1944, p. 7.

Raketbomben för New York färdig i år?

Minister Speer meddelade vid ett sammanträde med rustningsrådet för den tyska industrin att Wehrmachts överkommando ansåg de resultat som åstadkommits med V-2 tillfredsställande. Ytterligare förbättringar håller på att vidtagas. V-3, som är avsedd för beskjutning av New York, är så pass färdig att man har beräknat de första provskjutningarna till slutet av denna månad.

Rocket bomb for New York finished this year?

Minister Speer announced at a meeting of the German Industry Armaments Council that the Wehrmacht High Command considered the results achieved with V-2 satisfactory. Further improvements are being made. The V-3, which is intended for bombing of New York, is so complete that the first test launches are estimated by the end of this month.

V-3 Ready to Hit New York This Month, German Says. *New York Times*, 3 December 1944.

A Stockholm dispatch quoted the German labor chief, Albert Speer, yesterday as saying that Germany's V-3 weapon would be ready for firing against New York by the end of December. No intimation of its nature was given.

Deputy Chief Police Inspector Arthur W. Wallander, chief of staff of the city protective forces, said here yesterday: "Our services are ready." Mayor La Guardia warned on Nov. 12 that, "although there is no reason for alarm, we must be ready."

[In the Nuremberg trials, Albert Speer essentially denied the existence of any secret weapons, yet in this news report he publicly announced that they were being prepared for use. Many different weapon systems were competing for the title of V-3, the next German secret weapon to be publicly announced and demonstrated. Other than being able to hit New York, it is not clear if this particular "V-3" was a submarine-launched V-1 cruise missile, a submarine-launched V-2 or A-4 rocket, a European-launched A-9/A-10 intercontinental rocket, or something else.

Note that the *New York Times* misquoted the Stockholm newspaper. According to the Stockholm paper, Speer said that by the end of December 1944, the V-3 missile would be ready for test flights, not ready for an attack against New York then.]

Preparing the American Public for a V-3 Attack—Dec. 1944 [AFHRA 43811 electronic version p. 972]

At a CCS meeting in Washington, Dec 8, 1944, the CCS discussed "without much interest" a Presidential directive which would take action to meet a V-3 threat—intercontinental missile attack against the United States. Kuter reported to Arnold and Giles that the JCS was directing commanders to take preliminary actions and to prepare plans. "From their tone I feel they will accept or surely give serious consideration to a study pointing toward a Presidential announcement of the possibility of attack, the victory the enemy would achieve if we (don't?) take preparatory action and our decision to rely on the ability of the American public to take it." Kuter said he discussed the matter with Hull (Army Deputy Chief of Staff) and he directed Loutzenheiser, with McKee's assistance, to prepare a necessary study.

[See also related documents on pp. 4702–4703 and 5618–5660.]

Jürgen Michels. 1997. *Peenemünde und seine Erben in Ost und West: Entwicklung und Weg deutscher Geheimwaffen.* Bonn: Bernard & Graefe, p. 71.

Unter der Bezeichnung Aggregat 8 liefen eine ganze Reihe zum Teil stark voneinander abweichende Entwürfe. Die erste Studie entsprach in der Größe dem Aggregat 5, sollte aber durch Salbei und Visol (auch als Gasöl bezeichnet) angetrieben werden. Ende 1941 entstand eine sog. Hochdruck-Rakete, die in der Größe dem Aggregat 4 entsprechen sollte. Mit 8330 kg Salpetersäure und 1670 kg Gasöl sollten ca. 50,000 kp Schub erreicht werden. Diese Rakete sollte einen Sprengkopf von 2000 kg über 300 km tragen. Noch größer war ein weiterer Entwurf, der 14.295 kg Salpetersäure und 2860 kg Gasöl vorsah. Obwohl ein niedrigerer Schub von 35.000 kp geplant war, erhoffte man aufgrund einer langen Brenndauer von ca. 100 Sekunden eine Höchstgeschwindigkeit von 7380 km/hr zu erreichen und eine Nutzlast von 2500 kg etwa 450 km weit zu verschießen. Das Startgewicht war auf 22.370 kg ausgelegt.

Keine dieser Studien kam letztendlich über Windkanalversuche hinaus.

A whole series of designs, some of which differed greatly from one another, ran under the name Aggregat 8. The first study corresponded in size to Aggregat 5, but was to be powered by Salbei and Visol (also known as gas oil). At the end of 1941, a so-called high-pressure rocket was developed, which was to correspond in size to Aggregat 4. With 8330 kg of nitric acid and 1670 kg of gas oil, a thrust of approximately 50 tons was to be achieved. This rocket was to carry a warhead of 2000 kg over 300 km. Even larger was another design, which envisaged 14,295 kg of nitric acid and 2860 kg of gas oil. Although a lower thrust of 35 tons was planned, it was hoped that a maximum speed of 7380 km/hr could be achieved due to a long burn time of approximately 100 seconds and a payload of 2500 kg could be fired over a distance of around 450 km. The launch weight was intended to be 22,370 kg.

None of these studies ultimately got beyond wind tunnel tests.

[Among the several different proposed A-8 designs were some that were extended versions of the A-4 with higher thrust, for longer ranges and/or higher payload capacities. According to official postwar history books, such extended A-4 rockets were never actually built. However, as shown by documents throughout this section, there is significant evidence that at least some extended rockets were indeed built and possibly tested. These wartime prototypes also served as the basis of many postwar U.S., Soviet, and French rockets (Section E.7.2).]

Gerhard Reisig. 1997. *Raketenforschung in Deutschland: Wie die Menschen das all eroberten.* Münster: Edition Lenser. pp. 707–708.

In seinem Memorandum "Entwicklungsgrundsätze" vom November 1941 hatte W. Dornberger postuliert, daß die "A4"-Rakete nur eine temporäre Zwischenlösung sein sollte. Die tatsächliche militärische Forderung bestehe auf einer Fernrakete von 450 km Reichweite (Dornberger, 1941). Die entsprechende Raketentype erhielt die Bezeichnung "A8". [...]

In his memorandum "Development Principles" of November 1941, W. Dornberger postulated that the "A-4" rocket should only be a temporary interim solution. The actual military requirement was for a long-range missile with a range of 450 km (Dornberger, 1941). The corresponding rocket type was given the designation "A-8." [...]

Das “A8”-Projekt erforderte also eine grundlegende neue Systemkonfiguration, die analytisch eingehend untersucht wurde (Hellebrand, 1942). Meissner (1941) diskutierte 16 verschiedene Konfigurationen einer “A8”-Rakete, um einen optimalen Ausgleich der verschiedenen Parametergrößen der Rakete zu bestimmen. Bei diesen Entwürfen sollte die aerodynamische Form der “A4”-Rakete möglichst erhalten bleiben.

Die Grundlage der “A8”-Konfiguration bildet ein neues Triebwerk von 30 to (294 kN) Schub. Werner Thiel hatte die Entwicklung eines solchen Triebwerks bereits 1941 begonnen (Thiel, 1941). Die Treibstoffbasis für den 30-to-Motor ist die Kombination von Gasöl mit *Salbei*. Das Gasöl kann gegen ein 50-prozentiges Gemisch von Benzol und Benzin ausgetauscht werden. Dieser Motor ist eine Hochdrucktype mit einem Brennkammerdruck von 40 atü (41 Bar). Mit dem 30-to-Triebwerk wird eine Brennschlußgeschwindigkeit von über 2,000 m/sek bei der Machzahl 6,8 erreicht. Bei diesen hohen Machzahlen wird die Körperlage der Rakete instabil, d.h. der Luftangriffspunkt aller Luftkräfte auf die Rakete rückt vor deren Schwerpunkt. Eine gewisse Verbesserung der Stabilität wird durch Verlängerung der Zelle auf L = 13.5 Kaliber erreicht.[7] [...]

Die “A8”-Rakete wäre ein fortschrittliches, wegweisendes Projekt gewesen. Sie blieb nur ein “Papierprojekt”.

Tabelle XI.2 Dimensionen des “A8” Modells

Länge:	13.5 Kaliber
Kaliber:	1.651 mm
Leergewicht:	22,8 to/224 kN
Brennschluß-Machzahl:	6,8

[7] “A4”-Rakete: L=8.5 Kaliber

The “A-8” project thus required a fundamentally new system configuration, which was analyzed in detail (Hellebrand, 1942). Meissner (1941) discussed 16 different configurations of an “A-8” rocket in order to determine an optimal balance of the various parameters of the rocket. In these designs, the aerodynamic shape of the “A-4” rocket was to be retained as far as possible.

The basis of the “A-8” configuration was a new engine with a thrust of 30 tons (294 kN). Werner Thiel had already begun the development of such an engine in 1941 (Thiel, 1941). The fuel basis for the 30-ton engine is a combination of gas oil and *Salbei*. The gas oil can be replaced with a 50 percent mixture of benzene and gasoline. This engine is a high-pressure type with a combustion chamber pressure of 40 atmospheres (41 bars). With the 30-ton engine, an engine cutoff velocity of over 2,000 m/sec, Mach number of 6.8, is achieved. At these high Mach numbers, the rocket becomes aerodynamically unstable, i.e. the center of pressure of all aerodynamic forces on the rocket moves in front of its center of gravity. A certain improvement in stability is achieved by lengthening the airframe to L = 13.5 diameters.[7] [...]

The “A-8” missile would have been an advanced, pioneering project. It remained only a “paper project.”

Table XI.2 Dimensions of the “A-8” model

Length:	13.5 diameters
Diameter:	1.651 m
Weight without payload:	22.8 tons/224 kN
Engine cutoff Mach number:	6.8

[7] “A-4” rocket: L=8.5 diameters

Telegram No1 Dated: December 11, 1943.

D'ETAT

SECSTATE

WASHINGTON

WATCH. Repeated London and Algiers.

Following obtained by Austrian contact who has proved reliable but his source untested by us.

Germans already manufactured 12,000 rocket projectiles 10 to 12 tons total weight containing 3 plus tons explosive charge consisting of propane in some types and propylene in other types. Projectiles are 12 to 15 meters long. Twenty meter model abandoned because always exploded in air. Transport is by special RR cars with 10 axles. Range 230 to 330 km. Hits ground at angle of 48 degrees. Launched by apparatus powered with steam. Explosive charge in nose is followed by chamber capable receiving radio stimulus then cell containing rocket fuel composed of butane acetaldehyde and source understands also nitric or perhaps nitrous acid. Next chamber is for combustion where fuel burns in presence of nitric or perhaps nitrous acid. Part of escape gases operates turbine which another source says is to compress air required for combustion of fuel. Outer case is double with carbonic acid between for cooling. Firing locations are near Calais, St. Omer (these two towns have 17 batteries) and in Holland Belgium Denmark. (From 110. View range last location not comprehensible). Date for beginning their use postponed ~~fxx~~ from Xmas to beginning Feb. 1944. Suggests consulting Fritz von Opel who we understand is in USA. Manufacturers in Austria and vicinity include Raxwerke at Vinzendorf am Schneeberg also at Ebensee and Alt-Oetting. Also in region Berchtesgaden and parts are made in Heinkel works Schwekat and another Schwekat factory.

Some Germanx night fighters have rocket projectiles timed to explode at 12oo meters for use against Flying Fortresses.

Germans still make Schalltorpedoes shot from planes and directed by radio also torpedoes wound with point three mm wire.

Different and fairly reliable source reports plant of Lindes Eismaschinen AG at Hoellriegelskreutz who must be large producers of propane are filling shells or bombs for some secret weapon.

N.P.
1291-1295

Figure E.71: Allen Dulles. 11 December 1943. [Princeton University Library, Allen Dulles Papers, Series 4, Subseries 4K: Telegrams d'etat, 1942–1945, 1942–1943, MC019.09_c44.pdf, https://findingaids.princeton.edu/catalog/MC019-09_c44]. As of that date, 20-meter-long rockets had been built and launched but still had unresolved issues (compare with p. 5572).

December 17, 1943.

SECSTATE

WATCH. Repeated to Algiers.

Following from 821 following trip North. Dec. 9 to 12.

(Several paras BO.)

Friedrichshafen. 821 went particularly this area to investigate work there on secret weapon presumably preparation explosive filler for rocket. Claims following from inside source.

Following location secret installation: from Oberraderach follow good earth road 500 meters west along ridge here road turns north and south. North road mere camouflage and leads to fake camp. South road after 150 meters turns west for about 200 meters and reaches camp with 20 barracks in two north south rows. Immediately southeast this camp hidden in woods are laboratories and other installations consisting of 20 reinforced concrete bunkers about 30 meters square and fairly deep although not an underground plant. See our 1232. This camp is slightly east of Kluftern and half way on straight line from Markdorf to Friedrichshafen. Markdorf has 2 flak batteries in town. On lake shore 3 KP fog troops. Rumored that fog exercises have poisoned vegation along lake. Above camp has some 4,000 ex-concentration camp and penitentiary prisoners. Heavy military guard.

Rocket has charge of poison gas combined with compressed air which has terrific explosion. Steel cylinders manufactured near Strasbourg and then shipped to Friedrichshafen. Sources informant is doctor who largely engaged in attending lung cases among workers.

N.P.
1356-1362

Figure E.72: Allen Dulles. 17 December 1943. [Princeton University Library, Allen Dulles Papers, Series 4, Subseries 4K: Telegrams d'etat, 1942–1945, 1942–1943, MC019.09_c44.pdf, https://findingaids.princeton.edu/catalog/MC019-09_c44]. There appear to have been several plants in the Friedrichshafen area producing weapons of mass destruction as well as long-range rockets to deliver them.

Allen Dulles. 6 December 1943. [Princeton University Library, Allen Dulles Papers, Series 4, Subseries 4K: Telegrams d'etat, 1942–1945, 1942–1943, MC019.09_c44.pdf, https://findingaids.princeton.edu/catalog/MC019-09_c44].

From 493 source. German technicians working in large underground development back of Fischbach on Bodensee. Entrance at Manzell and main establishment near Kluftern. Believed to have something to do with secret air weapon.

[The sites named above are in the Friedrichshafen area. For more on OSS agent "493," see p. 4176.]

R. R. Thun. 5th Army POW Cage (Air), Target Notes A/5. 4 November 1944. [AFHRA A5417 electronic p. 969–970]

5. Under-ground Factory in FRIEDRICHSHAFEN: In Jan/43 P/W visited the site of a large new under-ground factory being built by Dornier at FRIEDRICHSHAFEN. Factory lies between the lake and the road to IMMENSTAAD, on the NW edge of FRIEDRICHSHAFEN. It is covered by a storage yard for wood and other bulk materials, and there is a R.R. spur leading into the underground part. P/W could give no information as to the size of the underground unit, other than to say that it was about the same size as the large Mercedes Factory in STUTTGART. He heard from friends that V-2 was being made there, and that three R.R. cars were necessary to haul away a single V-2 bomb. P/W considered himself an Italian, having been born in BOLZANO, and was obviously trying to give reliable information.

[See document photos on pp. 5328–5329. See also p. 5392, although there the answers to postwar questioning may have been less than complete and accurate.

Wartime German railroad cars were most commonly around 8–10 meters long. A standard A-4 (V-2) rocket was 14 meters long with all parts from the nosecone to the fins attached. Thus a standard A-4 could have been carried by a single railroad car of somewhat greater than average length (or by a single car of average length, if partially disassembled), or at most by two average-length railroad cars with plenty of room to spare.

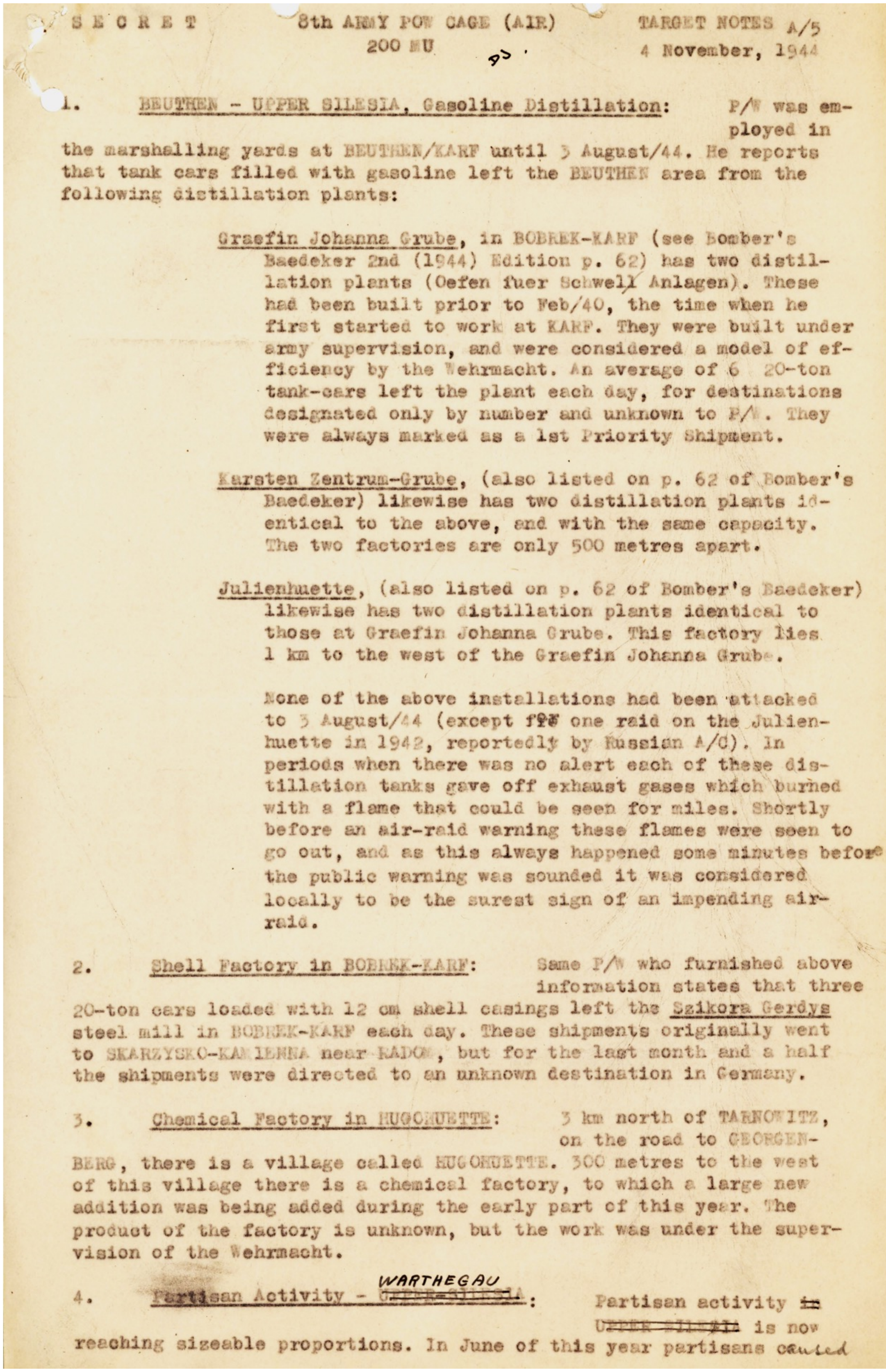
If the rockets produced by this underground factory at Friedrichshafen required three average-length railroad cars, the rockets could have been up to 24–30 meters long. (Or the rockets could have been even longer if the railroad cars were longer than average, or if the rockets were partially disassembled.) Thus this description does not sound at all like a standard A-4 rocket. Note some observers used "V-2" in a generic sense to refer to any large German rockets, not just the A-4.

What type of rocket was being produced in this underground factory? The most likely possibilities were an 18-meter-long extended A-4 (without wings) or A-9 (with wings), a 21-meter-long extended A-4 or A-9, a 20- to 26-meter-long A-10, or a ∼30+ meter-long A-9/A-10.

Whatever these unusually large rockets were, they were not at the design stage or the prototype stage. Possibly as early as 1943 and definitely no later than mid-1944, they were being mass-produced.

Where are all the wartime German and postwar Allied reports on this underground rocket factory?

Could an industrial archaeological excavation be conducted at the site of this factory now?]



SECRET 8th ARMY POW CAGE (AIR) TARGET NOTES A/5
200 MU 4 November, 1944

1. BEUTHEN - UPPER SILESIA, Gasoline Distillation: P/W was employed in the marshalling yards at BEUTHEN/KARF until 3 August/44. He reports that tank cars filled with gasoline left the BEUTHEN area from the following distillation plants:

Graefin Johanna Grube, in BOBREK-KARF (see Bomber's Baedeker 2nd (1944) Edition p. 62) has two distillation plants (Oefen fuer Schwell Anlagen). These had been built prior to Feb/40, the time when he first started to work at KARF. They were built under army supervision, and were considered a model of efficiency by the Wehrmacht. An average of 6 20-ton tank-cars left the plant each day, for destinations designated only by number and unknown to P/W. They were always marked as a 1st Priority Shipment.

Karsten Zentrum-Grube, (also listed on p. 62 of Bomber's Baedeker) likewise has two distillation plants identical to the above, and with the same capacity. The two factories are only 500 metres apart.

Julienhuette, (also listed on p. 62 of Bomber's Baedeker) likewise has two distillation plants identical to those at Graefin Johanna Grube. This factory lies 1 km to the west of the Graefin Johanna Grube.

None of the above installations had been attacked to 3 August/44 (except for one raid on the Julienhuette in 1942, reportedly by Russian A/C). In periods when there was no alert each of these distillation tanks gave off exhaust gases which burned with a flame that could be seen for miles. Shortly before an air-raid warning these flames were seen to go out, and as this always happened some minutes before the public warning was sounded it was considered locally to be the surest sign of an impending air-raid.

2. Shell Factory in BOBREK-KARF: Same P/W who furnished above information states that three 20-ton cars loaded with 12 cm shell casings left the Szikora Gerdys steel mill in BOBREK-KARF each day. These shipments originally went to SKARZYSKO-KAMIENNA near RADOM, but for the last month and a half the shipments were directed to an unknown destination in Germany.

3. Chemical Factory in HUGOHUETTE: 3 km north of TARNOWITZ, on the road to GEORGENBERG, there is a village called HUGOHUETTE. 300 metres to the west of this village there is a chemical factory, to which a large new addition was being added during the early part of this year. The product of the factory is unknown, but the work was under the supervision of the Wehrmacht.

4. Partisan Activity - WARTHEGAU ~~UPPER SILESIA~~: Partisan activity ~~in UPPER SILESIA~~ is now reaching sizeable proportions. In June of this year partisans caused

Figure E.73: A report of rockets larger than the standard A-4 (V-2) being mass-produced at an underground factory in Friedrichshafen. R. R. Thun. 5th Army POW Cage (Air), Target Notes A/5. 4 November 1944 [AFHRA folder 512.619C-15A 1943–1945; AFHRA A5417 electronic pp. 969–970].

S E C R E T page 2, Target Notes A/5, 4 November/44.

a triple train wreck by throwing a switch on the double track R.R. near Ktobuck. Two freight trains collided, and later a passenger train ~~likewise~~ piled into the wreckage.

5. Under-ground Factory in FRIEDRICHSHAFEN: In Jan/43 P/W visited the site of a large new under-ground factory being built by Dornier at FRIEDRICHSHAFEN. Factory lies between the lake and the road to IMMENSTAAD, on the NW edge of FRIEDRICHSHAFEN. It is covered by a storage yard for wood and other bulk materials, and there is a R.R. spur leading into the underground part. P/W could give no information as to the size of the underground unit, other than to say that it was about the same size as the large Mercedes Factory in STUTTGART. He heard from friends that V-2 was being made there, and that three R.R. cars were necessary to haul away a single V-2 bomb. P/W considered himself an Italian, having been born in BOLZANO, and was obviously trying to give reliable information.

6. A/C Components Factory - BERLIN: The Heinrich H. ~~Zim~~ Kluesendorf Factory, on ~~Sttaik~~ Citadellan Weg, Spandau, BERLIN, employed 600 ~~tin~~ Feb/43 making A/C parts for Junkers. The parts were for A/C motors, but P/W did not know to which factory they were later sent for assembly. P/W did not visit Spandau at the time of his last leave, and had not heard whether the factory is still running to-day. This factory is not listed in Bomber's Baedeker.

R. R. Thun,
1st Lt. AC.
Air Targets.

Distribution:

MAAF Int	1
CSDIC (Air) CMF	1
5th Army Cage	1
File	1

Figure E.74: A report of rockets larger than the standard A-4 (V-2) being mass-produced at an underground factory in Friedrichshafen. R. R. Thun. 5th Army POW Cage (Air), Target Notes A/5. 4 November 1944 [AFHRA folder 512.619C-15A 1943–1945; AFHRA A5417 electronic pp. 969–970].

A.D.I. (K) Report No. 113A/1945. Suspected 'V' Weapon Factories—Germany and Poland. [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL]

UNDERGROUND WORKS OBER RADERACH.
(September 1944).

2. A co-operative German P/W, who lived in the Friedrichshafen area until September 1944, said there was an underground factory between two hills to the North West of Ober Raderach village rather less than four miles North North West of Friedrichshafen at 47^o 42' 18" N., 9^o 26' 25" E. This pinpoint is very near that of a site described in a report from Italy dated 24th November 1944 reference MFIU/HQ/CSDIC/12.

3. It was locally rumoured that the Ober Raderach works was closely connected with the Zeppelin works at Friedrichshafen and that "25 ton objects" presumed to be 'V' weapons, were being produced. During the winter of 1943/1944 loud noises similar to those made by a power unit under test emanated from the plant but in about March 1944 there was a loud explosion; thereafter things quietened down more than somewhat.

4. P/W had no idea of how many workers might be employed but said they were all either P/W or German troops undergoing detention and they were never allowed outside the factory precincts.

5. These precincts were, however, extensive, as the 6 ft. wooden fence round the site enclosed both the above mentioned hills and a fairly considerable area of ground. A number of small brick office buildings and barrack huts were visible from the outside but the presence of guards operating under Gestapo supervision discouraged the curious from looking too closely.

[See document photo on p. 5331.

This is another report of rockets larger than the standard A-4 (V-2) being mass-produced at an underground factory in Friedrichshafen.]

NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL

SECRET. A.D.I.(K) Report No. 113A/1945.

THE FOLLOWING INFORMATION HAS BEEN OBTAINED FROM P/W. AS THE STATEMENTS MADE HAVE NOT AS YET BEEN VERIFIED, NO MENTION OF THEM SHOULD BE MADE IN INTELLIGENCE SUMMARIES OF COMMANDS OR LOWER FORMATIONS, NOR SHOULD THEY BE ACCEPTED AS FACTS UNTIL COMMENTED ON IN AIR MINISTRY INTELLIGENCE SUMMARIES OR SPECIAL COMMUNICATIONS.

SUSPECTED 'V' WEAPON FACTORIES - GERMANY AND POLAND.

A number of P/W and Allied nationals recently interrogated in this country and on the Continent have passed on stories about suspected 'V' weapon factories. These are not all very convincing but they may be found to tie up with rumours from other sources or be capable of proof by photographic interpretation.

UNDERGROUND WORKS OBER RADERACH.
(September 1944).

2. A co-operative German P/W, who lived in the Friedrichshafen area until September 1944, said there was an underground factory between two hills to the North West of Ober Raderach village rather less than four miles North North West of Freidrichshafen at 47° 42' 18" N., 9° 26' 25" E. This pinpoint is very near that of a site described in a report from Italy dated 24th November 1944 reference MFIU/HQ/CSDIC/12.

3. It was locally rumoured that the Ober Raderach works was closely connected with the Zeppelin works at Friedrichshafen and that "25 ton objects" presumed to be 'V' weapons, were being produced. During the winter of 1943/1944 loud noises similar to those made by a power unit under test emanated from the plant but in about March 1944 there was a loud explosion; thereafter things quietened down more than somewhat.

4. P/W had no idea of how many workers might be employed but said they were all either P/W or German troops undergoing detention and they were never allowed outside the factory precincts.

5. These precincts were, however, extensive, as the 6 ft. wooden fence round the site enclosed both the above mentioned hills and a fairly considerable area of ground. A number of small brick office buildings and barrack huts were visible from the outside but the presence of guards operating under Gestapo supervision discouraged the curious from looking too closely.

6. With reference to the Zeppelin factory itself a French report on the interrogation of an employee of Bugatti, Molsheim, mentions that some of the Zeppelin shops at Friedrichshafen were being tooled up in 1944 for the manufacture of aircraft torpedoes and that these would be tested on Lake Constance.

GLAMMERT SPINNEREI, MÄHRISCH WEISSWASSER, CZECHOSLOVAKIA.
(December 1943).

7. A Czech P/W had heard from his aunt, who lived at Mährisch Weisswasser, that in December 1943 the Germans had taken over the Glammert spinning mill in that town for "finishing work of a secret nature connected with the present G.A.F. programme".

8. The village of Weisswasser (Bila Voda) lies approximately 18 miles East South East of Zamberk and the spinning mill is located immediately North of the intersection of the main railway line and the road running South through the village, on the western side of this road, at 50° 01' 02 N., 16° 44' 50" E.

Figure E.75: Another report of rockets larger than the standard A-4 (V-2) being mass-produced at an underground factory in Friedrichshafen. A.D.I. (K) Report No. 113A/1945. Suspected 'V' Weapon Factories—Germany and Poland [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL].

Report T.I. 3339 (SD-2621pt/947), Flying Bombs and Rockets. December 1944. [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL]

V-2, V-26, V-32.

The information at hand differs as to the explosive (charge) in the rockets. This is evidently due to the fact that two types of rockets are now being used. For a considerable time the V-2 was known in Germany as the V-26, the only type then used. This projectile is 13 m. long (some say 16 m.), its diameter is 1.70 m. (some say 2 m.), it carries 900 kg. of explosives, its total weight is 6000 kg., its speed is 4800 km. per hour, its radius [range] is 300 km. It can go 100 km. high.

It is reported that since a short time ago a new rocket is being used, the V-32, said to be 18 m. long (some say 25 m.), with a diameter of 5 m. (?), and to carry 1200 kg. of explosives (some say 1600 kg.). Nothing is as yet known as to its speed, radius [range] of action, and the altitude it can reach.

According to an unconfirmed report the total weight of the V-32 is supposed to be considerably greater than that of the V-26. [...] The propulsion of the V-32 is said to be very bad, a large number of them having come to grief soon after being launched. The largest plants producing rocket equipment are located in Halle on the Saale.

[See document photo on p. 5333.

This is yet another report of rockets larger than the standard A-4 (V-2) being mass-produced.]

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NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL

The rocket is apparently launched by an additional explosion within a cavity or chamber which is closed by mounting the rocket on it before firing. The explosion is set off in the same manner as the propulsion ~~mxpixxm~~ explosions. No figures are known as to the initial velocity, it is not very great as it has been repeatedly observed that at the moment of launching the rocket does not follow a straight line but seeks its course in a wavering manner.

V-2, V-26, V-32.

The information at hand differs as to the explosive (charge) in the rockets. This is evidently due to the fact that two types of rockets are now being used. For a considerable time the V-2 was known in Germany as the V-26, the only type then used. This projectile is 13 m. long (some say 16 m.), its diameter is 1.70m. (some say 2m.), it carries 900 kg. of explosives, its total weight is 6000 kg., its speed is 4800 km. per hour, its radius is 300 km. It can go 100 km. high.

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According to an unconfirmed report the total weight of the V-32 is supposed to be considerably greater than that of the V-26. This report states that 1600 kg. of explosives are required to send such a rocket across the North Sea, besides the necessary nitrogen, 5 tons of liquid oxygen, and 3 tons of spirits distilled from potatoes for which 30 tons of potatoes have to be used up. This explains why the Germans seized so many barge-loads of potatoes which were destined for the civilian population. The propulsion of the V-32 is said to be very bad, a large number of them having come to grief soon after being launched. The largest plants producing rocket equipment are located in Halle on the Saale.

Launching:

The ground from where the rocket is to be launched must be hard and firm, and able to withstand great shocks. At first a concrete base was built, its wide surface reducing the ground shock per square foot so that the ground did not sink in. The trouble with this was the considerable time it took to build it, and the being confined to a certain spot. Now freezing mixtures (probably liquid oxygen) brought in special trucks, are used to freeze the ground (to what extent and depth is not known) thereby obtaining practically the same results as if concrete were used, except for a short duration only. Many reports indicate that, taking into account the time necessary for the setting up and pointing (about 2 hours) only four rockets can be launched each time per site thus obtained. The trucks and equipment are camouflaged; as they are spread out and as all transfers take place at night, they cannot easily be attacked from the air; after allied reconnaissance flights they are set up on another site. It follows that rocket launching sites cannot be destroyed for the simple reason that there aren't any to destroy.

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Figure E.76: Yet another report of rockets larger than the standard A-4 (V-2) being mass-produced. Report T.I. 3339 (SD-2621pt/947), Flying Bombs and Rockets. December 1944 [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL].

Interrogation report of a prisoner of war (PW) who had been employed at Peenemünde as a chemist. MU 500, CSDIC (West), Seventh Army APO 758 US Army, Reference No. 579, Peenemunde Experimental Center (Karlshagen). 14 December 1944. [Published in Georg and Mehner 2004, p. 93; Stevens 2007, p. 237. What is the archival source of this document???]

The V-2 flying bombs are assembled in the EAST Works (see Appendix A) which has about 3,000 engineers and workers. Two types of V-2 have been built: Type A 1 [A-10?], which is about 23 m long and 4.5 m in diameter, and Type A 4, which is about 18 m long and 2.5–3 m in diameter. Only the latter is in mass production. The experimental launching of V-2 used to take place every Saturday afternoon from Mar 43 to Mar 44. At the latter time it was rumored that HITLER had visited the center and had demonstrated his anger at the slow progress of the experiments. From this time on the frequency of the bomb launchings was increased to every other day. When PW left the center in July 44 there were still some launchings which were not successful due to the fact that the bombs were not able to be radio-guided, although they were launched successfully.

[...] PW heard that German technicians intended to launch them to an altitude of 120 km, which would have permitted them to reach NEW YORK. At the height of 15 km the bombs have a range of 500 km. When the bomb drops through the stratosphere to a lower level, it becomes red through friction.

[Various versions of the A-10 design had a length of 20–26 m and a body diameter of approximately 4.15 m (with fins spanning a larger diameter), and were required to achieve enough range to reach New York, so these details are fairly consistent with the prisoner's report.

A-4 had a body diameter of 1.65 m but fins spanning approximately 3.5 m, which may account for the prisoner's description of 2.5–3 m for the diameter. While the standard A-4 length was 14 m, versions of the A-4 (or A-9) with a length of 18 m are reported by a number of sources in addition to this prisoner.

Trajectories in which an A-9 (winged A-4) leveled off at an altitude of 15 km and flew horizontally toward its target, or an A-10-boosted A-9 leveled off at an altitude of 120 km and flew horizontally, were considered in detail alongside better-known trajectories.]

CIOS XXVIII-56. *Rockets and Guided Missiles.* p. 9.

The capacity of the fuel tank was 4,460 litres. Some larger tanks were made for A.4 towards the end of the war, but were never used. (ENG. FINZEL) [...]

Brett Davis. V-2 Plant Survivors Publicize Their Story. *Huntsville Times* 28 February 2000 [http://www.v2rocket.com/start/others/news-archive.html].

"People have now started to realize what happened there," said Alex Baum, who was a member of the French resistance and was captured and sent to the underground V-2 plant. He now lives in California. "We want to make the public more aware," Baum said. [...]

Baum said he remembers von Braun both from Peenemünde and Dora, although he had no contact with him or the other German engineers at the time by orders of the SS. He remembers one day when the top German brass, including Heinrich Himmler, the head of the dreaded SS and the second-ranking official in the Third Reich, visited Peenemünde. Von Braun praised the V-2 to them, Baum said.

"I understand German, too, because I was raised in Alsace-Lorraine (a region of France on the German border)," Baum said. "I could hear von Braun talking about the ultimate weapon that's going to destroy the United States and everything else. We (the prisoners) were not very close, but we could see them." Later, he would see von Braun visit the Mittelwerk, usually in the company of top military officials. "He was very desperate to get this thing going, and he knew exactly what was going on," Baum said.

[Alex Baum remembered that Wernher von Braun eagerly expected the arrival of a new rocket warhead with tremendous destructive power.

Compare Baum's testimony to the incident involving British journalist Gordon Young, who interviewed von Braun and Walter Dornberger at Garmisch in June 1945. They told Young that the V-2 would have soon received a "much more powerful" warhead. Allied censorship forced Young to eliminate any reference to German nuclear weapons at that time, since the U.S. nuclear weapons program was still completely secret. In August 1945, after U.S. nuclear weapons were used on Japan and became publicly known, Young tried to publish a second article reporting what he had learned from von Braun about nuclear-armed rockets. That second article was censored completely; only a brief reference in another article in Young's own newspaper (*Daily Express*) and three short articles in Australian newspapers escaped that second and final censorship (pp. 4679–4681).

Squadron Leader E. J. André Kenny (one of the most important British aerial photo interpreters for Operation Crossbow) confirmed that von Braun "had spoken of atomic energy at Garmisch, in 1945" (p. 5763).

For further evidence of rockets with nuclear warheads, see the summary of the interrogation of engineer Horst Kirfes (p. 4532), as well as the July 1946 *AAF Review* (p. 5038).

For many more references to nuclear-armed rockets that were intended to attack Allied targets during the war, see the list of documents on p. 5821.]

Benjamin Jacobs. 1995. *The Dentist of Auschwitz.* Lexington, Kentucky: University Press of Kentucky. Chapter 16: Dora-Mittelbau [http://nizkor.com/features/dentist/].

"What work are you doing here?" I asked an inmate. [...]

"Have you heard of the German V-rockets? After the Allied bombing destroyed Peenemünde, where they were first built, now we assembled them here, in the Harz mountain caves. At first we worked on the V1, then on the V2, and now," and here he began almost to whisper, "we are beginning to work on the V3."

Colonel Lowell P. Weicker. 1945. Headquarters United States Strategic Air Forces in Europe (REAR), Office of the Director of Intelligence AAF 390, Memorandum to George C. McDonald. 5 January. [Published in Georg and Mehner 2004 p. 203. What is the archival source of this document???]

1. You will recollect that the SHAEF forecast, arrived at after D-day in 1944, placed the capitulation of Germany at the end of December of that year. [...]

3. With the exception of a few modifications and improvements the U.S. Air Forces in this theater are fighting with substantially the same weapons as they used in 1942. [...] This period ended December 31, 1944 with Germany still fighting, but Germany is not fighting with the weapons of 1942. She is leading the world in tested jet propelled airplanes, long range missiles, new type submarines and, in certain classes, better tanks. A large part of her manufacturing facilities have gone underground and she is bending every sinew for the last stand on the Vaterland frontiers.

4. Our Ground Armies, despite superiority in manpower and quantity of equipment, are presently engaged more in defensive than offensive fighting and, unless this state of affairs is quickly changed or the Russians actually drive through to Berlin and victory, we must face the grim expectation of fighting Germany and her new capabilities through greater 1945. [...]

6. CONCLUSION:

a. The war has not terminated in accordance with SHAEF Plans.

b. SHAEF timing has dominated the development of equipment, training progress and establishment of manpower and supply for this theater.

c. The first cycle and period of the war has ended without the capitulation of Germany and with Germany leading in the development of principal new weapons and methods, which will be included in her capabilities during 1945.

7. RECOMMENDATION:

That this Directorate of Intelligence prepare a careful analysis of over-all Germany capabilities for 1945 as they may effect our flying formations and our target systems...

[This is a remarkably frank Allied acknowledgement of the technological superiority of German weapons, even in these final stages of the war.

This request apparently led to the creation of the following 19 January 1945 Commanders Intelligence Digest.]

Headquarters, United States Strategic Air Forces [USSTAF] in Europe, Office of the Director of Intelligence, An Evaluation of German Capabilities in 1945. The Commanders Intelligence Digest. 19 January 1945. [AFHRA folder 519.635 1945 Intelligence Digest; AFHRA A5729 electronic version pp. 255 onward and 561 onward; NARA RG 319, Entry UD-1041, Box 27, Folder 925497]

1. In the following paragraphs are listed the actual or potential weapons which the Germans may use against USSTAF operations in 1945. For the most part they include the so-called V weapons. No consideration is given to those for which there is lacking evidence of possible use for some time to come. [...]

2. V-2:

[...] The V-2, or rocket projectile, with a warhead of approximately one ton, and a current range of 225 miles, is being fired at London at the rate of 180/250 per month, and against Continental ports at the rate of approximately 300 per month.

[...] Larger rockets (68 feet in length as against 45 feet) are known to exist, and may appear in small quantities during the year. They would have a considerably larger warhead. [...]

4. "PHOO" BOMBS: Occasionally reports by pilots and the testimony of prisoners of war and escapees describe this weapon as a radio-controlled, jet-propelled, still-nosed, short-range, high performance ramming weapon, for use against bombing formations. Its speed is estimated at 525 mph and it is estimated to have an endurance of 25 minutes. These bombs are launched from local airfields, and are radio-controlled, either from the ground, or possibly by aircraft. [...]

5. MAGNETIC WAVE: The best information available is from very secret and reliable sources, and forces the conclusion that this weapon exists as a possibility. It is designed to cause failure of various electrical apparatus in aircraft. [...]

7. ATOMIC BOMB: Close check of every report, and close surveillance of the area in which tests are alleged to have taken place lead to the conclusion that such bombs are not a likelihood in 1945.

[See document photos on pp. 5338–5340.

Point 1 above suggests that there is significant evidence for those weapons that are then listed.

Point 2 definitively states that rockets 50% longer than the V-2 (21 m vs. 14 m), and with a warhead "considerably larger" than one ton, are "known to exist." Are those A-10 boosters, stretched A-4 rockets, or something else?

Point 4 suggests that the mysterious "foo" or "phoo" fighters reported late in the war were a real German anti-aircraft weapon that has never been fully described in publicly available documents; see for example Chester 2007.

Point 5 shows that an electromagnetic pulse directed energy weapon was reported by "very secret and reliable sources."

Point 7 suggests U.S. knowledge of multiple alleged German atomic bomb tests prior to January 1945, in a particular area that was under close Allied surveillance. This likely means the Baltic coast, including the October 1944 Rügen test.]

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HEADQUARTERS
UNITED STATES STRATEGIC AIR FORCES IN EUROPE
Office of the Director of Intelligence

19 January 1945

AN EVALUATION OF GERMAN CAPABILITIES IN 1945

PART ONE - INTRODUCTION AND PRINCIPAL CONCLUSIONS

1. The progressive destruction and dislocation of the German military, industrial and economic systems and the direct coordination with land and naval forces is the mission assigned by the Combined Chiefs of Staff to United States Strategic Forces in Europe. It is the purpose of this evaluation to estimate German capabilities for opposing this mission in 1945. The evaluation is divided into eight parts as follows:

a.	Part One	-	Introduction and Principal Conclusions
b.	Part Two	-	Radar
c.	Part Three	-	German Air Force
d.	Part Four	-	Flak
e.	Part Five	-	Passive Defense
f.	Part Six	-	Other Weapons
g.	Part Seven	-	U-Boats
h.	Part Eight	-	Certain Counter-Intelligence Problems

NOTE: For an evaluation of German economy and general war making capacity in relation to the objectives best suited for strategic attack in the accomplishment of USSTAF's mission, reference is made to the exhaustive and authoritative paper in preparation and shortly to be issued by the Combined Strategic Target Committee.

2. PRINCIPAL CONCLUSIONS: The following conclusions are extracted from the seven papers comprising the body of this evaluation.

a. Radar: New German radar equipment is expected during 1945 to give the enemy considerably improved early warning, fighter control, and flak control. This equipment will be exceedingly difficult to jam and will render present jamming technique obsolete. The capabilities of the enemy to oppose strategic attack through this equipment are believed to be materially improved.

b. German Air Force: The highest priorities in the Reich are devoted to a program of producing jet aircraft. The purpose of this program is to regain aerial superiority first over Germany and then over Europe, the armies and the sea approaches to the Continent. The superiority of an air force composed of jet aircraft, in sufficient numbers, is indubitable. It is estimated that at the present rates of production and training, if the program is unchecked, the Germans could possibly have roughly 1,000 jets operational by mid-summer. That quantity in the absence of appropriate counter-measures, could conceivably make further strategic bombardment of Germany too expensive to continue. A corollary aspect of this development is the serious menace to our photo reconnaissance missions which are essential to air intelligence, the strategic bombing program, and indeed to all successful military operations. The improved capabilities of the G.A.F. in 1945 depend largely upon the degree to which the production of jet aircraft can be impeded.

c. Flak: During the latter part of 1944 German Flak defenses materially increased in effectiveness and exceeded the G.A.F. in the amount of damage caused to USSTAF aircraft. It is estimated that with improved

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Figure E.77: Headquarters, United States Strategic Air Forces [USSTAF] in Europe, Office of the Director of Intelligence, An Evaluation of German Capabilities in 1945. The Commanders Intelligence Digest. 19 January 1945. [AFHRA folder 519.635 1945 Intelligence Digest; AFHRA A5729 electronic version pp. 255 onward and 561 onward; NARA RG 319, Entry UD-1041, Box 27, Folder 925497].

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PART SIX - OTHER WEAPONS

1. In the following paragrpahs are listed the actual or potential weapons which the Germans may use against USSTAF operations in 1945. For the most part they include the so-called V weapons. No consideration is given to those for which there is lacking evidence of possible use for some time to come. Both V-1 and V-2 are considered in this analysis because, even though they are, in effect, long-range artillery, they do possess the ability to affect our operations by hitting airfields, and supplies enroute and in concentrations.

2. V-2:

a. Present status. The V-2, or rocket projectile, with a warhead of approximately one ton, and a current range of 225 miles; is being fired at London at the rate of 180/250 per month, and against Continental ports at the rate of approximately 300 per month.

Against London its accuracy is currently rated at 3.2/1,000 per square mile at the main point of impact. Against Continental ports it is estimated at the least 6.1/1,000 per square mile at the main point of impact. The best record was 75 in a twenty-four hour period within a four square mile area of the Antwerp Docks.

b. 1945 Potential: The German plan calls for an increase in montly production from 600 to 1200. It is known, however, that any increase would be at the expense of the aircraft industry in radio equipment and certain essential components. An increase in accuracy would depend upon increased firings and increased use of already proved radio equipment, without which the majority of firings are conducted today. It is thought unlikely that range will be materially increased. Accuracy begins to fall off somewhere between 165 and 190 miles, and becomes increasingly inaccurate to the maximum of 225 miles. Whether or not V-2 becomes an increased menace in 1945 must depend upon the position of the aircraft industry and its requirements. Its potential lies in stabilization of the expanding aircraft program.

Larger rockets (68 feet in length as against 45 feet) are known to exist, and may appear in small quantities during the year. They would have a considerably larger warhead.

3. V-1:

a. Present Status: The so-called Flying Bomb is being fired from launching ramps against Continental targets, ports and supply concentrations, at the rate of 600 per month, and against England by airborne launchings, at the rate of 250 per month. Accuracy against Continental targets is now between 11.0/1,000 per square mile at main point of impact, and against England at 3.3/1,000 per square mile at main point of impact.

b. 1945 Potential: Here again, the German plan calls for an expansion in production, but, as in the case of V-2, this expansion must be at the expense of other vital industries. Authoritative estimates state that airborne launchings against England may reach 450 per month, and that a very substantial increase of launchings on the Continent will take place. On the other hand, the number of He-111s available for airborne launchings is distinctly limited, and the demands of other industries are such that the expanded production may not be carried out as planned.

4. "PHOO" BOMBS: Occasionally reports by pilots and the testimony of prisoners of war and escapees describe this weapon as a radio-controlled, jet-propelled, still-nosed, short-range, high performance ramming weapon, for use against bombing formations. Its speed is estimated at 525 mph

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Figure E.78: Headquarters, United States Strategic Air Forces [USSTAF] in Europe, Office of the Director of Intelligence, An Evaluation of German Capabilities in 1945. The Commanders Intelligence Digest. 19 January 1945. [AFHRA folder 519.635 1945 Intelligence Digest; AFHRA A5729 electronic version pp. 255 onward and 561 onward; NARA RG 319, Entry UD-1041, Box 27, Folder 925497].

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and it is estimated to have an endurance of 25 minutes. These bombs are launched from local airfields, and are radio-controlled, either from the ground, or possibly by aircraft. The few incidents reported by pilots indicate no success. They have passed over formations, andperformed various antics in the vicinity of formations. It is believed that in order to be effective some 100/200 would have to be launched against a formation, and it is also believed that they will not be produced in sufficient quantities to prove a real menace in 1945.

5. MAGNETIC WAVE: The best information available is from very secret and reliable sources, and forces the conclusion that this weapon exists as a possibility. It is designed to cause failure of various electrical apparatus in aircraft. Technically it does not appear to be a possible serious threat in 1945. At most it would be effective at a few locations for preventing ground strafing. Evidence to date indicates that it could have little effect against high level attack, since the apparatus would be too cumbersome to permit its use in aircraft.

6. GASES APPLICABLE TO AIRCRAFT: Two types of gases applicable to aircraft are known. One is designed to cause pre-ignition, blowing the heads off cylinders; and the other is designed to break down the viscosity of lubricating oils. Under laboratory conditions, free from operational considerations, these gases are a distinct possibility. It is doubtful, however, that with proper fighter escorts a sufficient concentration of either of these gases could be thrown against our formations to have any serious effect. Similarly, it is doubted whether sufficient anti-aircraft guns are available to produce an effective concentration, and it is probably that any possible concentration would be no more effective than a similar amount of well-directed flak.

7. ATOMIC BOMB: Close check of every report, and close surveillance of the area in which tests are alleged to have taken place lead to the conclusion that such bombs are not a likelihood in 1945.

TOP SECRET

3.4

Figure E.79: Headquarters, United States Strategic Air Forces [USSTAF] in Europe, Office of the Director of Intelligence, An Evaluation of German Capabilities in 1945. The Commanders Intelligence Digest. 19 January 1945. [AFHRA folder 519.635 1945 Intelligence Digest; AFHRA A5729 electronic version pp. 255 onward and 561 onward; NARA RG 319, Entry UD-1041, Box 27, Folder 925497].

Says New V-Bomb Now Ready to Cross Atlantic. *Ottawa Citizen* 26 January 1945 p. 17.

STOCKHOLM, Jan. 25—(Reuters)—V-4—new superflying bomb which the Germans claim can hit New York and other points on the eastern North American coast—now is in production and ready for launching across the Atlantic, a German engineer who was one of the principal inventors of V-weapons told correspondents today.

Until a few days ago he was head of an experimental station for V-bombs in Jutland but escaped to Sweden. He first posed as a Danish refugee but after questioning by Swedish authorities disclosed his real identity.

The German was then interned but as his knowledge was useful to the Swedish general staff, they are granting him special conditions and are keeping his name secret.

The V-4 is faster and more accurate than the V-2—and V-3 which is only an improved version of V-2—the engineer said.

It weighs about 15 tons, travels at 1.8 miles a second and attains an altitude of more than 120 miles.

It reaches this height in just over two minutes after being fired at an angle of 75 degrees.

Its great altitude and speed give it increased accuracy and range. At 360 kilometers altitude, the atmosphere is thinnest, so there is practically no friction to impede flight and thus reduce range.

Further, an object of this weight and travelling with this speed cannot easily be diverted from its course by forces such as wind pressure, when climbing or falling.

The great disadvantage of V-4, the engineer said, is that it is difficult to produce in quantity.

The Germans could therefore only send a limited number of bombs against Halifax, New York or such cities.

The Germans will probably reserve it for European targets until their final defeat, when sheer spite may cause them to attack North American cities, he said.

[Also reported in:

Threat of V-bombs for New York Told by Nazi 'Refugee' in Sweden. *Montreal Gazette* 26 January 1945 p. 10. https://news.google.com/newspapers?id=VXotAAAAIBAJ&sjid=vpgFAAAAIBAJ&pg=4256,4045572&hl=en

"V-4 to Attack New York": German Engineer's Story. *Manchester Guardian* 26 January 1945 p. 5.

Swedes Guard Inventor of All V-Weapons. *Lowell Sun* (Massachusetts) 26 January 1945 p. 1.]

PW Intelligence Bulletin No 1/47. 13 March 1945. [NARA RG 165, Entry NM84-79, Box 1915]

18. V-Weapon against USA

An acquaintance told PW (28 Jan) that the laboratory in SWINEMÜNDE where he worked, experimented with a new rocket missile, resembling V-2, 30 m long 4–5 m diameter. Experiments conducted with 1/25 of the explosive charge produced devastating results. It was intended to use the projectiles in nuisance bombings of the USA.

19. Atom Smasher

PW heard from friends that atom-smashing experiments (conducted somewhere NW of BERLIN) were successful and would result in the perfecting of an atom-disintegrating weapon by May 45.

(Source: San Uffz Theodor GÖRGES) 4 San Bereitschaft Hermann GÖRING Fallsch Corps captured 1 Mar)

[See document photo on p. 2622.

"A new rocket missile, resembling V-2, 30 m long 4–5 m diameter" for "bombings of the USA" sounds like a remarkably good description of the A-9/A-10 (p. 5271). According to this account it was not merely a paper design, but rather it had already progressed to the point of being "experimented with" as of January 1945, and it was intended to be launched from Europe to the United States as part of the war effort within the near future.

Note that the intercontinental rocket was being assembled and tested in Swinemünde (now Świnoujście, Poland), around 50 km from Peenemünde. That would be close enough to Peenemünde to allow for easy transport of materials and personnel, yet far enough away to potentially avoid the close scrutiny of Allied aerial reconnaissance of Peenemünde.

According to this report, the payload for this intercontinental rocket appears to have been a nuclear weapon. "Experiments conducted with" only "1/25 of the explosive charge produced" effects described as "devastating," which could hardly be said of 1/25 of the conventional explosive payload that had been used on rockets up to that point. Moreover, the report specifically referred to an "atom-disintegrating weapon."

This report indicated that the nuclear weapon had already been successfully tested. "Experiments" had already been "conducted" that "produced devastating results." (If the description meant 1/25 of the explosive yield, then plausible numbers are perhaps $\sim$1 kiloton for the tested version and $\sim$25 kilotons for the deployed version. "Atom-smashing experiments... were successful" and mass-produced versions for deployment would be ready by May 1945 if the war continued.]

Gordon Gaskill. March 1945. Can Super-Rockets Hit America? *The American Magazine.* pp. 25–108.

I have talked to the leading V-2 authority for the United States Strategic Air Forces in Europe, an officer of high rank and solid reputation who knows all the Allies know about V-2. And we know a surprising amount.

Because of his secret work I am not permitted to reveal his name. But he has given me new and exclusive information which points to only one conclusion: This great rocket is unquestionably the most revolutionary weapon of our time. [...]

This authority, from facts at his command, has calculated for me approximately what kind of rocket might hit New York. Leaving Germany, it would weigh 63 tons, mostly fuel. Its war head would be 7 tons of high explosive. The journey from Germany to New York—about 4,000 miles—would only take 25 minutes. The "motor" would run but 8 minutes of this time. The rocket would climb almost vertically as high as 300 miles above the earth before leveling off sharply, and its maximum speed would be over 9,000 miles per hour, with an added time saving from the earth's rotation.

"I am using New York merely as an example," he said. "The Germans could just as easily fire at Detroit or Chicago or San Francisco, although the error will naturally be greater if they aim farther west."

It still sounded a little Buck Rogers to me and I must have shown it, for he smiled and said, "I know. Only a few months ago a lot of people in Britain were joking about the 'fantastic' rumors of V-1 and V-2. I've helped dig some of those same people out of the rubble. . . . No, I'm afraid such a rocket is really practical. In fact, it's even more practical than the one they're using now against Britain. The curious thing about rockets is that the bigger you build them, the more efficient and satisfactory and inexpensive they become."

I asked him why the Germans hadn't yet used such a rocket, if it was so simple. In answer he pulled out a newspaper clipping, reporting a speech on December 1 by the Nazi Labor Chief, Speer. In an address to the German War Production Board, Speer promised that "V-3" would be ready for firing at America very soon.

[The anonymous expert was likely U.S. Army Air Forces Colonel Donald Putt.

The 7-ton payload is consistent with several other reports of a German intercontinental rocket with a payload of 6 tons (pp. 4338 and 4350–4363). Perhaps 7 tons was an estimate, or perhaps it included 6 tons for the explosive and 1 ton for guidance and/or pilots.

Even 6 or 7 tons of conventional explosive would hardly have justified the enormous amounts of funding and effort required for Germany to develop, build, and launch such a rocket. However, there is evidence that a 6-ton hydrogen bomb was in the late stages of development (p. 4280), and that would have been a far more logical payload.]

Cläre Werner. 16 May 1962 SED Arnstadt transcript. Jonastalverein Archive, Arnstadt. For a discussion of the background and reliability of this document, see p. 4551.

Am 16. März 1945 war ein weiteres Ereignis. Auch hier gab es gegen 21 Uhr Fliegeralarm für unser Gebiet. Hans war dazu wieder mit einigen Freunden auf dem großen Turm, auch wir konnten mit hoch. Diesmal hatten die Leute Ferngläser mit, und es wurde nicht in Richtung des Übungsplatzes gesehen, sondern in Richtung Ichtershausen. Dort wurde es gegen 23 Uhr sehr hell, es war aber nicht so wie die beiden ersten Male davor, sondern es stieg etwas gegen den Himmel mit einem großen Feuerschweif, es ging immer höher, aber es entfernte sich von uns in Richtung Norden. Die Leute fielen sich in die Arme, wir haben es, hurra, wir sind die Größten, wir sind unbesiegbar usw. Die ca. 15 Leute feierten bis zum Morgen. Hans verbot uns wieder alles Gesehene und sagte nur: Wir waren bei einer weiteren Sache dabei, die in der Welt einmalig ist und in jedem Geschichtsbuch stehen wird.

On 16 March 1945, there was a further event. Again, at 21:00 there were air raid warnings for our area. Hans was to return with some friends to the large tower, also we could go up with them. This time the people had binoculars, and watched not in the direction of the training area, rather in the direction of Ichtershausen. There at 23:00 it became very bright, but not like the first two times before, rather it rose somewhat against the sky with a large fire exhaust, higher and higher, but it moved away from us in the direction of the north. The people fell into each other's arms, [saying] we have it, hurray, we are the biggest, we are invincible, etc. The approximately 15 people celebrated until the morning. Hans forbade us again about everything we had seen and only said: We were present at a further event that is unique in the world and will be in every world history book.

[If the rocket was launched at 11:00 p.m., there would have been relatively few witnesses observing the sky at that hour. If air raid warnings were issued to everyone in the area before the launch, there would have been even fewer witnesses.]

Werner Kasper. 16 May 1962 SED Arnstadt transcript. Jonastalverein Archive, Arnstadt. For a discussion of the background and reliability of this document, see p. 4551.

Auf dem Gelände der Polte Rudisleben gab es ebenfalls eine Versuchsanlage und einen Nachbau für Raketenabschüsse, so wie in Peenemünde. Auch dafür mußten wir vershiedene Tanks aus verschiedenem Stahl errichten, die im Gelände jeweils zu Sechsergruppen gebracht wurden. Auch hier waren Sauerstoff, Stickstoff, verschiedene Treibstoffe und auch verschiedene Gase als Füllungen in den Tanks bzw. Behältern in der Größe von 1000 bis 20 000 Liter.

On the grounds of Polte Rudisleben there was also an experimental station and duplicate equipment for rocket firing, as in Peenemünde. We also had to build different tanks from different steel, which were brought there in groups of six. Here too were oxygen, nitrogen, different fuels and also different gases for filling the tanks in size from 1000 to 20,000 liters.

Es wurden verschiedene Abschüsse in Rudisleben durchgeführt. Höhepunkt war der 16. März 1945 in der Nacht gegen 11 Uhr. So einen Feuerschein bei einem Abschuß habe ich nie wieder gesehen. Wir hatten Bereitschaft und waren vor dem Bunker 4 nahe am Eingang, wo wir auch all unsere Werkzeuge hatten. Einige Wochen zuvor hatten wir viel zu tun, vor allem mußten wir eine Menge von Treibstofftanks errichten. Es lagerten ca. 100 Tonnen Treibstoff im Gelände. Von Nordhausen wurden immer nachts Teile gebracht, und Fachleute von Peenemünde und Berlin waren ständig da. Die Wachmannschaft wurde durch SS ersetzt, nur in unserem Bereich war noch die normale Wachmannschaft.

Am 13. März war eine Kupferleitung verstopft, und ich mußte mit einem Kupferschmied ins Objekt. Wir wurden in einem geschlossenen LKW mit SS-Leuten hingefahren. Was wir dort sahen, war einmalig: Diese Aggregate und dieses riesige Ding. Es muß über 30 m hoch gewesen sein und über 4 m im Durchmesser. Unten waren große Flügel und oben kleine Flügel. Darum waren ein großer Holzverschlag und eine Krananlage.

Uns wurde sofort die Arbeit gegeben, und es war für uns nicht einfach, die Kupferleitung in Gang zu bringen. Nach unserer Arbeit wurden wir nicht wieder zu unserem Bunker, sondern in ein Stollensystem im Bereich des Steigers nach Erfurt gebracht. Dieses war so groß, daß darin LKWs fahren konnten. Von einigen hohen SS-Leuten wurden wir belehrt und mußten einige Unterschriften geben, daß wir nichts gesehen haben; falls wir etwas sagen oder erzählen würden, würden wir sofort von der SS erschossen.

Daher nehme ich an, daß am 16. März dieses riesige Ding in die Luft ging, Flugrichtung Norden. Es war einmalig.

Various firings were conducted in Rudisleben. The high point was 16 March 1945 at 11:00 at night. Such a fire light with a firing I have never seen again. We were on duty and were in front of Bunker 4 near the entrance, where we had all our work equipment. A few weeks earlier, we had a lot to do, above all, we had to build a lot of fuel tanks. It took approximately 100 tons of fuel there. Parts were always brought from Nordhausen at night, and officials from Peenemünde and Berlin were there constantly. The security guards was replaced by SS guards, only in our area were there still the normal guards.

On March 13, a copper line was clogged and I had to go with a coppersmith into the base. We were driven there in a closed truck with SS men. What we saw there was unique: These Aggregates [rockets] and this huge thing. It must have been over 30 m high and over 4 m in diameter. Below were large fins and above were small fins. [Two-stage design.] Around it was a large wooden scaffold and a crane system.

We were put to work immediately, and it was not easy for us to fix the copper line. After our work, we were not brought back to our bunker, but rather went to a system of tunnels in the area of Steiger [forest], near Erfurt. These [tunnels] were so large that trucks could drive inside them. We were instructed by some high SS men and had to give some signatures that we had seen nothing; if we were to say or tell something, we would immediately be shot by the SS.

Therefore I take it that on 16 March this huge thing went in the air, flying in the direction of the north. It was unique.

Albin Kummer. 16 May 1962 SED Arnstadt transcript. Jonastalverein Archive, Arnstadt. For a discussion of the background and reliability of this document, see p. 4551.

Das größte Flugobjekt wurde am 16. März 1945 in der Nacht abgeschossen. Dieses Flugobjekt wurde als Wunderwaffe bezeichnet. Es war über 30 m hoch und hatte unten einen Durchmesser von über 4 m. Zum Betanken dieser Waffe wurden zwei Tage benötigt.

Es war einmalig, wie das große Ding gegen den Nachthimmel ging. Die großen Herren von SS und Forschungsrat feierten bis zum Mittag am anderen Tag. Es war wohl ein großer Erfolg der Wissenschaft und der Forschung. Ein zweites Flugobjekt wurde vorbereitet, doch dann waren einige ganz hohe Tiere im Objekt, ich glaube sogar, daß Speer dabei war. Doch dann war auf einmal alles ruhig, das Objekt wurde sogar abgebaut.

The biggest flying object was fired off on 16 March 1945 in the night. This flying object was called a wonder weapon. It was over 30 m high and had a diameter of over 4 m at the bottom. To fuel up this weapon required two days.

It was amazing how the large thing flew against the night sky. The big men from the SS and Research Council celebrated until noon the next day. It was probably a great success of science and research. A second flying object was prepared, but then some very big shots were in the base, I believe even that Speer was there. But then everything was suddenly quiet, the base was even disassembled.

[The given height and base diameter appear to match the description of an A-9/A-10 two-stage rocket.

The statement that it took two days to fuel the rocket (probably with liquid oxygen for oxidizer and either ethanol or fuel oil for fuel in both stages) makes sense from a technical standpoint and seems to support the credibility of Albin Kummer's account.

Kummer's report is highly consistent not only with other accounts within the 1962 SED Arnstadt transcripts, but also with outside statements such as those by Otto Skorzeny (p. 5352) and Werner Grothmann (p. 5355–5359).]

Alfred Gründler. 22 July 1962 SED Arnstadt transcript. Jonastalverein Archive, Arnstadt. For a discussion of the background and reliability of this document, see p. 4551.

[...] Am 1. Juli 1938 wurde die Produktion der Siemens & Halske AG Berlin in Arnstadt aufgenommen. Ab. 1. September 1938 war hier gleichzeitig das Wernerwerk und das Siemens-Schuckert-Werk untergebracht. [...]

Sie beschäftigten sich mit der Entwicklung von Zielsuchgeräten, welche in Flugzeugen und Raketen eingebaut werden konnten. Das erste Gerät war so um die 20 Kilogramm schwer, dann waren sie nur noch zwölf Kilogramm schwer. Bei den ersten Versuchen im November 1944 gab es in Luisental, Neustadt-Glewe, einige Unfälle, aber dann waren die in Ordnung. Im März 1945 (den Tag kann ich nicht mehr sagen) wurde eine A-4 und dann sogar eine A-9/A-10 von der Polte in Rudisleben abgeschossen. Die große Rakete war so gut, sie ging im Norden Norwegens mit einer Abweichung von nur sechs Metern ins Ziel.

[...] On July 1, 1938, Siemens & Halske AG Berlin started production in Arnstadt. From September 1, 1938, the Wernerwerk and the Siemens-Schuckert-Werk were located here at the same time. [...]

They dealt with the development of guidance systems, which could be installed in aircraft and rockets. The first device was about 20 kilograms heavy, then they were only twelve kilograms heavy. In the first tests in November 1944 in Luisental, Neustadt-Glewe, there were some accidents, but then they were fine. In March 1945 (I can no longer say which day) an A-4 and then even an A-9/A-10 were fired off from Polte in Rudisleben. The large rocket was so good, it went to northern Norway with a deviation of only six meters from the target.

[Gründler said that during the war he worked on advanced guidance systems for very long-range rockets at a Siemens facility in Arnstadt, which had begun operation in 1938. He described rocket work there and at Rudisleben, just north of Arnstadt.

U.S. intelligence documents from 1944 and 1946 confirmed that indeed there was a Siemens plant just north of Arnstadt that produced sophisticated guidance systems for very long-range rockets (see pp. 2938–2962, 5348, 5557), and even that the Siemens plant began operation in 1938.

Northern Norway would have been the most logical target for a long-range rocket test. The distance from Arnstadt to the northern coast of Norway is roughly 2200 km or 1400 miles, and northern Norway was sparsely settled. Germany occupied and tightly controlled all of Norway until the end of the war, had military airfields from southern to northern Norway, and also had submarines operating off the coast of Norway. Germany likely had long-range rocket control and tracking stations in Norway.

At an October 1945 press conference, U.S. Army Air Forces General Henry Arnold announced that German rockets "can now travel" 2000–3000 miles and "hit a target on the button" (p. 5454). That public statement suggests that Germany successfully conducted such a test before the end of the war, and that Arnold had obtained evidence detailing that test.]

[Bombing Target] No. 1341, Arnstadt, GL 2618. [AFHRA 25177 electronic version pp. 7–10]

Report No. SKB 45
Report from Switzerland
Information date: early July
Report date: 12 July, 44
Dissemination date: 14 July, 44

It is reported from an entirely reliable source that the direction apparatus for V-2 is manufactured by Siemens at Arnstadt in Thüringen. 45 kms west of Orlamünde (see our SKB43 of 8 July). Approximately every 10th V-1 has a short wave transmitter to control its flight. Siemens still manufactures precision instruments for a/c at Gera.

Date 26 August 1944

TARGET INFORMATION SHEET

[...] (i) The TARGET is the INSTRUMENT WORKS of SIEMENS & HALSKE A.G., at ARNSTADT in Thuringia. It stands in open country, at a point one mile N. by W. of ARNSTADT. [...] The target is adjacent to a sparsely built-up area.

(ii) The construction of this plant is reported to have started in 1938, when both A.E.G. and the SIEMENS & HALSKE A.G., were stated to have erected workshops in the area for the manufacture of precision instruments. It is possible that both plants are included within the target outline. The target is now reported to specialise on the construction of precision instruments more particularly control apparatus for flying bombs and possibly for other secret weapons. The plant is reported to employ nearly 5,000 workers, and is rated at priority 1.

(iii) The total target area (see Illustration 3(m) 18/2) is about 1,000 yards long and 600 yards wide; its major axis running S.W.–N.E. [...] The chief distinguishing feature is the deeply sunk main structure (1), [...] which may be either the foundation for a building still to be completed, or a roof of a possible underground factory. The large spoil heaps (3) together with buildings (4), (5), and (6) alone stand out within the general target outline. [...]

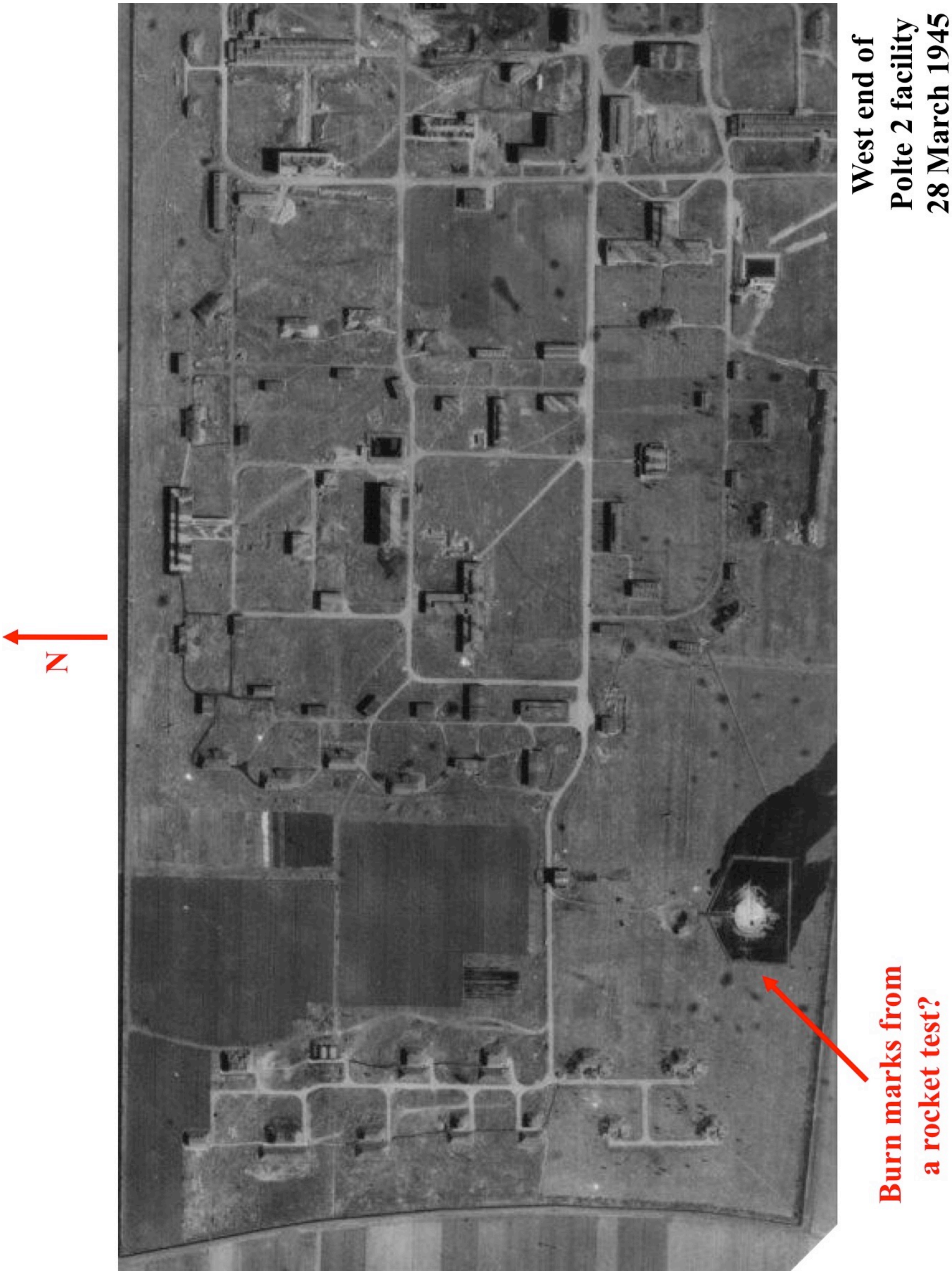

Figure E.80: 28 March 1945 U.S. aerial surveillance photograph of the west end of the Munitionsfabrik Polte 2, Rudisleben, Thuringia, showing what may have been burn marks from a recent rocket test (perhaps the 16 March launch?).

Figure E.81: 28 March 1945 U.S. aerial surveillance photograph of the east end of the Munitionsfabrik Polte 2, Rudisleben, Thuringia.

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MESSAGE (SUBMIT TO MESSAGE CENTER IN DUPLICATE) PRECEDENCE

No. DATE 8 Apr. '45.

To G-2, Div Arty S-2, CCA-S-2, CCB-S-2.
for G-2 Periodic Rpt.

Ammo dump approx. 1-1/2 km Nw CRAWINKEL (J1547) and 1-1/4 km SW of WOLFIS (J1450) Area 7000'x 200' NW at (J12504950) and SE at (J13404800) Dump consists of approx. 40 double entrance bunkers whose average measurement is 50'x30'. Hwy from Wolfis runs directly thru area. At (J11104850), approx. 5000' NW of the ammo dump a supply

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MESSAGE (SUBMIT TO MESSAGE CENTER IN DUPLICATE) PRECEDENCE

No. DATE 8 April 45

To G-2, Div Arty S-2, CCA-S-2, CCB-S-2
for G-2 Periodic Rpt.

point 400'x 200' is located. Adjacent to rail line W of RUDISLEBEN (J2756) is a supply point. Area covers approx. 5000'X 200'. It's E section contains approx. 75 huts averaging 50'x30'. W section 15 barracks approx 140'x 35'. 2km N of RUDISLEBEN at ICHTERHAUSEN (J2758) Great vehicular activity as of 4 Apr.. N

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of ICHTERHAUSEN a barracks area is located at (J274592).

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NARA RG 407, Entry NM3-427, Box 12365, Folder 604-2.3 (1688-4) G-2 Jrnl File 4th Armd Div. 7–8 Apr 45

Figure E.82: U.S. Army G-2 intelligence messages from 8 April 1945 describing a large installation at Rudisleben and Ichterhausen [NARA RG 407, Entry NM3-427, Box 12365, Folder 604-2.3 (1688-4) G-2 Jrnl File 4th Armd Div. 7–8 Apr 45]. What exactly did U.S. forces discover there? Where are their reports?

SS-Obersturmbannführer Otto Skorzeny. [Skorzeny 1995, pp. 161, 169]

In October 1944, after the Budapest operation, I flew once again to Führer Headquarters in East Prussia. Preparations were just being made for the Ardennes offensive and Hitler wanted to give me his instructions for Operation Greif.

[...] He assured me that the German Army would triumph in the end in spite of treason and mistakes. This offensive would be successful. Apart from that, "new, truly revolutionary weapons would take the enemy completely by surprise."

There was much talk about German "secret weapons" at this time, and Dr. Goebbels' propaganda did its best to nourish these rumors. [...] However most talk was about another, terrible weapon that was supposed to be based on artificially produced radioactivity.

[...] Included in the V-weapons program was the construction of a rocket capable of bombarding New York or Moscow. This rocket was practically finished at the end of March 1945 and could have gone into series production beginning in July.

[...] I could go on and list a whole series of other new weapons which were designed and built by us during the war.

Henry Picker. 2009. *Hitlers Tischgespräche im Führerhauptquartier.* 2nd ed. Berlin: Propyläen-Taschenbuch bei Ullstein.

[See pp. 4635–4639 for excerpts from this source regarding the development of both fission bombs and intercontinental rockets to carry them.

Henry Picker (German, 1912–1988) was a lawyer whom Hitler invited to attend and take notes on many of his mealtime meetings and conversations. After the war, Picker published those notes, along with his own postwar commentary, as *Hitlers Tischgespräche*, or *Hitler's Table Talk*. Many former officials of the Third Reich vouched for the accuracy of Picker's recollections and comments. Picker stated that:

- A fission bomb was successfully developed and was designed to be delivered by a rocket such as the A-9.
- The A-9 rocket was intended to strike targets in the United States. To achieve that sort of range, the A-9 would have had to be launched on top of a larger A-10 first stage. Thus whenever Picker mentioned the A-9, he was apparently referring to the complete A-9/A-10 intercontinental rocket.
- Prototypes of the A-9/A-10 rocket were completed and ready for launch before the war ended.
- Mass-production of the A-9/A-10 was planned and facilities were built, but those operations were interrupted by the end of the war.
- Hitler considered it vital for the German military to hold geographical areas that were closely associated with the nuclear weapons and intercontinental rocket programs until those weapons could be used. Those areas included Silesia, Bohemia, Thuringia, and the Berlin area.]

U.S. astronaut Gordon Cooper. 2000. [Cooper and Henderson 2000, pp. 148–155]

Wernher [von Braun] was brilliant, as one would expect, but I also found him to be a marvelous conversationalist, raconteur, and genial host... On many occasions, I sat at the bar in his home all night long talking space until the sun came shining in the windows... He regaled me with tales of his life in Germany, before and during the war... Then there was Joaquin "Jack" Keutner [actually spelled Joachim Kuettner], with whom I worked in the early days of Mercury on the Redstone rocket program. Jack had some hair-raising flying stories to tell.

At war's end, a manned V-2 was sitting on the pad at Peenemünde, all tested out, fueled up, and ready to go. It would have been launched on a low-energy easterly orbit, Jack explained. The plan: to drop a warhead on New York City. That 1945 manned rocket flight—sixteen years before the first U.S. manned rocket flight—came within a week or so of being launched.

Werner confided to me that the Germans were testing more than rockets at Peenemünde. "Some of the craft we were developing," he said, "were far ahead of anything the rest of the world had or knew about." "You mean jets?" I asked, thinking of the Luftwaffe's Me 262, the world's first jet fighter. He smiled a scientist's knowing smile. "You could almost not refer to them as planes. We flew several craft that were totally different. Very advanced principles were involved."

According to Jack, who flew some of these advanced craft, they included saucer-shaped vehicles with double intakes and counter-rotating fans and disks and some with advanced propulsion systems. Jack said they had flown successfully. None of these craft surfaced after the war. Wernher and Jack were unclear about whether any of them had survived the war's last hectic days.

[Cooper had a reputation for telling apparently unsubstantiated UFO stories. At a minimum, Cooper's account of this German rocket project requires some correction: the rocket would likely have been moved from its original development location at Peenemünde to a different launch site by spring 1945, would have been a V-2 variant (A-4b or A-9) on an A-10 booster, and would have been fired westward, and the saucer story invites suspicion.

However, the claim that a manned rocket targeting New York was nearly ready for launch agrees with many independent sources (e.g., pp. 5352, 5355–5359, 5365–5403, 5444–5450), and Kuettner and von Braun are plausible sources for Cooper's information.

Dr. Joachim Kuettner was selected by Wernher von Braun as the project manager for Mercury-Redstone, the first U.S. manned suborbital flights. His previous qualifications were succinctly stated as being a test pilot for high-altitude gliders in Germany during the war. Was he directly involved in a manned suborbital A-9 project?]

MISSILE BRAIN is examined by Cooper (*right*) and Dr. Joachim Kuettner, director of the Redstone booster project, who check electronic gear inside rocket.

Figure E.83: Gordon Cooper and Joachim Kuettner examining a Redstone booster in 1960 [Gordon Cooper 1960].

Heinrich Himmler's chief adjutant Werner Grothmann on advanced rockets [Krotzky 2002]. For a discussion of the background and reliability of this source, see pp. 3396–3397.

[S. 9] Dabei fand ich es doch amüsant, dass ausgerechnet unser bestes Stück, die Riesenrakete, die nach Amerika fliegen sollte, gerade in einer Anlage gebaut wurde, die überhaupt nicht groß war. Na ja, das waren ja auch erst mal die Prototypen für die Flugversuche. Der Serienbau wäre dann näher am Truppenübungsplatz vorgesehen gewesen, wo es eine gute Möglichkeit gab, die enormen Dinger bis zur Flugklar-Meldung in einer Bodensenke zu tarnen. So hätte man die Rakete in einer sehr großen Anlage gebaut, in die eigentlich auch die Produktion einer der Atombombenserien hineinkommen sollte. Das wäre zwar auf zwei unterschiedlichen Geschossen geschehen, aber man hätte dann für beide Teile einen gemeinsamen Weg gehabt. Warum Gerlach sich da quergelegt hatte, ist mir bis heute nicht klar. Es kann sein, dass Himmler mit seiner Einschätzung richtig lag, Gerlach hätte doch zu große Nähe zu uns gemieden, weil er seine eigenen Pläne verfolgen würde. Denn das war ja klar: Die Raketenproduktion, gerade für die Amerika-Rakete, war unsere eigene Sache, die hätten wir auch nicht mehr aus der Hand gegeben. Das war alles unter unserer Kontrolle. Wenn jetzt eine der beiden durchkonstruierten Atombombensorten im selben Komplex hergestellt und zusammengebaut wird, konnten wir den Schutz der Anlage viel effizienter gewährleisten.

[p. 9] I found it amusing, however, that our best piece, the giant rocket, which was to fly to America, had just been built in a plant that was not big at all. Well, those were the prototypes for the flight tests. The mass production would then be closer to the military training base [Ohrdruf], where there was a good possibility to camouflage the enormous things in a depression up to the launch. So the rocket would have been built in a very large plant, which was also supposed to produce one [kind] of the nuclear bombs. This would have happened on two different floors, but then there would have been a common path for both components. Why Gerlach was involved there, is still not clear to me today. It may be that Himmler was correct in his estimation that Gerlach would have avoided too much proximity to us because he would pursue his own plans. Because that was clear: the rocket production, especially for the America rocket, was our own thing, we would not have given it away. It was all under our control. If now one of the two kinds of atomic bombs was built and assembled in the same complex, we would have been able to ensure the protection of the system much more efficiently.

[S. 11] Gerlach ist aber erst dann zu Bormann gefahren, nachdem wir den ersten gelungenen Start unser Grossrakete oder der grossen Rakete für die Entfernung von Thüringen bis London, das war auch eine Neuentwicklung, mitbekommen haben. Das war am 16. März. Das werde ich nie vergessen, da riefen Leute bei Himmlers Stab an, von denen hatte ich noch nie gehört und taten so, als hätten wir jetzt den Krieg gewonnen.

[p. 11] Gerlach did not go to Bormann until we got the first successful launch of our big rocket or the big rocket for the distance from Thuringia to London, which was also a new development. That was on March 16th. I will never forget that, when Himmler's staff got phone calls from people, whom I had never heard of before and who acted as if we had now won the war.

[S. 10] Zur Bezeichnung V 4 kam man wegen den gedanklichen Nähe zur A 4, also der V 2. Das war die echte Langstreckenrakete für Amerika. Dabei hätte es von Thüringen aus nur bis an die Ostküste gereicht, aber dort lagen ja die für uns wichtigen Städte. V 4 hatte man gewählt, weil es ja im Grunde eine Weiterentwicklung der V2 war, wenn auch mit zwei Stufen und mehr als der doppelten Höhe, aber nicht mit höherer Nutzlast. Der erste scharfe Schüß war eigentlich mit voller Ladung für Oktober 45 vorgesehen. Nach dem Test der Versuchsatombombe im März 45 und als man sehen könnte, dass die front nirgegendwo mehr hielt, hatten Hitzköpfe von der politschen Seite einen Angriff mit dem Prototyp und einer eilig zusammengebauten Uranbombe gefordert. Das war aber niemand von uns und ist auch ganz kalt abserviert worden, wie ich vorhin sagte. Außerdem wäre es ein lächerliches Unternehmen geworden, weil das Material nicht gereicht hätte und auch die Rakete noch nie getestet worden war.

[p. 10] One arrived at the designation V 4 because of the mental proximity to the A 4, or the V 2. This was the real long-range rocket for America. From Thuringia it would have reached only the east coast, but there lay the cities that were important to us. V 4 had been chosen because it was basically a further development of the V2, albeit with two stages and more than double the height, but not with a higher payload. The first attack with full cargo was actually scheduled for October 45. After the test of the test bomb in March 45 and when one could see that the front was no longer held anywhere, hotheads from the political side had demanded an attack with the prototype [America rocket] and a hastily assembled uranium bomb. But that was none of us, and it was quite opposed, as I said before. In addition, it would have been a ridiculous attempt because there was not enough [fissionable] material and the rocket had never been tested.

[S. 18] Im Februar oder Anfang März war intern noch mal die Losung bekräftigt worden, den ersten Angriff auf Amerika noch im Oktober durchzuführen. Bei der Beratung dazu lagen Papiere vor, die Skorzeny für die Raketentechniker zusammengeschrieben hatte, also er hatte das sicher nicht selbst geschrieben, sondern jemand von seinen Leuten, und es sind auch Erklärungen von den Wissenschaftlern besprochen worden. Es sah so aus, dass wir das hinbekommen würden. Die große Rakete war ja schon längere Zeit im Bau und die sie gesehen hatten, also die Teile dafür, waren doch beeindruckt. Wir waren jedenfalls von der technischen Vorbereitung für die Waffe un den Träger her überzeugt, dass es dann klappen wird. Früher wäre es keinesfalls gegangen. Ich kenne einiges von der Löiteratur, die dazu so überzogene Angaben macht. Die Autoren übersehen nur, dass man einen umfassenden Angriff auf Städte in Amerika nur mit strategischen Waffen führen kann, nicht mit taktischen. Dann musste auch die Technik sicher funktionieren. Stellen sie sich vor, man wirft das 'Ei' über New York ab und es zündet nicht! Am Ende liefern es die Amerikaner vier Wochen später bei einem selbst ab. Eine Schwierigkeit bestand ja auch darin, das Gesamtgewicht für die große Bombe zu reduzieren. Es war wohl von den Ingenieuren immer wieder verlangt worden, den Durchmesser und das Gewicht zu reduzieren, wobei ich glaube, dass sich das auf einen ganz bestimmten Bombentyp bezog, denn da hörte und sah ich später schließlich etwas, wo ganz klar war, dass bei dem Ding der Durchmesser wahrscheinlich nicht das Problem gewesen sein konnte. Jedenfalls ging es um den Platzbedarf und die Unterbringungsmöglichkeiten in der Raketenspitze und natürlich auch um die Nutzlast. Das war ja ein wichtiger Faktor, weil der die Reichweite beeinflusste. Übrigens war das auch ein Thema für die Luftfahrt-Ingenieure bei Messerschmitt und Heinkel.

[p. 18] In February or early March, the goal of the first attack on America in October was reaffirmed internally. In the consultation there were papers that Skorzeny had put together for the rocket technicians, or he certainly had not written them himself, rather someone from his people, and explanations were also discussed by the scientists. It looked like we could do it. The large rocket had already been under construction for a long time, and those who saw it, or the parts for it, were impressed. We were certainly convinced of the technical preparation for the weapon and the carrier, that it would then work. In any case, we were convinced of the technical preparations for the weapon and the launch vehicle, that they would work out. It could not have happened sooner. I know some of the literature, which makes it such exaggerated claims. The authors just overlook the fact that a comprehensive attack on cities in America can only be done with strategic weapons, not with tactical ones. Then also the technology had to work safely. Imagine if you throw the 'egg' over New York and it does not detonate! In the end, the Americans would deliver it four weeks later on their own. One difficulty was also to reduce the total weight for the large bomb. It had been asked by the engineers again and again to reduce the diameter and the weight, which I believe involved a certain type of bomb, because when I finally heard and saw something, it was quite clear that the diameter of the thing probably could not have been the problem. In any case, it was about the space requirements and the accommodation possibilities in the rocket nose and of course also the payload [mass]. This was an important factor, because it affected the range. By the way, this was also a topic for the aviation engineers at Messerschmitt and Heinkel.

[S. 33] Den Russen fiel dann mehr in die Hände als wir hofften. Zum Beispiel der Prototyp einer künftigen Rakete, zu der allerdings die Amerikaner zuvor die Konstruktionsunterlagen erbeutet hatten.

[p. 33] The Russians found more [in Thuringia] than we hoped. For example, the prototype of a future rocket for which, however, the Americans had previously captured the design documents.

[S. 48] Wir konnten da nichts erreichen bis auf den dringenden Wunsch Himmlers, wir brauchten schnellstens eine Rakete, die bis Amerika fliegen kann. Die Leute dort waren aber sehr zurückhaltend. Was uns überraschte, war dann allerdings folgendes. Ich glaube, es war von Ploetz, der hatte wohl persönlich Beziehungen zu jemandem aus der Peenemünder Gruppe und Kammler darüber informiert, dass nach seiner Kenntnis die Planungen für eine Rakete mit übergroßer Reichweite eigentlich fertig sind und dass man mit etwas gutem Willen schnellstens damit beginnen könnten, die in die Realität umzusetzen. Kammler hat sich das angehört und dann nach Rücksprache mit Himmler vorgeschlagen, das Konzept von unseren eigenen Raketenleute noch mal durchrechnen zu lassen. Die haben dann nach einiger Zeit gemeldet, dass man in Peenemünde ganz solide gearbeitet hat und daß diese Rakete theoretisch alles erfüllen würde, was sie sollte. Ich glaube, damals war die Rede von gut 4000 km Flugweg und eine Tonne Fracht. Das weiß ich aber nicht mehr so genau, weil es noch ein Parallelprojekt gab, für andere Werte vorgesehen waren.

[p. 48] We could not achieve anything except the urgent wish of Himmler. As soon as possible, we needed a rocket that could fly to America. The people there were very cautious. What surprised us was the following. I think it was von Ploetz, who had been personally in contact with someone from the Peenemünde Group, and informed Kammler that, to his knowledge, the plans for a rocket with a very long range were actually finished and that with a little good effort, they could begin as soon as possible to translate that into reality. Kammler listened to this and then, after consultation with Himmler, suggested that the design of our own rocket people be calculated again. They then reported after some time that they had worked very hard in Peenemünde and that this rocket would theoretically fulfill everything it should. I think at that time there was talk of a good 4000 km of range and a ton of payload. But I do not remember that exactly because there was a parallel project that was intended for other values.

[S. 48] Ich meine, wir hatten wirklich gute Leute in unseren eigenen Projekten, und die hatten wieder recht gute Kontakte nach Peenemünde, aber die konnten auch nur das bestätigen, was Kammler aus Peenemünde hörte: Entweder steuert jemand die Rakete ins Ziel, oder die muß vollautomatisch gehen. Himmler war skeptisch, ob ein Pilot bei der Geschwindigkeit überhaupt reagieren kann. Ich meine, die Rakete sollte ja mit etlichen Tausend Kilometern fliegen. Dann gab es auch gar keine Fernsteuerung, die auf die Entfernung wirklich sicher funktionierte. Da hatte Himmler schon früher mal mit Ohnesorge darüber gesprochen und ich glaube, der hat dazu auch was arbeiten lassen. Was sich da ergeben hat, weiß ich aber nicht. Nur an eines kann ich mich noch erinnern, nämlich unsere Raketenleute hatten ja eine kleine Abteilung von, heute müsste sagen Elektronikern, die haben zur völligen Überraschung von uns und auch von Ohnesorge im Winter 44 eine Sende- und Empfangsanlage entwickelt, die man nicht mehr stören konnte, weil sie selbständig dauernd die Funkfrequenz änderte. Außerdem war die ganz klein, richtig winzig. Die hatte nur ungefähr ein kg, der Empfänger meine ich. Wie die das geschafft haben, diese Technik zu verkleinem, ist mir unbekannt. Himmler aber Befehl gegeben, Ohnesorge den Prototyp zu zeigen. Ob das geschehen ist, kann ich nicht sagen. Ich weiß auch nicht, ob der Sender überhaupt auf die Reichweite bis Amerika ausgelegt war. Nach Krieg hörten wir dann, die Amerikaner hätten den Transistor erfunden. Das hat wohl einige von unseren Leuten sehr aufgeregt, weil der doch von uns stammte. Ein Bekannter sagte mir dazu, bei uns hätte der Transistor “Sperrschicht-Halbleiter” geheißen. Der war von einem Professor an einer technischen Hochschule erfunden worden. Es kann sein das war Aachen.

[p. 48] I mean, we had really good people in our own projects, and they had good contacts again to Peenemünde, but they could only confirm what Kammler heard from Peenemünde: Either someone pilots the rocket into the target, or it must be fully automatic. Himmler was skeptical whether a pilot could react at all at that speed. I mean, the rocket was supposed to fly several thousand kilometers. Then there was no remote control at all, which really worked safely at that distance. Himmler had already talked to Ohnesorge about this and I think he had something worked out. But I don’t know what came of it. I can only remember one thing, namely that our rocket people had a small department of, today I would have to say electronic engineers, who, to the complete surprise of us and also of Ohnesorge, developed a transmitting and receiving system in the winter of 44, which could no longer be jammed, because it constantly changed the radio frequency on its own. It was also very small, really tiny. It weighed only about one kilogram, the receiver I mean. How they managed to miniaturize this technology is unknown to me. But Himmler gave orders to show the prototype to Ohnesorge. Whether this was done, I cannot say. I also don’t know if the transmitter was even designed to reach America. After the war, we heard that the Americans had invented the transistor. That must have upset some of our people very much, because it came from us. An acquaintance told me that in our country the transistor was called a “junction semiconductor.” It had been invented by a professor at a technical university. It may have been Aachen.

Figure E.84: Location of the former Jonastal tunnel complex (just north of Gossel).

Figure E.85: A memorial for the prisoners who worked at the Jonastal tunnel complex.

File 2508 Memmingen. German Secret Weapons. Undated but probably early 1945. [AFHRA 25193 electronic version p. 579]

The largest flying bomb factory is the DORNIER WERKE at MEMMINGEN on railway KEMPTEN-MEMMINGEN-ULM. V.1 to V.4 types are made here.

[Note that the above information is given casually and without further explanation, as if the U.S. officials writing and reading the report all knew what the V-3 and V-4 were. In addition to the noted railway connection, Memmingen had a large airfield. There were also large Dornier factories 60 km away in Friedrichshafen.]

OSS cable from "Zenda" in Bordeaux to "Climax" in Paris, 21 April 1945 [NARA RG 226, Entry A1-211, Box 8, WN 23251–23273, Folder 116].

[...] We are attempting to locate German secret weapons expert recently flown into Royan to set up something believed to be known as V-4. Lacking technical knowledge we await your instructions.

[Various new weapons were vying for the title of "V-4," and it is not clear which one this was.

Royan on the French coast was held by German forces until April 1945, 10 months after the invasion of Normandy. It has never been explained why German forces were so determined to hold on to that one location long after the rest of France had been liberated. Was there a long-range rocket or other advanced weapon in Royan?

What exactly did Allied forces discover after the fall of Royan? Where are the reports now?]

G-2 Journal of U.S. Headquarters of 4th Armored Division, APO 254. From 041600B to 051600B April 45 (5 April 1945), Gotha J0965 Germany. [NARA RG 407, Entry NM3-427, Box 12345, Folder 604-2.2 (L688...2) G-2 Journal 4th Armored Div.]

64 Russian PW states 50,000 Germans rptd in underground factory mfg jet propelled planes at KAHLA J7152 as of 2 wks ago/not bombed as yet/at JENA J7066 much AA and barrage balloons/ROTHENSTEIN J7257. (Copy Sent VIII Corps 051130B).

65 Polish Civ rptd formed conc camp of 6000 was located at CRAWINKEL J1547 where they were used to dig tunnel for underground factory to manufacture V-1 rockets (no rockets have been made there to date)/GOSSEL J1949 camou[flaged] completed factory no pers allowed near this place which is located about 2 mi N of GOSSEL/on 3 Apr was manufacturing V-1s and experimenting with V-3s.

G-2 Periodic Report No. 177. 7 April 1945. [NARA RG 407, Entry NM3-427, Box 12342, Folder 604-2.1 G-2 Periodic Reports 4th Armored Div 1 Jan–18 May 45]

Murdercamp, vic[inity] OHRDRUF: A PW, NCO, rpts that a Concentration Camp of political prisoners, existed in the vic of OHRDRUF. According to stories told him by members of the guards, several thousand persons were killed during this winter at the camp. The PW himself happened onto an open mass grave some weeks ago, and he states that he saw nude bodies laying in lakes of blood. The PW further rpts that many, or perhaps all, of the bodies were exhumed lately and burned in the woods, vic J 115565. On 28 Mar 45, PW believes, several hundred of the political prisoners were still alive. He further states that guards in part belonged to the SS Das REICH and in part to SS LEIB-STANDARTE Adolf Hitler.

[...] The entire area btwn OHRDRUF–SCHWABHAUSEN–WOLFIS–WECHMAR (J 1156) was a tk troop drill and maneuver ground. PW was told by an ordnance man stationed at OHRDRUF that from here a new secret wpn will shortly rise (wird steigen). It is believed that the entire area should be very thoroughly examined for new material. If any of the above mentioned political prisoners can be found alive, interesting evidence should also be forthcoming. (Source: 89 Inf Div Per Rpt No. 27). [...]

Annex No 1 [...] One of the most ridiculous actions of the supreme command (Nazi regime) is the insistence upon the fighting in the far flung areas such as in the BALTIC States, in ITALY, and also the maintenance of troops in NORWAY and DENMARK. It is deemed a disgusting order to see these forces ill placed with the advances of our troops over the RHINE barrier.

G-2 Journal 80th Infantry Division, 1905 09 Apr 45, Gotha, Page No 1068. [NARA RG 407, Entry NM3-427, Box 10127, Folder 380-2.2, G-2 Jnl—80th Inf. Div. Apr 45. G-2 Journal]

Fr 318: RJ at (127489) entrance to underground plant. French workers going from RJ to WOLFIS (1450) were escorted by armed guards, not allowed to look right or left. 300 meters N of STUTZHAUS (105470) is entrance to 105 plant, working last week. Area at (135495) considered to be very important production area. Rpt from 318th MG O.

[These Modified British System coordinates in the Nord de Guerre Grid all correspond to locations approximately 1–4 km southwest of the town of Wölfis, very close to the small city of Ohrdruf in Thuringia.

The belief that "a new secret weapon will shortly rise" from this area could be a reference to advanced rockets and/or nuclear weapons, and there is evidence that both were being developed and tested in this area.

U.S. Colonel Robert S. Allen visited this area in April 1945 and described underground installations that were numerous, massive, and highly sophisticated (p. 4569).

See the map in Fig. E.86 for the areas still held by the German military at the end of the war, as mentioned in the above report. These areas were fiercely defended and likely held secret weapons that Germany still hoped to deploy, such as long-range rockets, long-range jets, and nuclear weapons.]

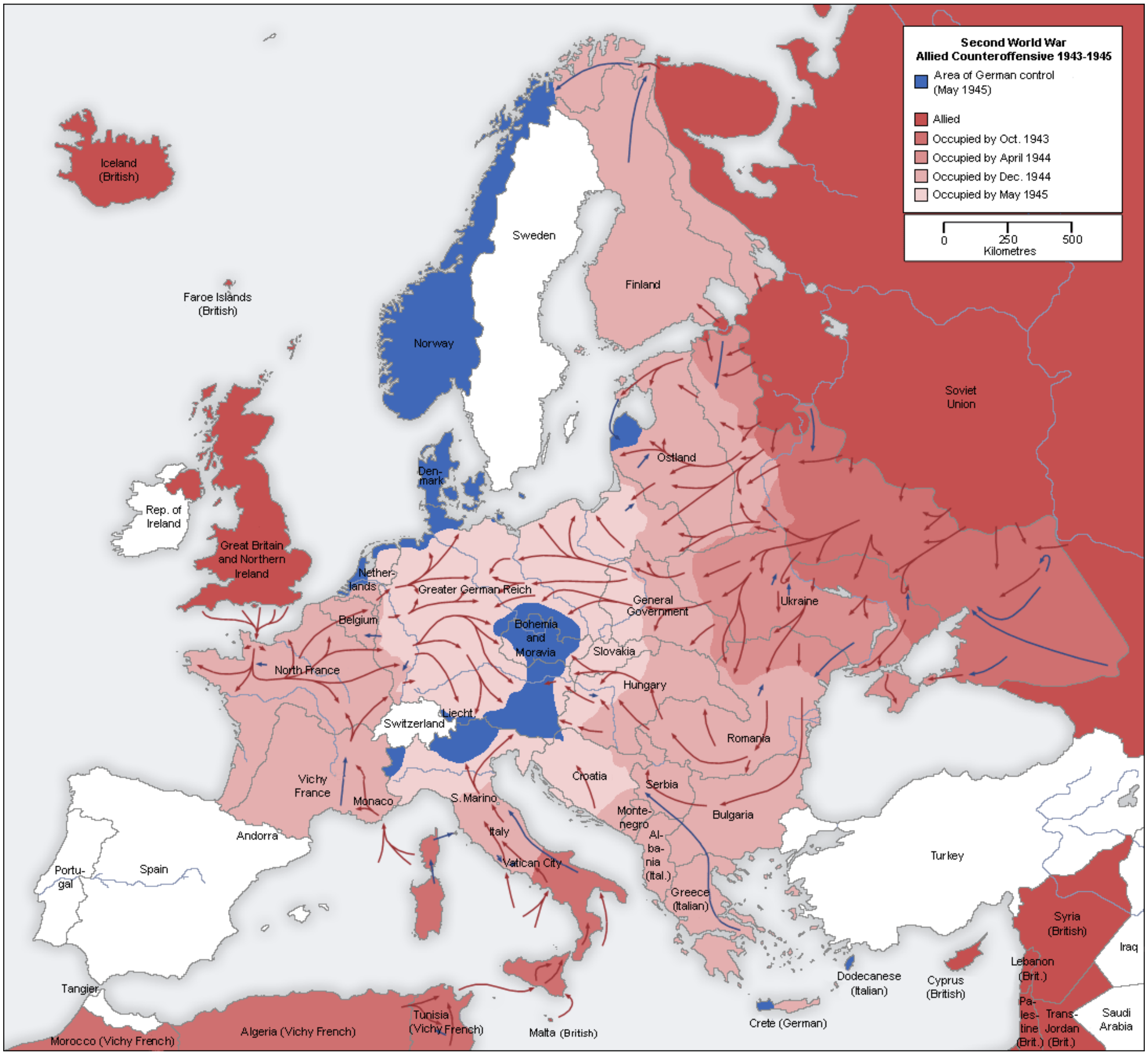


Figure E.86: Map of German-controlled territory at the end of the war.

U.S. Army 89th Infantry Division. G-2 Msg File. 8 April 1945. [NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45]

info—

7 DP—report location of installation making V-4

R-6-sheet — ~~869541~~ 869451 in hillside and elevation of hill 315—entrance S side of hill.

Between 20 and 30,000 DP's—Gadget holds 2 men—send finished product to Weimar for complete assembly—

U.S. Army 89th Infantry Division. G-2 Message Summary. 8 April 1945. [NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45]

8 April 45

From 353:

Displaced persons report underground factory in hill 315 at J869451. Entrance on south side of hill. Factory employs some twenty to thirty thousand Russians, Poles, French, etc. They are making the V-4, which is a two man rocket of some sort. Partial assembly at this factory and weapon then is sent to WEIMAR J5271. During the time the source of this information worked at this factory, approx one week ago, there had been no bombing.

More information later after a complete interrogation.

Tuxedo 2
0900

[Please see photos of the G-2 messages from 8 April 1945 on pp. 5368–5373.]

[At NARA RG 407, Entry NM3-427, Boxes 11005 and 12365, I found many versions of this U.S. Army message, including copies from the 89th Infantry Division unit that actually originated the message, a copy from another unit that apparently received the report by radio, and copies echoing up and down the chain of command. The details are the same in all of them, except what is apparently the first message (Fig. E.87) says "Gadget holds 2 men," which clarifies that this was a rocket large enough to hold two men, not a rocket small enough to be set up and launched by two men. Unfortunately I could find no further details, and no follow-up reports—no "complete interrogation" of the displaced persons as promised, and no reports of Americans visiting the V-4 factory themselves.

The J869451 coordinates are the same in all of the messages (except the coordinates 869541 that were initially written down and then crossed out and replaced in the first message). That appears to be Modified British System coordinates for the Nord de Guerre Zone, as confirmed by the J5271 coordinate for Weimar. Using the website tool http://www.echodelta.net/mbs/eng-translator.php, Modified British System coordinate wJ869451 in the Nord de Guerre Grid corresponds to a location just south of Dreitzsch, and approximately 3 km east of Neustadt an der Orla. The only other clue is that the entrance was on the "south side" of "hill 315," referring to the elevation of the location.

It is interesting that the V-4 factory coordinates are given with 100-meter precision (J869451), much more precise than even the Weimar coordinates (J5271, with only 1-km precision). That seems to show a remarkable confidence in the location, most likely either from maps that the escaped prisoners brought with them, or from the escaped prisoners pointing to their former home on maps that the U.S. Army had.

Figure E.88 shows adjacent sheets R-6 (above) and S-6 (below) of the GSGS 4416 map used by the U.S. Army, covering the relevant part of Thuringia. In what was apparently the original report (Fig. E.87), the coordinates for the two-man rocket factory were first given as 869541 (above), then as 869451 (below), 9 km due south of the first location. There is no "hill 315" near either location, and neither of these specific locations seems like a very promising site for a massive underground factory.

However, this general location does seem plausible, since there were a number of other known German research and development facilities above or below ground near that area, including for example:

- A factory for making large rockets at Pössneck, 13 km from Neustadt an der Orla, which may or may not have been the same rocket factory mentioned here (p. 5375).
- Factories in Neustadt an der Orla that just happened to have world-class expertise at making nickel membrane filters for gaseous diffusion uranium enrichment (p. 3633).
- The massive Kahla REIMAHG underground jet factory approximately 15 km to the west (pp. 5214–5217).

- Several other factories in or near Neustadt an der Orla.[2]

Could the V-4 site be located somewhere in that area? We have two approximate alleged locations, the approximate hill elevation, the fact that the main entrance was on the south side of the hill, and the presumed fact that that entrance would likely have been adjacent to a railroad track that existed at that time in order to bring large amount of supplies in and to ship partially completed V-4s to Weimar.

At NARA I also photographed as many other relevant Army documents as I could, for several days before and after this report. When this report was filed on 8 April 1945, the U.S. Army units involved were well to the west of these coordinates. Based on the Army's location, and the fact that the message says "Displaced persons report...," the J869451 location appears to have been given to the U.S. Army by French/Polish/Russian prisoners who escaped from there and fled toward the Americans. It is possible that the prisoners did not give exactly the right location, or that due to language differences the Army misunderstood the location, or that someone wrote down the coordinate numbers incorrectly or in the wrong order. Then those same coordinates got repeated in all the messages. Perhaps the rocket factory was not around Neustadt an der Orla, but rather in some entirely different region.

In these NARA files, I could not find any further reports about the V-4 factory. If the U.S. Army wrote a report, it might still be classified and not in the publicly available files. Or perhaps some other American team actually went into the factory and wrote a report—Alsos, CIOS, Theodore von Kármán's team, etc. Or maybe the Germans emptied out the factory and/or collapsed the entrances before the Americans arrived.

Perhaps the entrances were collapsed with V-4s still inside, just waiting for modern historians to rediscover them. Proof that Germany was building and even mass-producing manned spacecraft 20 years ahead of their time (even if they were never launched) would be incredible.

The two-man design also appears to demonstrate that Germany was really serious about delivering some sort of weapon of mass destruction over a long range. Electronic guidance systems were not yet reliable or accurate enough, so a pilot was necessary. With typical German thoroughness, the designers planned for two pilots instead of one, in case one pilot lost consciousness or changed his mind about going through with the mission after launch. I do not see why the Germans would have gone to such engineering extremes if the payload were not a weapon of mass destruction, or if the target were not at a longer range than the existing V-2 could reach accurately with an automated guidance system.

For what appears to be an early public report of the two-man rocket, see p. 5321.

For diagrams of the two-man rocket from an engineer who apparently worked on it, see pp. 5384–5388.]

[2]Rainer Karlsch. 2009. Wunderwaffen für den "Endsieg"? Die geheimen Arbeiten des Forschungsinstituts für Physik und dessen Verlagerung nach Neustadt an der Orla (1944–1945). *Zeitschrift für Thüringische Geschichte.* 63:259–276.

009. Geheime Forschungsstätte Harrasmühle 1943–45. https://www.heimatfreunde-neustadt-orla.de/neustadt-umgebung/item/009-erinnerung-an-die-gesandten-zum-20ten.html

DECLASSIFIED
Authority NND 735017

NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45

G-2 MSG FILE

Tp)
: Rpt
Verbal)

To:

Fr:

m/o -
TDP- report location of installation making V-4
R-6-sheet - ~~869541~~ 869451 in hillside
and elevation of hill 315 - entrance S side of hill.
Between 50 and 30,000 DP's - Gadget holds
2 men - send finished product to
Weimar for complete assembly -

Journal	Corps	353 Inf	Date
	CG	354 Inf	
	Asst CG	355 Inf	
Map	C of S	Rcn Tr	Time
	G-1	Engrs	In / Out
Worksheet	G-3	Med Bn	
	G-4	QM	
Evaluation	Div Arty	89 Sig	Msg No

Figure E.87: U.S. Army G-2 intelligence reports from 8 April 1945 describing a large underground factory in the vicinity of Neustadt an der Orla that had been using 20,000–30,000 French and other foreign workers for assembly line production of the "V4... two man rocket." [NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45]

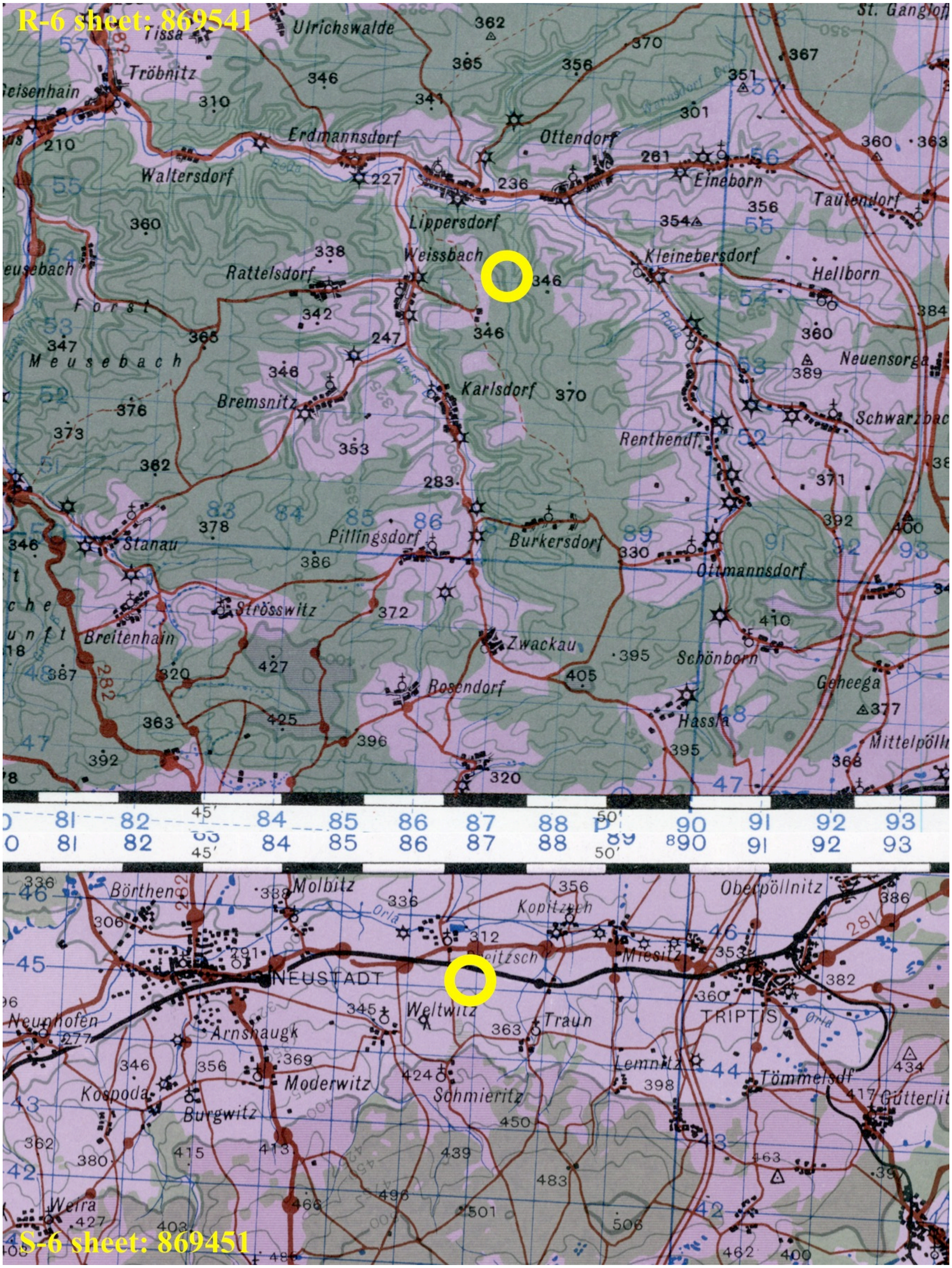


Figure E.88: Adjacent sheets R-6 (above) and S-6 (below) of the GSGS 4416 map used by the U.S. Army. The coordinates for the two-man rocket factory were first given as 869541 (above), then as 869451 (below), 9 km due south of the first location. There is no "hill 315" near either location, and neither location seems like a very promising site for a massive underground factory.

DECLASSIFIED
Authority NND 735017

NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45

G-2 MESSAGE SUMMARY

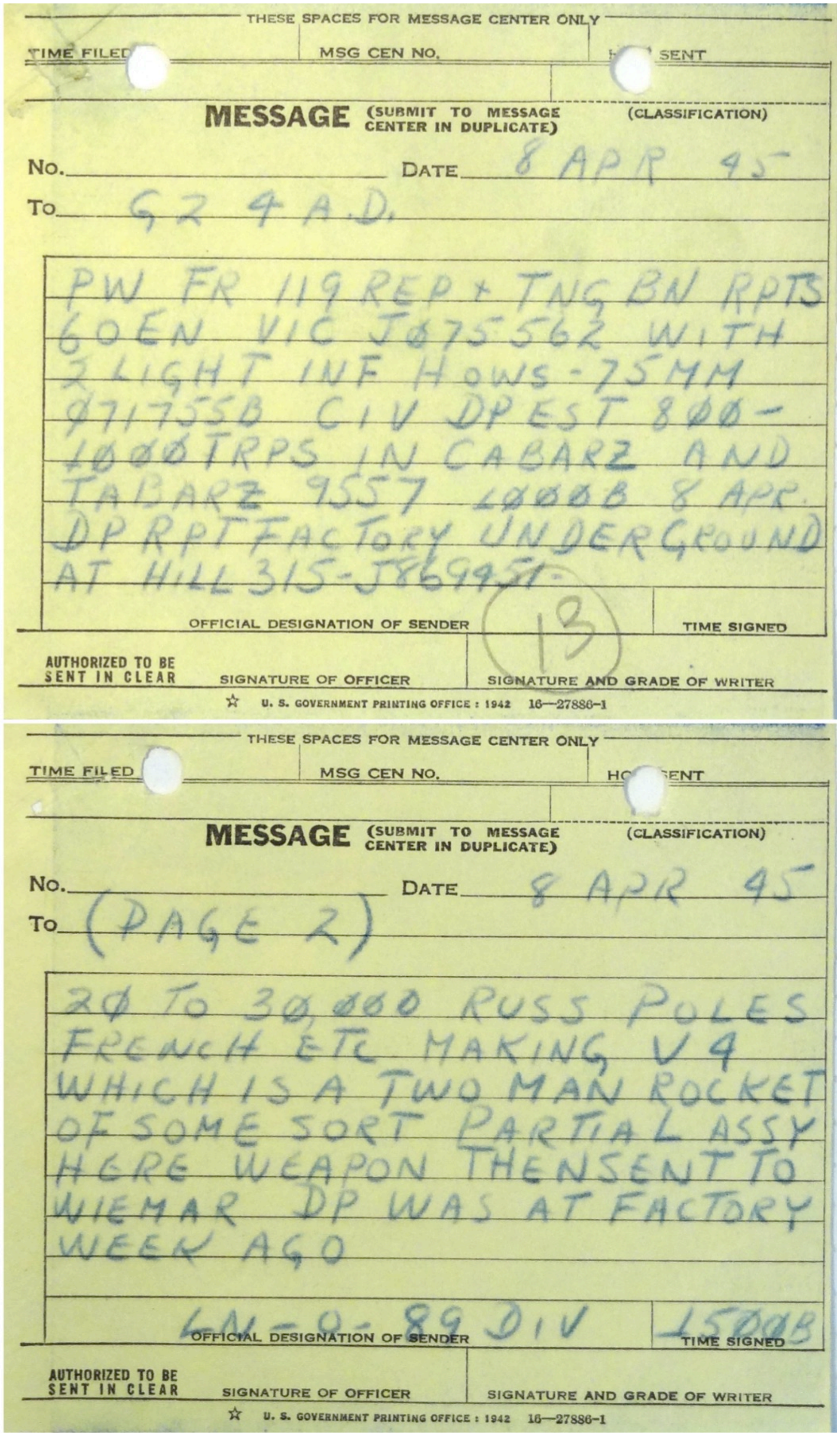
MESSAGES	DISTRIBUTION
8 April 45 From 353: Displaced persons report underground factory in hill 315 at J869451. Entrance on south side of hill. Factory employs some twenty to thirty thousand Russians, Poles, French, etc. They are making the V-4 which is a two man rocket of some sort. Partial assembly at this factory and weapon then is sent to WEIMAR J5271. During the time the source of this information worked at this factory, approx one week ago, there had been no bombing. More information later after a complete interrogation. Tuxedo 2 0900 17	Corps C G Asst C G C/S G-1 G-3 G-4 Div Arty 353d Inf 354th Inf 355th Inf Rcn Tr Engrs Med C M Ord Hq Co A G CO Sp Trs Map Journal File LNSEC AGLO

Evaluation

Figure E.89: U.S. Army G-2 intelligence reports from 8 April 1945 describing a large underground factory in the vicinity of Neustadt an der Orla that had been using 20,000–30,000 French and other foreign workers for assembly line production of the "V4... two man rocket." [NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45]

DECLASSIFIED
Authority NND 735017

NARA RG 407, Entry NM3-427, Box 12365, Folder 604-2.3 (1688-4) G-2 Jrnl File 4th Armd Div. 7–8 Apr 45



THESE SPACES FOR MESSAGE CENTER ONLY

TIME FILED | MSG CEN NO. | HOW SENT

MESSAGE (SUBMIT TO MESSAGE CENTER IN DUPLICATE) (CLASSIFICATION)

No. DATE 8 APR 45

To G2 4 A.D.

PW FR 119 REP + TNG BN RPTS
60 EN VIC J075562 WITH
3 LIGHT INF HOWS-75MM
071755B CIV DP EST 800-
1000 TRPS IN CABARZ AND
TABARZ 9557 100 0B 8 APR.
DP RPT FACTORY UNDERGROUND
AT HILL 315-J869451.

OFFICIAL DESIGNATION OF SENDER (13) TIME SIGNED

AUTHORIZED TO BE SENT IN CLEAR SIGNATURE OF OFFICER SIGNATURE AND GRADE OF WRITER

U. S. GOVERNMENT PRINTING OFFICE : 1942 16—27886-1

THESE SPACES FOR MESSAGE CENTER ONLY

TIME FILED | MSG CEN NO. | HOW SENT

MESSAGE (SUBMIT TO MESSAGE CENTER IN DUPLICATE) (CLASSIFICATION)

No. DATE 8 APR 45

To (PAGE 2)

20 TO 30,000 RUSS POLES
FRENCH ETC MAKING V4
WHICH IS A TWO MAN ROCKET
OF SOME SORT PARTIAL ASSY
HERE WEAPON THEN SENT TO
WIEMAR DP WAS AT FACTORY
WEEK AGO

G2-0-89 DIV OFFICIAL DESIGNATION OF SENDER

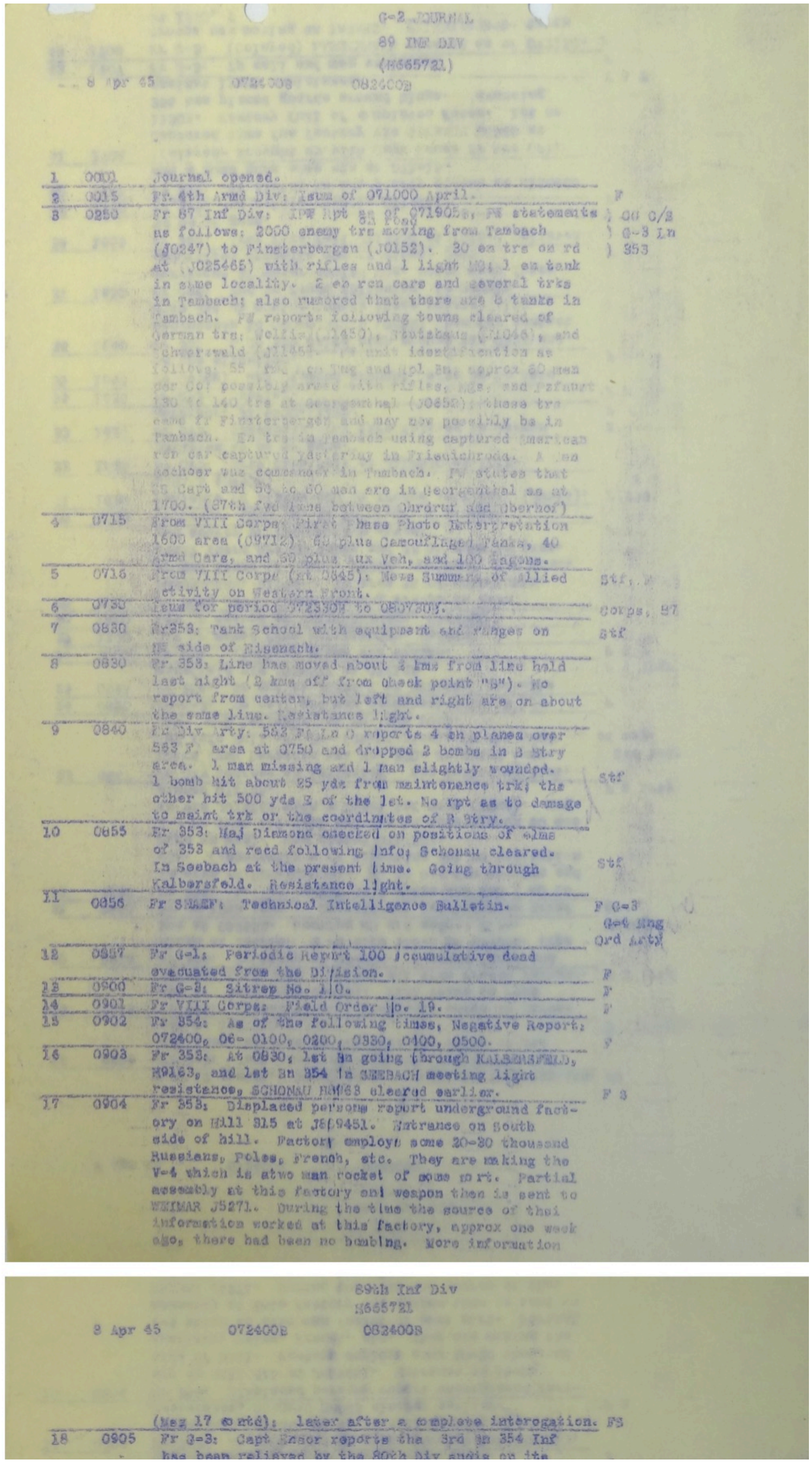
1500B TIME SIGNED

AUTHORIZED TO BE SENT IN CLEAR SIGNATURE OF OFFICER SIGNATURE AND GRADE OF WRITER

U. S. GOVERNMENT PRINTING OFFICE : 1942 16—27886-1

Figure E.90: U.S. Army G-2 intelligence reports from 8 April 1945 describing a large underground factory in the vicinity of Neustadt an der Orla that had been using 20,000–30,000 French and other foreign workers for assembly line production of the "V4... two man rocket." [NARA RG 407, Entry NM3-427, Box 12365, Folder 604-2.3 (1688-4) G-2 Jrnl File 4th Armd Div. 7–8 Apr 45]

DECLASSIFIED
Authority NND 735017



G-2 JOURNAL
89 INF DIV
(H665721)

8 Apr 45 072400B 082400B

1	0001	Journal opened.	
2	0015	Fr 4th Armd Div: Isum of 071000 April.	F
3	0250	Fr 87 Inf Div: IPW Rpt as of 071905B, PW statements as follows: 2000 enemy trs moving from Tambach (J0247) to Finsterbergen (J0152). 30 en trs on rd at (J025465) with rifles and 1 light MG; 1 en tank in same locality. 2 en rcn cars and several trks in Tambach; also rumored that there are 6 tanks in Tambach. PW reports following towns cleared of German trs: [illegible] (J1450), [illegible] (J1046), and Schwarzwald (J1145). PW unit identification as follows: SS [illegible] Tng and Rpl Bn, approx 60 men per Co, possibly armed with rifles, MGs, and Pzfaust. 130 to 140 trs at Georgenthal (J0659); these trs came fr Finsterbergen and may now possibly be in Tambach. En trs in Tambach using captured American rcn car captured yesterday in Friedrichroda. A [illegible] was commander in Tambach. PW states that SS Capt and 50 to 60 men are in Georgenthal as at 1700. (87th fwd lines between Ohrdruf and Oberhof)	G-3 C/S G-3 Ln 353
4	0715	From VIII Corps: First Phase Photo Interpretation 1600 area (09712): 65 plus Camouflaged Tanks, 40 Armd Cars, and 50 plus Aux Veh, and 100 Wagons.	
5	0716	From VIII Corps (at 0645): News Summary of Allied Activity on Western Front.	Stf, [illegible]
6	0730	Isum for period 072330B to 080730B.	Corps, 87
7	0830	Fr353: Tank School with equipment and ranges on NE side of Eisenach.	Stf
8	0830	Fr 353: Line has moved about 2 kms from line held last night (2 kms off from check point "B"). No report from center, but left and right are on about the same line. Resistance light.	
9	0840	Fr Div Arty: 563 FA Ln O reports 4 en planes over 563 FA area at 0750 and dropped 2 bombs in B Btry area. 1 man missing and 1 man slightly wounded. 1 bomb hit about 25 yds from maintenance trk; the other hit 500 yds E of the 1st. No rpt as to damage to maint trk or the coordinates of B Btry.	Stf
10	0855	Fr 353: Maj Dimmons checked on positions of elms of 353 and recd following info; Schonau cleared. In Seebach at the present time. Going through Kalbersfeld. Resistance light.	Stf
11	0856	Fr SHAEF: Technical Intelligence Bulletin.	F G-3 G-4 Eng Ord Arty
12	0857	Fr G-1: Periodic Report 100 Accumulative dead evacuated from the Division.	F
13	0900	Fr G-3: Sitrep No. 10.	F
14	0901	Fr VIII Corps: Field Order No. 19.	F
15	0902	Fr 354: As of the following times, Negative Report: 072400, 08- 0100, 0200, 0330, 0400, 0500.	F
16	0903	Fr 353: At 0830, 1st Bn going through KALBERSFELD, H9163, and 1st Bn 354 in SEEBACH meeting light resistance, SCHONAU H8963 cleared earlier.	F S
17	0904	Fr 353: Displaced persons report underground factory on Hill 315 at J5[illegible]9451. Entrance on South side of hill. Factory employs some 20-30 thousand Russians, Poles, French, etc. They are making the V-4 which is atwo man rocket of some sort. Partial assembly at this factory and weapon then is sent to WEIMAR J5271. During the time the source of thei information worked at this factory, approx one week ago, there had been no bombing. More information	

89th Inf Div
H665721

8 Apr 45 072400B 082400B

		(Msg 17 contd): later after a complete interogation.	FS
18	0905	Fr G-3: Capt [illegible] reports the 3rd Bn 354 Inf has been relieved by the 80th Div [illegible] on its	

NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45

Figure E.91: U.S. Army G-2 intelligence reports from 8 April 1945 describing a large underground factory in the vicinity of Neustadt an der Orla that had been using 20,000–30,000 French and other foreign workers for assembly line production of the "V4... two man rocket." [NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45]

Journal entry

S E C R E T

Auth: CG 89 Inf Div
Init: Mld
Date: 8 April 1945

G-2 PERIODIC REPORT

From: 071800
To : 081800
Hq 89 Inf Div
(H985593)
8 March 1945

No. 29

1. ENEMY SITUATION AT END OF PERIOD:
   a. Enemy front lines: No cohesive line.
   b. Units in contact:

Unit	Location	Source	Date
Elms 347 Inf Div	vic (H908592)	PW & Doc	8 Apr
Elms 11 Pz Div	vic (H9954)	PW & Doc	8 Apr
Elms 159 Inf Div		Doc	8 Apr

   (See IPW Report, Annex #1)

   c. Arty: Civ rpts 4 arty pieces and 2 20mm guns vic (J126466) at 071915B. PW rpts 2 75mm Hows vic (J075562).

   c. Miscellaneous: French ex-PW reported that the defenses of FRIEDRICHRODA (H9955) was organized by Gen Von Manterefel using SS mixed with Wehrmacht and armed with bazookas and MGs. PW straggler from Hq Btry, 2d Army AA Bn states unknown number of SS troops in GROSSFAHNER (J1677). French DP reports German general and staff moved into TABARZ (H9556) 6 April. Also reports pillboxes on road between LANGENHAIN (H9559) and TABARZ (H9556). Airplane plant vic (H996578). Captured factory full of time fuzes vic SEEBACH (H8960) at 1130B. DPs rpt underground factory on Hill 315 at (J869451). Entrance on S side of hill. Factory employs some 20 to 30 thousand Russians, Poles, etc. They are making V-4 which is a two man rocket of some sort. Partial assembly at this plant and weapon is sent to WEIMAR (J5271). There had been no bombing of the factory. Civ rpts there are 2 Tiger tanks and 50 enemy dug in at GEORGENTHAL (J0652).

3. MISCELLANEOUS:
   a. Estimated enemy casualties including PW:
      (1)

PW through Div PWE in period	378	
PW through Div PWE to date		10125
PW through Med channels in period	33	
PW through Med channels to date		1883
Total		11938

      (2) Estimated enemy dead and wounded: 200
   b. See Miscellaneous Intelligence Notes, Annex #2.
   c. See Terrain Study, Annex #3, to be iss[ued] later.
   d. Weather and visibility: Some high clouds during the night increasing during the day. Tomorrow low clouds in afternoon, area of fog in early morning. Vis 1 mi on hills, ½ to 1 mi in valleys in early morning increasing to 3 to 4 miles in afternoon. Wind NE 7 miles per hour tonight, becoming 14 miles per hour in the afternoon. Max temp 59°, min temp 35°. Favorable for screening, smoke and to gases during night and early morning becoming unfavorable in the afternoon. Conditions mostly unfavorable for incendiaries, partly favorable in afternoon. Conditions favorable for air support in late morning and afternoon.

4. ENEMY CAPABILITIES: No change.

Myrick
Myrick
G-2
Mld

S E C R E T

NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45

Figure E.92: U.S. Army G-2 intelligence reports from 8 April 1945 describing a large underground factory in the vicinity of Neustadt an der Orla that had been using 20,000–30,000 French and other foreign workers for assembly line production of the "V4... two man rocket." [NARA RG 407, Entry NM3-427, Box 11005, Folder 389-2.2 G-2 Jrnl File—89th Inf Div. 8–9 Apr 45]

A. W. Detweiler. V-2 Factory at Pössneck. 19 June 45 [AFHRA folder 519.650-1 Oct 1944–Dec 1945 Exploitation—Enemy Equipment; AFHRA A5729 frame 1573].

1. Following information phoned by Col. T. Ames, Asst. A-2, Air Staff Shaef:

a. The CIO (Group Capt. Humphrey) of 2nd TAF has been advised that the V-2 factory at Pössneck (J-73) has not been examined. Since this is in the Russian area, it is suggested by Group Capt. Humphrey that any action taken must be immediate.

b. Col. Hall, G-2 of the 30th Division, is reported to be familiar with this installation.

c. The above information furnished to 2nd TAF by a Major Darling.

d. It has been requested that Group Capt. Humphrey be advised of any action taken on the above.

[See document photo on p. 5375.

Pössneck and the rest of Thuringia were transferred from occupying U.S. forces to occupying Soviet forces on 1 July 1945, which prompted the urgency of this 19 June 45 memo.

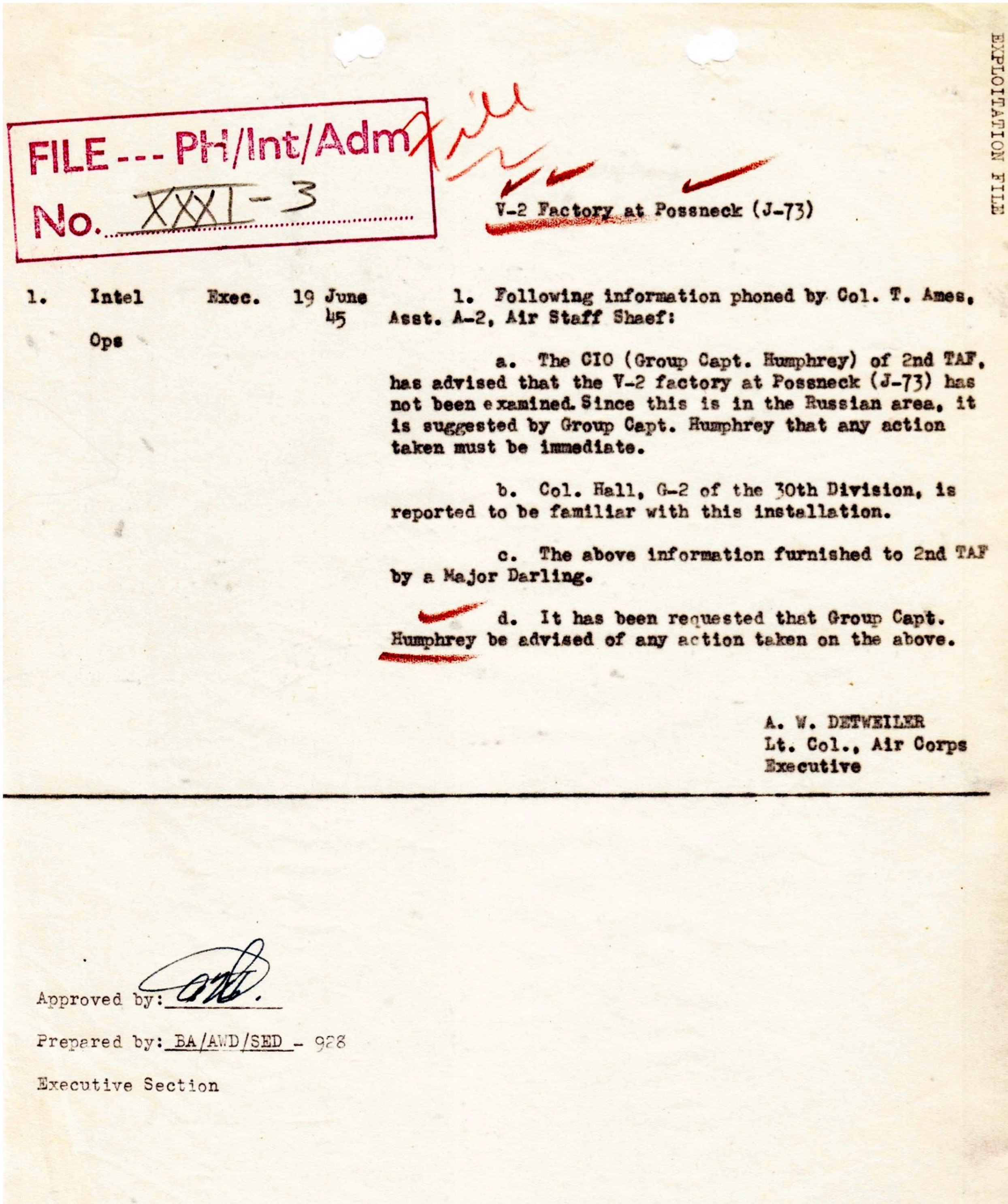
This document proves that there was a rocket factory at Pössneck, which was only 13 km from Neustadt an der Orla, yet both are very far from Nordhausen and would not have been confused with the underground rocket factory there. The U.S. military used "V-2" in the generic sense to refer to large German rockets, so the Pössneck factory could have been manufacturing V-2/A-4 rockets or something else. Was the Pössneck factory the same as the "two-man rocket" factory? Perhaps the "Pössneck" factory was not actually in Pössneck, but was merely nearby, and the U.S. military referred to the nearest town of significant size, Pössneck. Or maybe the escaped prisoners were slightly off in their description of the location of the two-man rocket factory. Even if the Pössneck factory mentioned in the above document was a different facility, its existence demonstrates that that area contained underground rocket factories, making the reports of the two-man rocket factory highly plausible.

For examples of nuclear work that was conducted in this same area and same time, see:

> Rainer Karlsch. 2009. Wunderwaffen für den "Endsieg"? Die geheimen Arbeiten des Forschungsinstituts für Physik und dessen Verlagerung nach Neustadt an der Orla (1944–1945). *Zeitschrift für Thüringische Geschichte.* 63:259–276.
>
> 009. Geheime Forschungsstätte Harrasmühle 1943–45. [https://www.heimatfreunde-neustadt-orla.de/neustadt-umgebung/item/009-erinnerung-an-die-gesandten-zum-20ten.html]

What reports on the Pössneck facility or other scientific facilities in this area were produced by Colonel Hall, Colonel Ames, Lt. Colonel Detweiler, Major Darling, Captain Humphrey, or others? Can those reports be located and (if necessary) declassified?]

AFHRA folder 519.650-1 Oct 1944 – Dec 1945
Exploitation—Enemy Equipment



EXPLOITATION FILE

FILE --- PH/Int/Adm File
No. XXXI-3

V-2 Factory at Possneck (J-73)

1. Intel Exec. 19 June 45
Ops

1. Following information phoned by Col. T. Ames, Asst. A-2, Air Staff Shaef:

a. The CIO (Group Capt. Humphrey) of 2nd TAF, has advised that the V-2 factory at Possneck (J-73) has not been examined. Since this is in the Russian area, it is suggested by Group Capt. Humphrey that any action taken must be immediate.

b. Col. Hall, G-2 of the 30th Division, is reported to be familiar with this installation.

c. The above information furnished to 2nd TAF by a Major Darling.

d. It has been requested that Group Capt. Humphrey be advised of any action taken on the above.

A. W. DETWEILER
Lt. Col., Air Corps
Executive

Approved by: ____

Prepared by: BA/AWD/SED - 928

Executive Section

Figure E.93: This 19 June 45 U.S. intelligence memo proves that there was a factory making large rockets at or near Pössneck, 13 km from Neustadt an der Orla [AFHRA folder 519.650-1 Oct 1944–Dec 1945 Exploitation—Enemy Equipment; AFHRA A5729 frame 1573].

Hitler had a V-4 to raid London. *Daily Mail.* 18 April 1945 p. 4.

PARIS, Tuesday.

Hitler had another secret weapon—the V4—which he intended to rain on London, according to the Paris newspaper *Paris-Presse*.

But this last coup was prevented by the lightning Allied advance. A secret underground factory near Erfurt was captured and the secrets of the new weapon discovered.

The newspaper, from interviews with French deportees liberated from the factory, gives this picture of the new "V" weapon:

"Imagine a V2 which, instead of being blind and inaccurate, surpasses the accuracy of the most perfect artillery; a projectile 15 to 20 yards long, controlled by wireless from the ground, and travelling at a speed of some 3,750 miles an hour."

The subterranean factory, built in rock, was several storeys in height, with a network of tunnels and covering an area of about ten square miles.—*Reuter.*

[Tuesday was 17 April, so this *Daily Mail* story appears to have been written by someone in Paris with inside knowledge of the reporting before the *Paris-Presse* edition actually appeared in print on 18 April.]

Raymond Henry. Nous Font des Révélations sur le V-4: Dernier Rêve de Hitler. *Paris-Presse* No. 135, 18 April 1945 p. 1.

Libérés plus tôt que les Allemands ne pouvaient s'y attendre par l'avance americaine, des deportes français affectés à la fabrication des armes secrètes

Liberated earlier than the Germans could have expected by the American advance, French deportees assigned to the manufacture of secret weapons

nous font des révélations sur le V-4 dernier rêve de Hitler

we make revelations about the V-4 last dream of Hitler

Ces déportés qui n'avaient pas vu le jour depuis des mois, travaillaient au secret dans une usine souterraine s'étendant sur 24 km^2

These deportees, who had not seen daylight for months, worked secretly in an underground factory spread over 24 km^2

Hitler avait fait un rêve: le dernier. Il rêvait de gagner la guerre, grâce à une novelle arme secrète, le V-4. Ce rêve ne se réalisa pas. Les nazis n'en emporteront même pas le secret dans leur tombe. Car ils avaient eu l'imprudence d'affecter par représailles, aux usines où l'on expérimentait et fabriquait le V-4, des déportés français qui permettent aujourd'hui aux Alliés de percer le mystère de l'ultime arme secrète sur laquelle le III^{e} Reich fondait ses ultimes espoirs.

Hitler had a dream: the last. He dreamed of winning the war, thanks to a new secret weapon, the V-4. This dream did not come true. The Nazis will not even take the secret to their graves. For they had been imprudent enough to assign, by reprisals, to the factories where the V-4 was experimented with and manufactured, French deportees who now allow the Allies to pierce the mystery of the ultimate secret weapon on which the Third Reich founded its ultimate hopes.

Ces Français, qui ont travaillé pendant plusieurs mois sous terre, sans revoir la lumière du jour, ont pu fournir sur le V-4, ses perspectives et son emploi, des précisions que "Paris-presse" est le premier à publier.

These Frenchmen, who worked for several months underground, without seeing the light of day, were able to provide details on the V-4, its prospects and its use, which "Paris-press" is the first to publish.

[If this is the same massive underground V-4 rocket factory populated by French and other foreign workers and reported by Allied forces on pp. 5368–5373, its location was given there. Using the website tool http://www.echodelta.net/mbs/eng-translator.php, Modified British System coordinate [w]J869451 in the Nord de Guerre Grid corresponds to a location 1 km southeast of Dreitzsch, just east of Neustadt an der Orla. Thus the massive underground rocket factory described was not Nordhausen. It was approximately 110 km away from Nordhausen, and the description indicates it was much larger than Nordhausen.]

Nous connaissions les V-1 et les V-2. Nous connaissions même, par oui-dire, les V-3, qui devaient être une édition améliorée et agrandié des V-2.

We knew the V-1s and the V-2s. We even knew, by the way, the V-3s, which were to be an improved and enlarged version of the V-2s.

Nous savions aussi que les Allemands se proposaient d'expédier une véritable pluie de ces projectiles sur Londres. Mais nul n'avait encore entendu parler des V-4, l'arme qui devait donner la victoire définitive à Hitler.

We also knew that the Germans intended to hasten a veritable rain of these projectiles on London. But no one had heard of the V-4, the weapon that was to give Hitler the final victory.

Cette arme était sur le point de sortir. Les usines où l'on procédait à la fabrication et aux essais viennent d'être conquises par les troupes alliées, au cours de leur foudroyante avance, et les secrets qu'elles ont révélés sont encore inédits.

This weapon was about to be released. The factories in which it had been manufactured and tested have just been conquered by the allied troops during their tremendous advance, and the secrets they had revealed have not yet been published.

C'étaient, dans la région d'Erfurt et pas très loin de ce sinistre camp de Buchenwald libéré, lui aussi, par l'offensive alliée, d'immenses, de prodigieuses usines souterraines enfouies les unes à côté des autres, étagées les unes au-dessus des autres, reliées par un labyrinthe de canalisations et de tunnels, et s'étendant sur une superficie de 24 kilomètres carrés. En bref, une gigantesque cité creusée dans le roc et où se succédaient interminablement, à la lumière de puissants globes électriques, ateliers, magasias, laboratoires et casemates.

There were, in the region of Erfurt and not very far from the sinister camp of Buchenwald that was also liberated by the allied offensive, immense, prodigious underground factories buried one beside the others, levels ones above others, connected by a labyrinth of pipes and tunnels, and extending over an area of 24 square kilometers. In short, a gigantic city hollowed out of the rock with an interminable succession, lit by powerful electric globes, of workshops, storerooms, laboratories, and fortifications.

Deux chemins de fer à voie étroite approvisionnaient ce royaume souterrain, deux chemins de fer si artistement camouflés que jamais l'aviation alliée ne les avait découverts.

Two narrow-gauge railroads supplied this underground kingdom, two railways so artistically camouflaged that the allied aviation never discovered them.

[This article states that it was already known that V-3 (or at least one weapon system vying for that title) was an "improved and enlarged version of the V-2." This probably means that the standard V-2 length of 14 m was enlarged to 18 or 21 m long as reported elsewhere, accommodating more propellant and hence improving the rocket's range and/or payload capacity.]

Un projectile géant d'une précision absolue

C'est là, dans le mystère, que les meilleurs techniciens d'Allemagne, soumis à un étroit contrôle, préparaient le V-4. Le V-4? Imaginez un V-2, mais un V-2 qui, au lieu d'être aveugle et imprécis, aurait au contraire surpassé en précision les canons les plus perfectionnés; un projectile immense, long de 15 ou 20 mètres, propulsé par fusée, comme le V-2, mais pouvant, à la différence de celui-ci, être dirigé de terre par ondes hertziennes et capable, pendant tout le temps de sa course parcourue à une vitesse de 6.000 km à l'heure, d'indiquer sa position à la centrale de tir, grâce à des dispositifs gyroscopiques couplés avec un poste émetteur de T.S.F.; un engin enfin qui n'aurait peut-être pas pu changer le sort de la guerre, mai qui aurait certainement prolongé les hostilités en causant de nouveaux et incalculables ravages, et en provoquant pour les Alliés de graves difficultés supplémentaires.

Mais le danger est conjuré. Le V-4 git désormais, sans force et sans vertu, dans l'ombre de ces cavernes d'où les nazis aux abois n'ont pas eu le temps de le faire surgir. Quelques mois seulement, quelques semaines peut-être, paraît-il, nous séparaient encore du moment où ces monstres nouveaux se seraient abattus sur nous.

A giant projectile of absolute precision

It was there, in the mystery, that the best technicians of Germany, subject to a strict control, were preparing the V-4. The V-4? Imagine a V-2, but a V-2 which, instead of being blind and imprecise, would on the contrary surpass in precision the most perfect canons; an immense projectile, 15 or 20 meters long, propelled by rocket, like the V-2, but capable, unlike the latter, of being guided by Hertzian waves and capable, throughout all the time of its course traveling at a speed of 6,000 km per hour, of indicating its position to the launch station, thanks to gyroscopic devices coupled with a radio transmitter; a device which might not have been able to change the outcome of the war, but which would certainly have prolonged hostilities by causing new and incalculable havoc, and provoking serious difficulties for the Allies.

But danger is avoided. The V-4 lies henceforth, without force and without virtue, in the shadow of these caverns where the stymied Nazis did not have time to make it appear. Only a few months, perhaps a few weeks, it seems, still separated us from the moment when these new monsters would have fallen upon us.

[The V-4 weapon described above was a V-2 or A-4 rocket whose length had been increased from the usual 14 meters to "15 to 20 meters," in order to carry more propellant and improve the rocket's range and/or payload capacity. This V-4 was also described as having a much more precise guidance system (combining onboard inertial gyroscopes and external radio signals), which would have been especially important to achieve good targeting accuracy at ranges greater than that of the standard V-2 and/or for highly valuable payloads such as a nuclear bomb.

See also pp. 2938–2962.

If U.S. forces overran a factory that had been producing improved V-3 and V-4 rockets as described here, where is all the documentation for what was actually found and removed by the United States? Can that information be located in archives? Were prototypes of the rockets and the improved guidance systems brought back to the United States? If that material is still classified, can it be located and declassified now?]

Albert Ducrocq. 1947. *Les Armes Secrètes Allemandes.* Paris: Berger-Levrault. pp. 160–161.

On avait longtemps douté de l'efficacité militaire de la A-9: dépenser 100 tonnes de combustible et perdre une machinerie compliquée pour aller jeter seulement une tonne d'explosif sur le territoire américain, voilà qui semblait payer bien cher le plaisir d'ennuyer l'adversaire! Remarquons tout d'abord, à ce sujet, que le prix de revient n'est guère plus élevé que dans le cas d'un bombardement par V-2, puisque la fusée-mère A-10 est récupérable, et d'autre part, ce qui coûte cher (du moins en heures de travail englouties) ce n'est pas tant l'alcohol ou l'eau oxygénée que la machinerie des V-2 ou A-9; dans l'un et l'autre cas on en faisait le sacrafice à l'avance. [...]

Et puis il y a bien pire: dans l'esprit d'Hitler, la A-9 était aussi destinée, le cas échéant, à transporter des bombes atomiques sur le territoire américain. [...] Se rend-on compte des répercussions matérielles et morales du lancer d'une seule bombe atomique sur New-York par exemple! Il nous est pratiquement impossible de les mesurer.

D'ailleurs, outre le bombardement par A-9, les Allemands voulaient entreprendre le bombardement direct des côtes américaines au moyen de V-2 lancées par des sous-marins. C'était leur deuxième arme nouvelle contre l'Amérique. Elle devait entrer en action en même temps que la A-9, c'est-à-dire au début de l'été 1945...

There had long been doubts about the military effectiveness of the A-9: spending 100 tons of fuel and wasting complicated machinery to throw just one ton of explosive on American territory seemed like a high price to pay for the pleasure of annoying your adversary! First of all, it is worth noting that the actual cost is not much higher than in the case of a V-2 attack, since the A-10 first stage is recoverable, and second, what is expensive (at least in terms of man-hours) is not so much the alcohol or liquid oxygen as the V-2 or A-9 machinery; in both cases, the cost was decided in advance. [...]

And there is worse: in Hitler's mind, the A-9 was also intended, if need be, to transport atomic bombs onto American territory. [...] Do you realize the material and moral repercussions of dropping a single atomic bomb on New York, for example? It is virtually impossible to measure them.

What is more, in addition to A-9 bombing, the Germans wanted to undertake direct bombing of the American coastline using submarine-launched V-2s. This was their second new weapon against America. It was to come into action at the same time as the A-9, i.e. in early summer 1945...

[Albert Ducrocq (1921–2001) was a French scientist and science writer who was involved in the French investigations of German science and German scientists near the end of the war and after the war. He would have had considerable knowledge about German scientific plans and capabilities from his own investigations and also from former French (or other) workers that he had talked to.

His claims that German atomic bombs and delivery vehicles for them were ready or nearly ready by the end of the war agree with statements by many other independent sources.

According to Ducrocq, Germany had planned to launch a simultaneous attack on many Allied targets using its atomic bombs and different delivery vehicles for them. For independent confirmation, see pp. 4549–4550, 4587, 4621, 4627–4665, 4679–4681, 4766, 5038, 5454–5466.

For more information from Ducrocq, see pp. 5218, 5658–5659, 5666.]

Walter Dornberger. 1958. *V-2: The Nazi Rocket Weapon.* New York: Viking. pp. 138–140, 152, 236–237.

[pp. 138–140:] It was easy enough to see that the range of one-stage rockets, which had to go on carrying the useless deadweight of the empty tanks and heavy motors after the 'all-burnt', would never be appreciably increased. If we were going to add to the rocket's deadweight, already reduced to a minimum, any considerable load for long distances, even a change of propellants would be of very little use to us. The only exception would be a combination of hydrogen and oxygen with a theoretical exhaust velocity of over 10,000 feet per second. But this was for the time being out of the question because of the difficulty of handling liquid hydrogen. Nor would a bigger rocket help much. [...]

With an improved, lighter A4 type of one-stage rocket with relatively bigger tanks we might be able to achieve a range of 250 to 300 miles—but mainly at the expense of the warhead, that is, the payload.

We had to break new ground. Why need the rocket strike the ground at a speed of nearly 2,000 m.p.h.? If we gave it wings and took advantage of their lift, changing the trajectory to a glide after a suitable time interval, we could use the energy hitherto expended in making great holes in the ground to increase range.

Calculations showed that with such a structure we might achieve a range of 350 miles, which would be double that of the A4. [...]

Thus the A9 came into being.

Hundreds of calculations were made to plot the trajectory that would give the greatest range. Finally the missile was planned to reach, at a height of about 12 miles, a maximum speed of 2,800 m.p.h., and then go into a shallow curving glide with a peak of nearly 18 miles. On arrival over the target, at a height of about 3 miles, it was planned to fall perpendicularly, like the Fi 103 (V1).

It was only a step from the pilotless A9, with fully automatic guidance, to the piloted A9. This extremely fast aircraft, with a wing area of only about 145 square feet, had no military significance. Special landing flaps enabled it to land, after traveling about 400 miles in 17 minutes, at a speed of only 100 m.p.h.

This development of the A9, however, did not satisfy our ambitions. We wanted to cover thousands of miles. Our own private and exclusive sphere of activity began only beyond the extreme limit of the range of the heaviest aircraft.

Only by abandoning the one-stage for the multiple-stage rocket, that is, by dropping the dead weight when it had served its purpose and thereby improving the mass-ratio of the rocket, could we hope for these almost incredible range increases.

This was the origin of the A9/10 project. The object here was to cause the motors of the second stage (the A9) to begin firing only when the missile had reached a high speed by means of its first stage, which acted as a booster.

Catapulting was an alternative method of imparting a high starting speed to the A9. On the basis of calculations and experience with V1 launching sites, a long, inclined catapult had been designed capable of giving the A9 a launching speed of 800 m.p.h. This would have been sufficient for the fully fueled rocket to fly on smoothly, after leaving its launching ramp.

A better plan, however, and one which greatly improved range, was to construct the A10, weighing 87 tons and with a total propellant capacity of 62 tons, as the first stage of the combined A9/A10. The A9 was placed on top of the A10. The latter had a thrust of 200 tons for 50 to 60 seconds and gave the rocket a speed of 2,700 m.p.h. After exhaustion of the first stage the A9 would be ignited and lift out of the A10. The A9 was to tilt fairly sharply soon afterwards and reach a peak altitude of 35 miles. Then the long supersonic glide was to begin. Meanwhile the A10, equipped with brake-flaps and parachute, could be recovered for further use after drifting down on to water.

The A9, beginning to operate at a great height, would acquire an additional velocity of about 3,600 m.p.h., resulting in a maximal velocity of about 6,300 m.p.h. at the moment its motor cut off. A distance of 2,500 miles could therefore be covered in about 35 minutes. Like the single-stage A4 this two-stage rocket was to take off vertically and obviate the need for elaborate launching installations.

Countless trajectories were calculated by our outstanding expert in flight and ballistics, Dr. Steuding, and all of the factors involved, such as the earth's curvature and rotation, were taken into consideration. Guidance systems were investigated and development of the missile began.

For some months work on this project, which had been fully occupying large sections of our establishment, had ceased. I had forbidden further work on the plan in our practical branches, because of the urgency of the A4. Only the Projects Group was permitted to carry on.

During our frequent visits to this department we had repeatedly and thoroughly discussed these plans, due for practical development at an early date, as well as the optimal trajectory of the rocket. We had foreseen and planned for its use in time of peace. Very fast stratospheric rocket-aircraft, travelling at high supersonic speed, had reached design stage. They would be able to cross from Europe to America in 40 minutes.

Once we reached this stage the horses fairly bolted with us. With our big rocket motors and stage-rockets we could build space-ships which would circle the earth like artificial moons at a height of 300 miles and a speed of 18,000 m.p.h. Space stations and glass spheres containing the embalmed bodies of pioneers of rocket development and space travel could be sent round the Earth on endless journeys. Even an expedition to the moon was a popular topic.

We dreamed, too, of atomic energy, which would at last give us the necessary drive for flight into the infinity of pace, to the very stars. [...]

[p. 152:] I could not have been asleep long before I woke with a start.

Sssst—bang!

So Stölzel was doing his experimental firing after all.

Sssst—bang! Sssst—bang!

The window-panes rattled. Yet I had told Stölzel to set the time fuses so as not to disturb the peaceful slumbers of Peenemünde. [...] And I had given him permission to fire only 5 of the 15 rounds available. [...]

Something wrong there. That couldn't be Captain Stölzel, who had asked my permission that evening to carry out test firing during the night with his anti-dive-bomber tank weapon. It was not the 100 lb. high explosive charge of the 10-inch solid-propellant rocket which had awakened me from my first deep slumber and set the windows of my room rattling. [...]

Peenemünde was being raided! [...]

[pp. 236–237:] The demand from increased range made it necessary to start work again without delay on the winged A4, which had been lying fallow since spring 1943. We had named the winged A4 missile the A9. Ever since the beginning of the war we had seen that we could not tackle the A9 at Peenemünde as well as the A4 with any hope of its becoming operational before the end. The problems would have made far too many demands on our depleted staff. Some research had, however, been done in the wind tunnel since the spring of 1940 to determine the proper form of the supersonic wings and tail unit of the A9. The findings were now hastily dug out again and a schedule of tests drawn up.

On 8th January, 1945, the first A9 was launched. The control failed about 100 feet above the firing table. A few days later we were unable to launch a new projectile because the alcohol tank had developed a leak. At last, on the 24th, we had our first success. The rocket, climbing vertically, reached a peak height of nearly 50 miles at a maximum speed of 2,700 m.p.h. This purely rocket-powered aircraft, with a wing area of 145.32 square feet, broke the sound barrier without trouble. It flew with stability and steered automatically at both sub- and supersonic speeds. On the descending part of the trajectory, soon after the rocket levelled out at the upper limit of the atmosphere and began to glide, a wing broke. On the whole the result was eminently satisfactory and more than fulfilled our expectations.

Thus our theories on this design had been borne out as well. It was possible to cause rocket aircraft to fly at many times the speed of sound, and they could certainly be landed by means of braking and landing flaps. We were well on the way to solving a problem which, together with high-altitude research, was the first I had set myself to tackle after the war: the landing after a flight into airless space. We had taken a long stride forward in developing the first intermediate stage preceding the space-ship. Rocket aircraft could cover long distances in the upper stratosphere, at heights of 12–16 miles, at incredible speed and land in safety. If only we could succeed in maintaining full rocket thrust just long enough to ensure that we reached this height at very high supersonic speed, flying horizontally and in the right direction, and then either went into a glide or could switch in a low-thrust cruising motor using very little propellant, why, then we should be able to bridge thousands of miles by strictly economic means. Such were the ideas that occupied our minds in 1944. If we could realize them in practice we might hope to enrich international traffic, a few years after the war, with newer and bigger models. This revolutionary form of transport could never be rivalled for speed and range by normal propeller or jet-driven aircraft.

Basically the problem had already ceased to be a problem. It was only a question of working out the technicalities and devoting enough time to development. But the evacuation of Peenemünde put a stop to all further experiment.

[Dr.-Ing. Hermann Steuding was the main group leader for evaluation in the control and flight technology department BSM / A I (StF) in Peenemünde.]

[The raid was the Operation Hydra bombing attack on Peenemünde by the British Royal Air Force during the night of 17–18 August 1943.]

Figure E.94: Recognition for the first successful flight of the A-4/V-2 rocket on 3 October 1942, including Dr. Wernher von Braun (darkest civilian suit), Captain Heinz Stoelzel (young man in dark uniform standing to the right of von Braun as seen from our perspective), and General Walter Dornberger (in front of von Braun, wearing a hat).

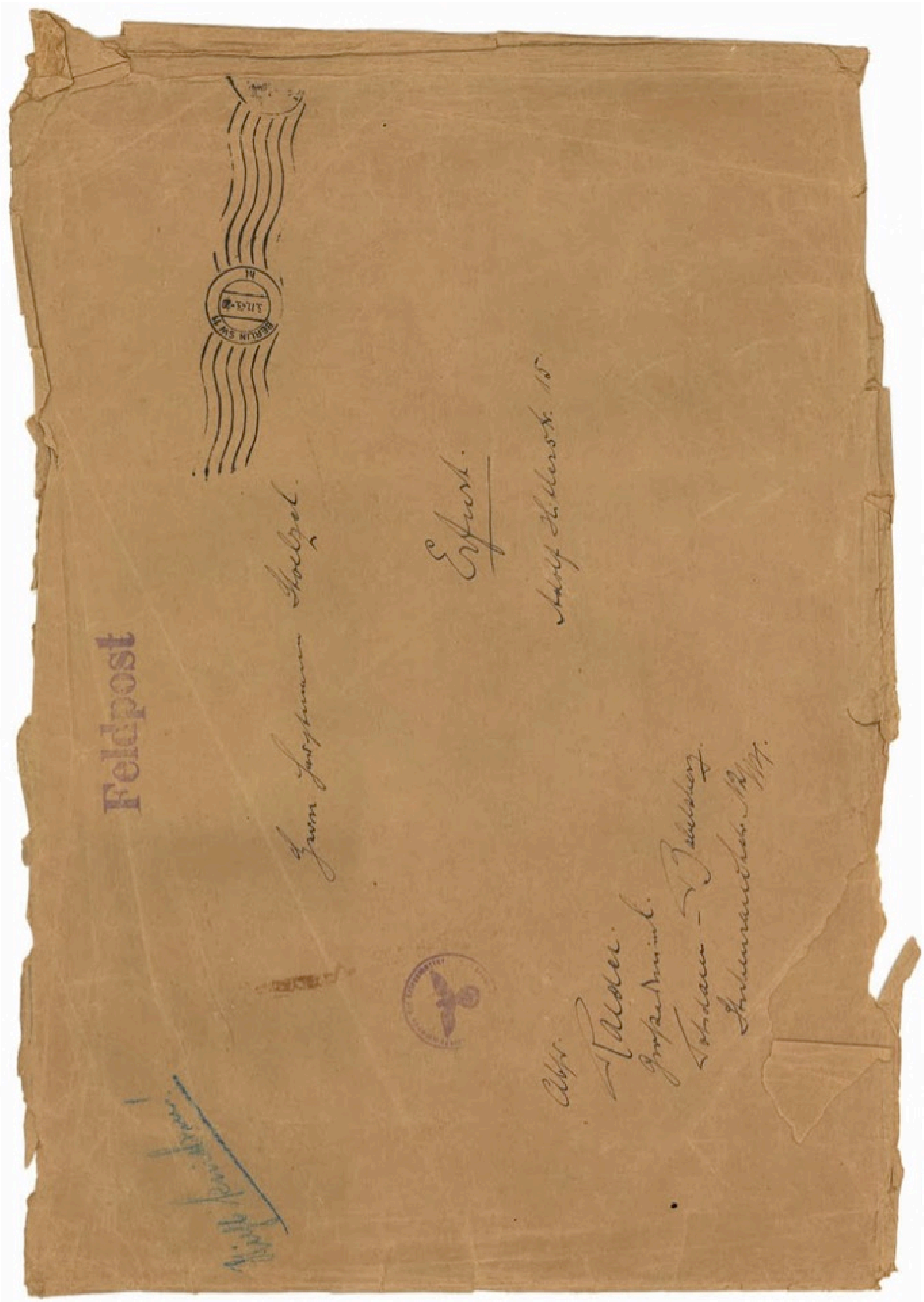


Figure E.95: Envelope addressed to Heinz Stoelzel at Erfurt and postmarked 3 November 1943, suggesting that he may have been engaged in rocket development programs near Erfurt by then.

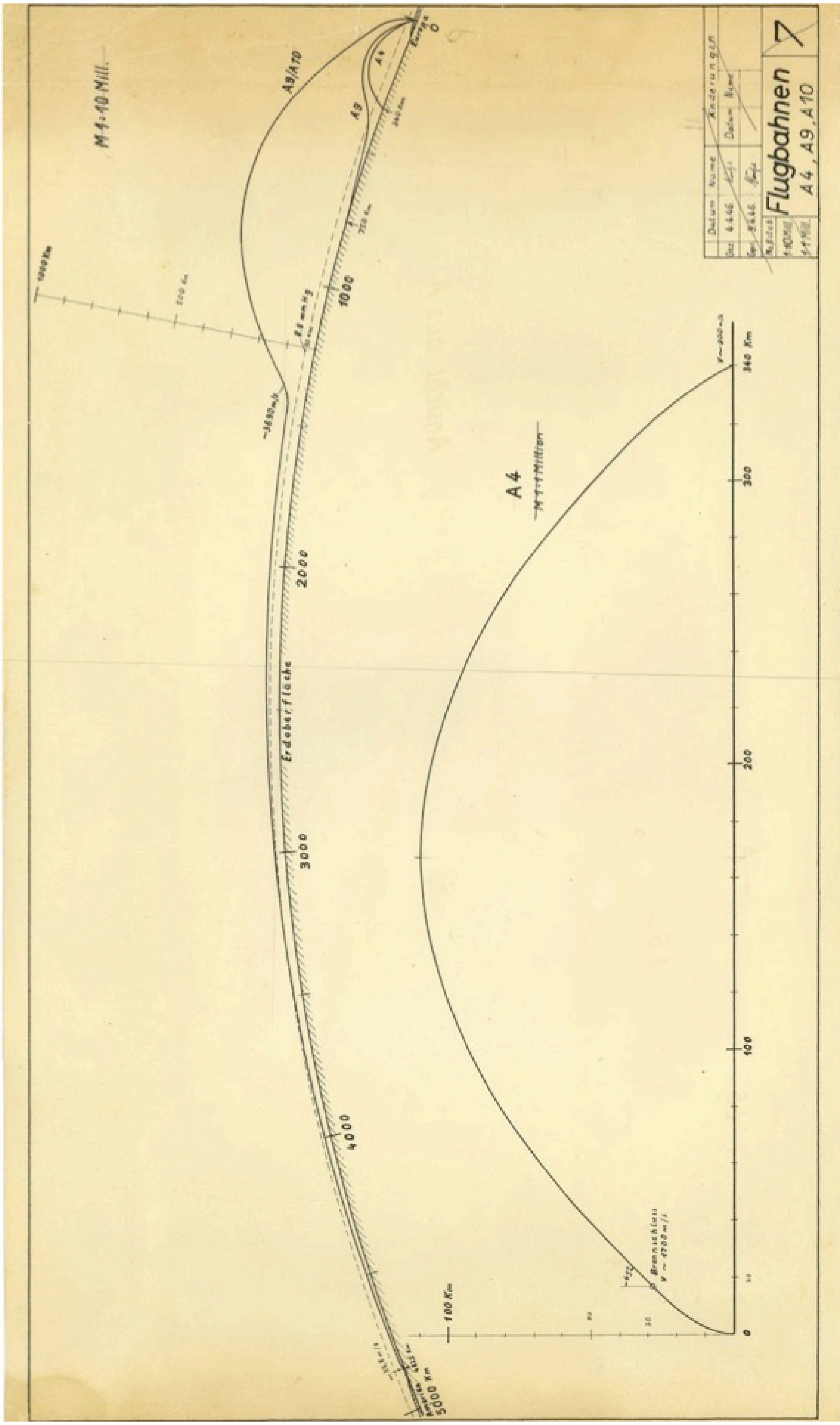


Figure E.96: Planned A9/A10 trajectory hand-copied in 1945 by Heinz Stoelzel.

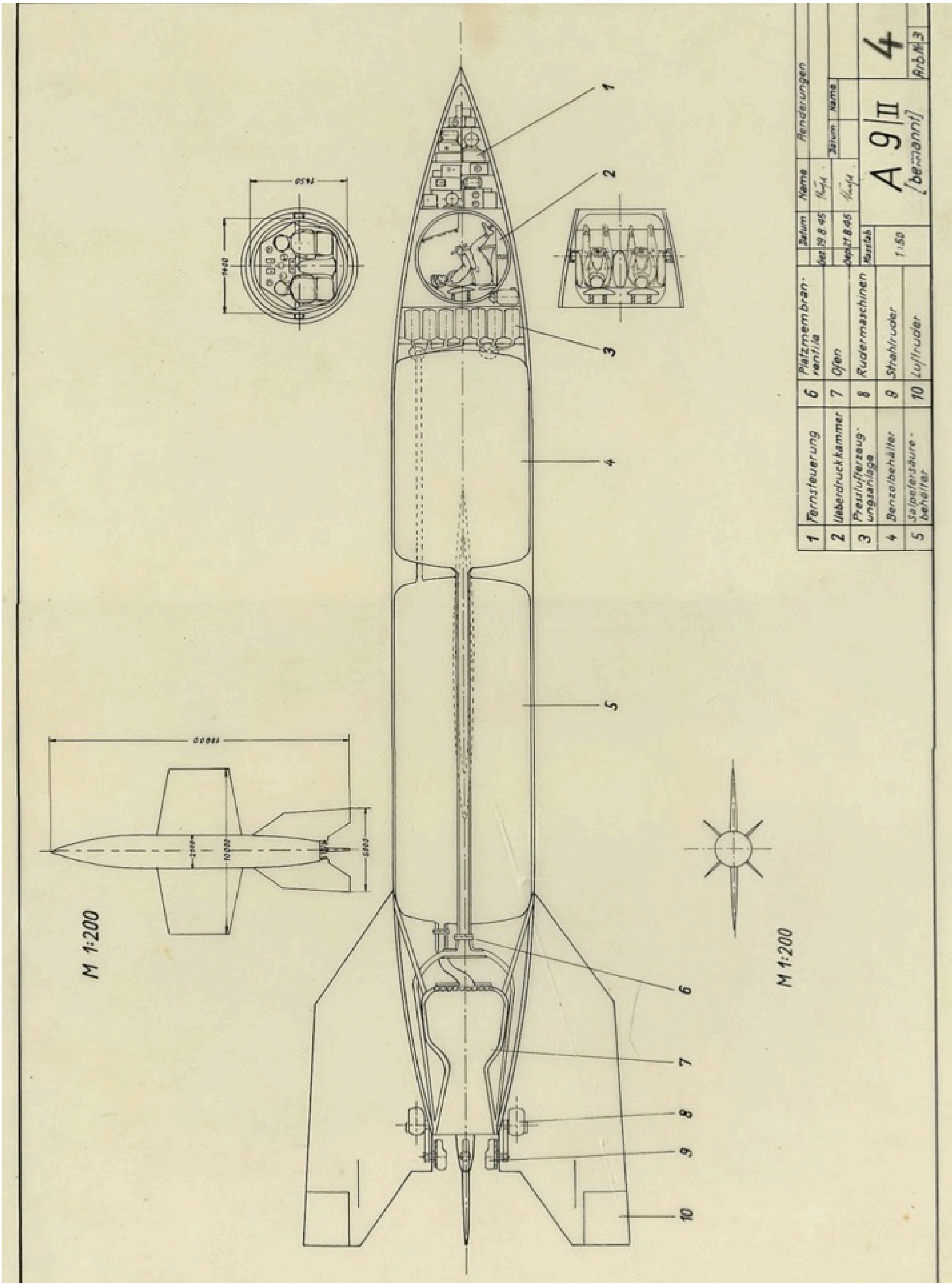


Figure E.97: Design for A-9 upper stage with a two-man crew to be launched into space, hand-copied in 1945 by Heinz Stoelzel. The vast majority of Stoelzel's papers were destroyed after his death, including the A-10 lower stage design if it was in his possession.

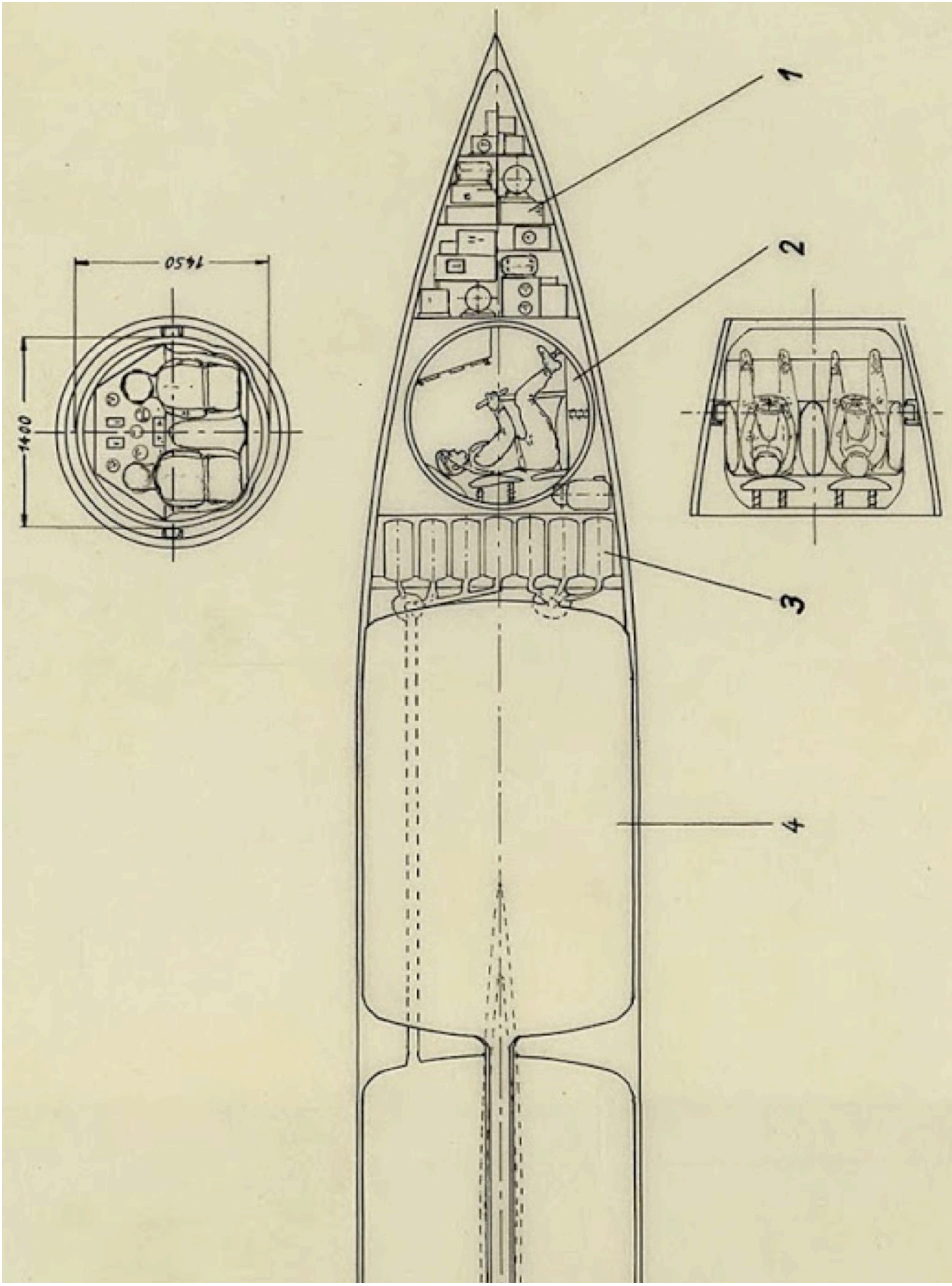


Figure E.98: Detail from Heinz Stoelzel's drawing of the A-9 upper stage showing the two-man crew.

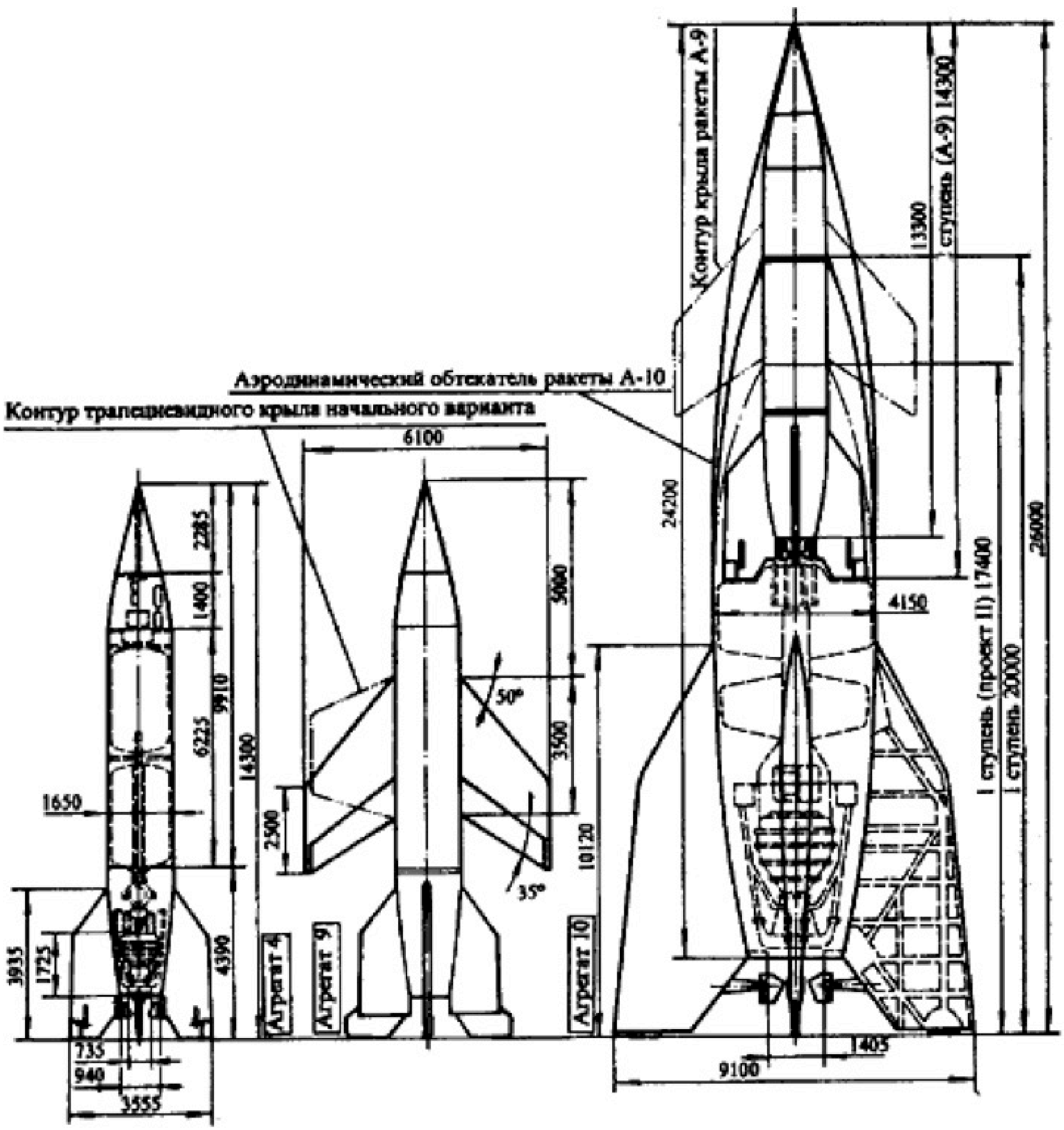


Figure E.99: Russian description of German plans and/or equipment captured in 1945, showing complete intercontinental missile with A-9 upper stage on A-10 lower stage [http://epizodsspace.airbase.ru/bibl/k-r/1998/5/fau2.html].

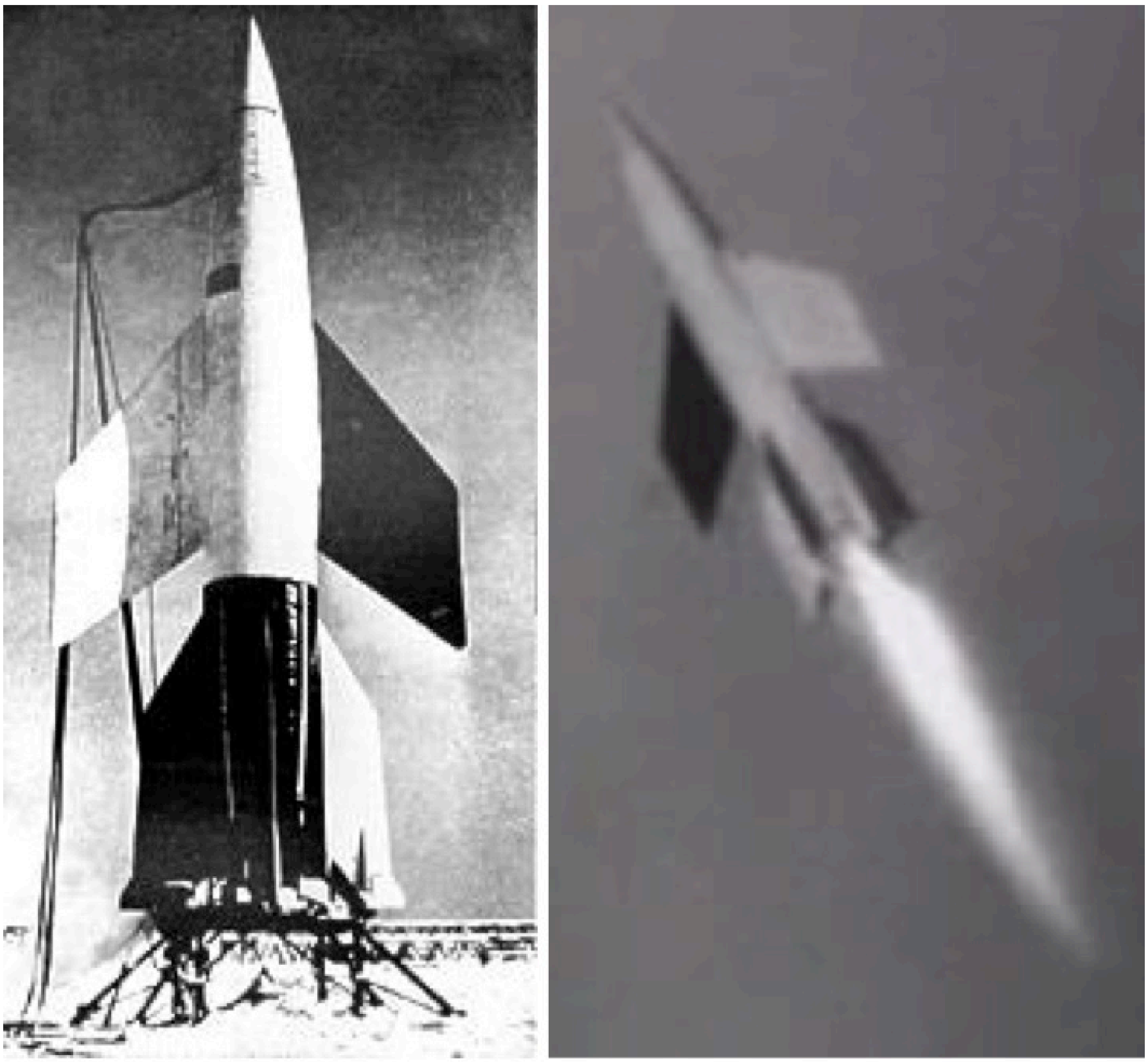


Figure E.100: Test launch of A-9 (A-4b) upper stage (24 January 1945).

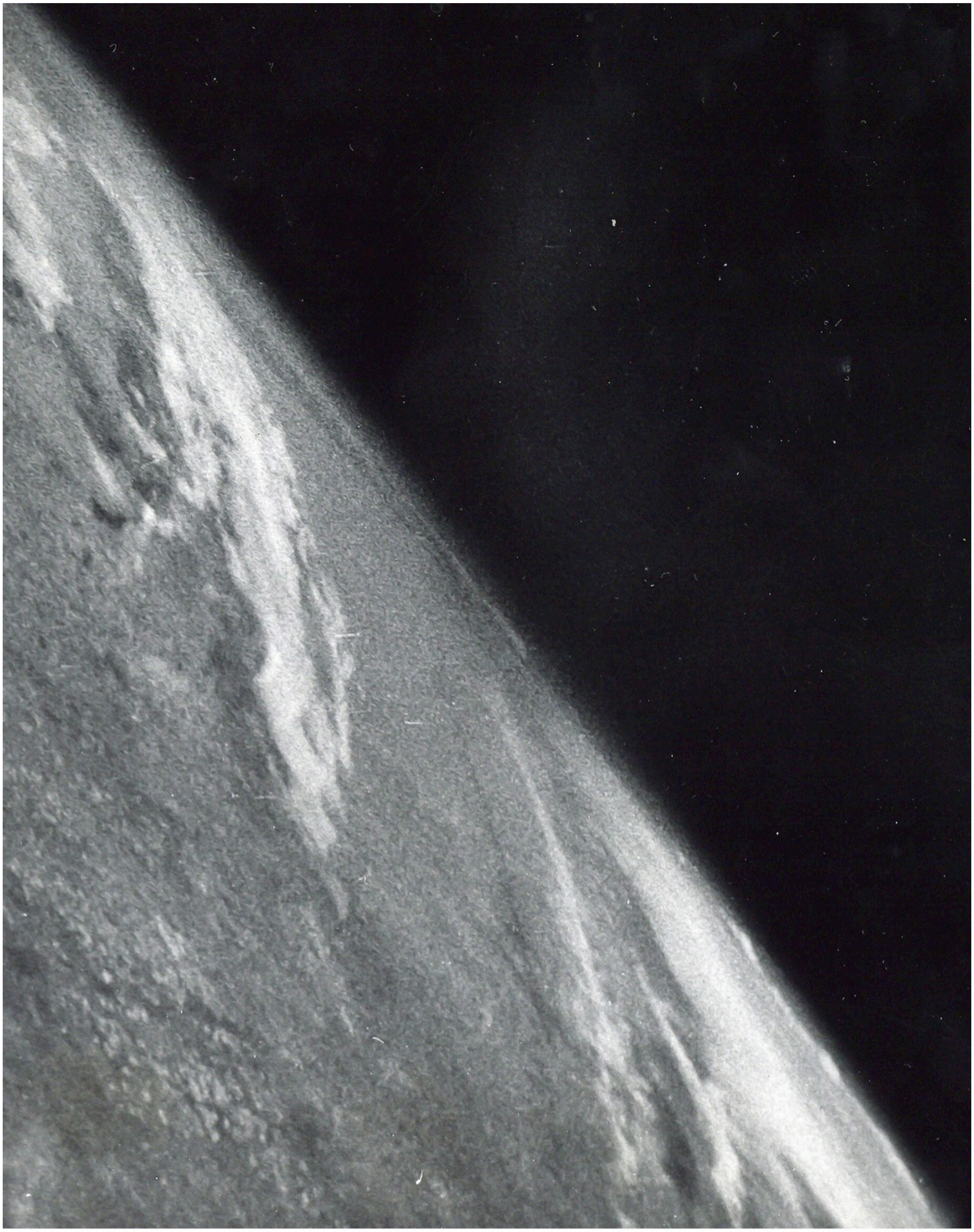


Figure E.101: Photograph of Earth from space, taken using a German A-4 rocket captured and tested by the United States (White Sands Missile Range, 24 October 1946).

CIOS ER 38. *Luftschiffbau Zeppelin—Dir. Eckener.* 25 May 1945. [See also p. 5327.]

[...] DIR. KURT ECKENER was interviewed and gave information:- Luftschiffbau Zeppelin made only the A and B tanks for the A-4, eastings thereto and part of the outer case. The threefold tube casting caused trouble owing to leaks developing.

The tanks were developed by L. Z. who also helped other firms to go into production. One of the main of these firms was Schindler of Kennelbach, Austria, Nr. Bragenz where tanks can probably be found now. DR. VON BRAUN was the Peenemünde representative with whom this firm carried out the development; he gave them an order for tanks of the same diameter but about 20 cm. longer than normal, and about ten of these were made. Some of these should also be available at Kennelbach. In full production 200 pr. of tanks were produced, and 350 bodies. At first they were despatched assembled (but later not) to Mittleberg (werk?) in Harz.

Leichtmetall-Regensburg, Meldewerke-Slesian, Marcus-Berlin also made tanks. The only special tool involved was a welder used on the tanks which is available at the works. All the documents were removed by the French. Herr Zalewski-Neurenborn could give more detail on the tanks and construction. Venturis, Eckener said, were made by Linke-Hoffmann.

The only development of A4 of which Eckener had heard was one of the same size with lateral wings [A-9 or A-4b] which was to have a range of 10,000 Km. and a ht. [maximum altitude] of 60 Km [on an A-10]. One of these had been constructed at Peenemünde. It is possible that this might have been flown by a pilot. One of Eckener's test pilots was exceedingly keen to fly an A4 and had asked him to approach von Braun to suggest this. One of his test pilots had been killed previously flying a V-1. [...]

ZALEWSKI, when interviewed, gave information:-
L. Z. produced only the middle part of the rocket i.e. the tanks and surrounding body. Components to the rear (mainly of ferrous composition) were produced by Linke-Hoffmann of Breslau. Turbines were produced by Walther-Kiel who also with Siemens produced electrical apparatus. [...]

He named ten firms engaged on production of tanks. They were:-

(1) L. Z.—Friedrichshafen.

(2) Austria—Vienna.

(3) Bertram Müller—Weidenein.

(4) Wezel—Uhingen, Nr. Stuttgart.

(5) Marcus—Berlin.

(6) Melder—Freistadt i/e S.

(7) Metallbad—Halberstadt.

(8) Gebrüder Hermann—Köln.

(9) Mittelwerke—Halle.

(10) Schindler—Kennelbach, an associated firm.

Swiss Turning a Deaf Ear to Stories of Nazi Infiltration. *The Swiss Observer* (Journal of the Federation of Swiss Societies in the U.K.) 31 January 1947.
[**https://doi.org/10.5169/seals-686905**]

Reprinted from "New York Herald Tribune."

[...] There has been a great outcry in Switzerland also over the immigration of Captain Heinz Stoelzel, once liaison officer between the army and the German scientists who were working in research laboratories at Peenemünde where the V-2 rockets were developed. Stoelzel is known to be an unrepentant German, and proud of his nation, however he may feel about Nazism. When he arrived in the country last summer he was invited to lecture before the Swiss Federal Institute of Technology.

In his lecture he asserted that Germany was well on its way to perfecting the atomic bomb and then aroused some popular wrath by crying: "Thank God, the Allies did not seriously damage Peenemünde. German research will always continue, and in years to come will make important contributions to science, just as in years gone by." [...]

Cables from the files of Leslie Groves. [NARA RG 77, Entry UD-22A, Box 160, Folder In & Out July 16, 1946–Jan. 1947]

From: Bern Switzerland sgd Harrison

To: State Department

Nr: A 433 — 23 September 1946

Reference is made to the Legation's confidential airgram No. A-423 to the Department of September 11, 1946, copy of which was sent to Berlin, with respect to the German military internee, Heinz Stoelzel, presumed to be identical with the German national of the same name who delivered a lecture at the Swiss Federal Technical Institute at Zurich on V-2 bomb production as reported in the Legation's restricted airgram A-385 of August 19, copy of which was forwarded to Berlin.

As a result of investigations conducted by Mr. Leonard L. Bacon of the American Consulate General, Zurich, it has now been definitively ascertained that the Legation's presumption as to the identity of Heinz Stoelzel is correct. The Consulate General reports that it has interviewed Mr. Pierre Schwaar, the author of the Die Nation article quoted in the Legation's A-385 and that Mr. Schwaar, who attended Stoelzel's lecture, states that it was conducted under the auspices of the Swiss Federal Technical Institute's School of Aerodynamics. Stoelzel was introduced by Dr. J. Ackeret, Head of the School, with the preface that Stoelzel "was a German scientist with practical experience in his speciality of rocket projectiles". The Consulate General conveys Schwaar's impression that Stoelzel treated the subject in a superficial and "popular" manner; that most of his information appeared to come chiefly from American popular magazines; and that Stoelzel endeavored to give the impression that whereas the atom bomb was all very well as a military weapon, the Germans had developed a principle of application of energy which had immediate peacetime uses.

The Consulate General further reports that it has succeeded in obtaining the following highly confidential information from the office of the Zurich Cantonal Fremdpolizei:

"According to the police file, Stoelzel was born on February 2, 1916, in Germany; birthplace and residence unknown. He was a captain in the Wehrmacht and assigned to the rocket-bomb plant at Peenemünde, at an unknown date he came into Switzerland as a deserter and was interned. In March 1946 he was reclassified as a refugee after examination by the Bundespolizei in pursuance of the general policy of transferring military internees from Army control to police supervision. He was then granted a "Studiumbewilligung" or study permit at the Swiss Federal Technical Institute as an expert on rocket projectiles and took up residence in Zurich at 25 Rosslistrasse. The Kantonal Fremdenpolizei received in August of this year from the Police Division of the Federal Justice and Police Department at Bern a letter stating that Stoelzel was to be repatriated to Germany 'immediately'. This has not yet occurred. The Fremdenpolizei had a copy of Stoelzel's lecture and apparently took an interest in his point of view.

The Legation proposes, through the medium of the American representative on the Joint Allied-Swiss Commission established under the Washington Accord, to present Stoelzel's name as a candidate for repatriation by the Swiss Government. In the event that the Swiss Government agrees to this suggestion, the Legation will, if possible, notify promptly the appropriate authorities in Germany in order that a carefully kept supervision of him there may be effected.

With respect to Stoelzel's associates, Lt. Kunick and Capt. Riedl, referred to in the SSU, Bern, report quoted in the Legation's A-423, the Military Attaché has made available to the Counselor of Legation for Economic Affairs copies of reports prepared by his office on April 4 and April 17, 1946. These reports indicate that Riedl vanished from the internment camp at Weesen and presently is living with his American wife at Ascona. Kunick, although nominally still interned at Weesen, makes frequent trips to Zurich where he is seeking employment.

The Legation will continue to report such additional information with respect to these 3 cases as may come to hand.

[...] INFO: AAF, ASW, CAD, P&O, R&D, Gen Groves, [...]

From: Bern Switzerland sgd Harrison

To: Secretary of State

Nr: A 468 16 October 1946

Reference is made to the Legation's secret airgram No. A-433 of September 23, 1946 to the Department, copy of which was forwarded to Berlin, with respect to the German military internee Heinz Stoelzel.

In accordance with the proposal outlined in the reference airgram, the American member of the Joint Allied Swiss Commission has inquired on behalf of all Allied members the position of the Swiss Government with respect to the freedom accorded Stoelzel and other German military internees and the likelihood of his and their repatriation. This request was made at the October 3 meeting of the said Commission. No response thus far has been made by the Swiss member.

The Department will have noted the allusion in the reference airgram to Professor J. Ackeret, Head of the Swiss Federal Institute's School of Aerodynamics, who introduced Stoelzel at the latter's lecture at Zurich on June 28, 1946. The Consulate General at Zurich has indicated its intention to make further inquiries with respect to Professor Ackeret. The Legation has noted that Professor Ackeret's name is No. one on the list of "Suggested Repatriations from Switzerland" dated August 19, 1946, prepared by the Department's Division of Economic Security Controls, recently transmitted to this Legation. Such a listing would suggest that the Department regards Professor Ackeret as a German national. The Legation's information, however, indicates that he is a Swiss national. In this connection, the Legation quotes herewith the following report submitted to the Counselor of Legation for Economic Affairs under date of October 14, 1946 by local office of SSU:

"According to our information Ackeret is a Swiss national but very pro-German and was pro-Nazi. He is the co-inventor of the experimental Ackeret-Keller internal combustion turbine. In conjunction with Keller who is completely under his influence, Ackeret was trying to form a Swiss cooperative research group to work on jet propulsion aircraft. It is believed that this is being done with an eye to future cooperation with Germany because other projects of more immediate profit were being shelved in favor of a scheme which will, at best, not be profitable for years."

"The above information is dated May 1945."

The comments of the Consulate General at Zurich with respect to Professor Ackeret will be transmitted to the Department upon receipt.

[...] INFO: AAF, ASW, CAD, P&O, R&D, Gen Groves [...]

[The *Swiss Observer* and *New York Herald Tribune* reported that Heinz Stoelzel "asserted that Germany was well on its way to perfecting the atomic bomb." What information did Stoelzel have about the German atomic bomb? Did his knowledge come from the fact that he was developing intercontinental rockets to carry such a bomb?

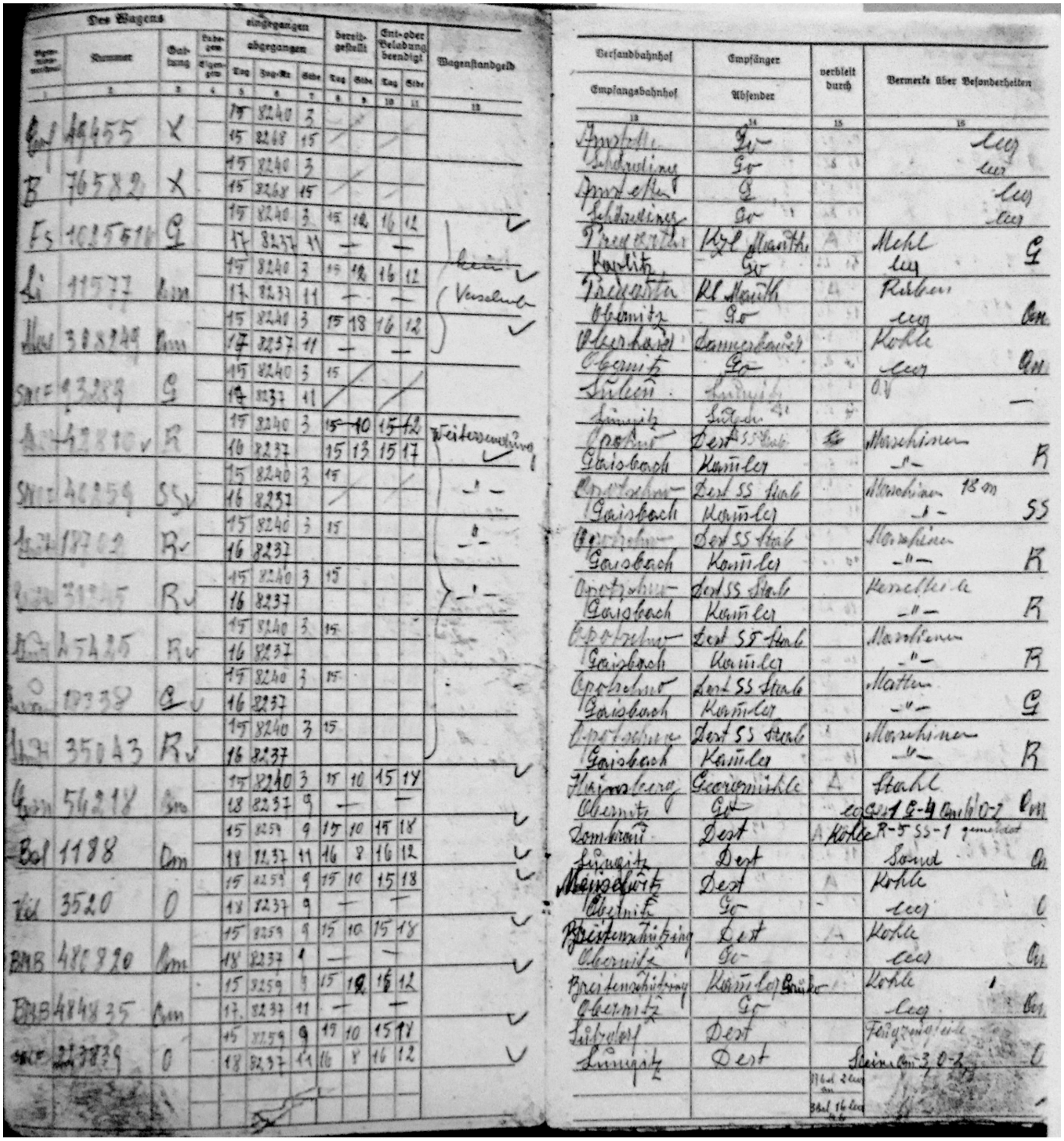
Why was this information on Stoelzel sent directly to the attention of Leslie Groves, where it remains in his files at the U.S. National Archives and Records Administration? Does this incident suggest that Groves knew that there had actually been a German atomic bomb project, and was taking action behind the scenes to ensure that no one (even a lone refugee in Switzerland) spoke out about it?

Essentially all of the other scientists who had been involved in wartime German programs to develop and deliver weapons of mass destruction were employed by and under the tight control of various Allied governments, either in those Allied countries or in Allied-occupied zones of Germany and Austria. Among the knowledgeable alumni of those wartime German programs, Heinz Stoelzel was virtually alone in being free of Allied employment, free of living in an Allied country or an Allied-occupied country, and free to publicly reveal the true facts about how far those wartime programs had progressed. Thus Groves and other high-ranking Allied officials who were aware of the wartime German programs would have viewed Stoelzel as a unique threat.

Note the line in the 23 September 1946 cable: "in order that a carefully kept supervision of him there may be effected." After this incident, Stoelzel did indeed return to Germany, where he apparently kept a very low profile for the rest of his life. His silence from then on may have been enforced by government minders and censors, or it may have been self-imposed to avoid the likely unpleasant consequences.

A corollary to this discussion is that all of the German and Austrian scientists working for Allied countries (or under Allied scrutiny in Germany and Austria) would have been censored by the same sort of "carefully kept supervision" of their public statements for the rest of their lives. Thus it is no surprise that they made so few comments (only the occasional slips) for the rest of their lives about how far the wartime German programs had progressed.

The statements of U.S. officials in these documents do not seem to reflect favorably on them when viewed by a modern reader. Jakob Ackeret (1898–1981) was a Swiss citizen, born in Zurich, and a famous professor of aerodynamics who had been teaching at the university in Zurich since 1931. Despite those facts, U.S. officials claimed that he was a German citizen and made him priority number one on their list of people that the United States was ordering Switzerland to deport to Germany, from whence presumably the United States itself would seize him (and his research). It seems as if the most damning evidence that U.S. officials could cite against Professor Ackeret was that he passed up "other projects of more immediate profit" because he was more interested in working on a much more innovative research "scheme which will, at best, not be profitable for years." Apparently the U.S. officials could not even imagine why someone might prefer to pursue long-term innovative research over short-term non-innovative commercial profit, and were convinced that must mean that Ackeret was part of an evil conspiracy. How common was this mindset?]



A train shipment of "18 m machines" and accessories was apparently personally forwarded by Hans Kammler in St. Georgen an der Gusen, Austria on 15–16 March 1945

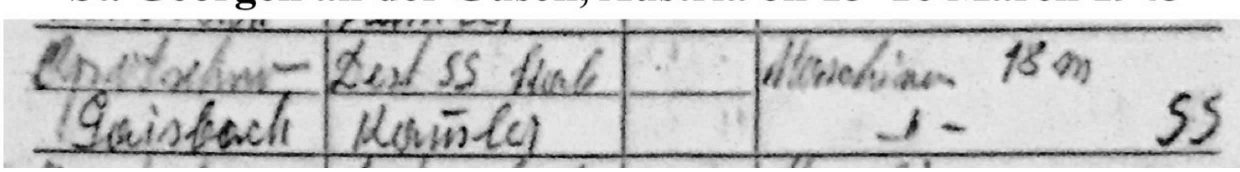


Figure E.102: A shipment of "18 m machines" and accessories was sent by train to the SS staff leadership at DEST (St. Georgen an der Gusen) on 16 March 1945, and apparently personally forwarded by Hans Kammler from there to Gaisbach, Austria on 16 March 1945, as indicated by a logbook of train shipments [Collection Rudolf A. Haunschmied, from St. Georgen an der Gusen train station]. Could these high-priority 18-meter-long machines have been advanced rockets?

Charles R. Christensen. 2002. *A History of the Development of Technical Intelligence in the Air Force, 1917-1945: Operation Lusty.* Edwin Mellan Press. p. 189

Dr. A. Pohlhausen from the Peenemunde Group assisted Northrop Aircraft Company with guidance system for their missile development program. Pohlhausen had worked out the mathematical formula for the motion of a gyroscope under high G-forces. His work was being used to develop a guidance system for the transoceanic A-10 surface-to-surface missile when the war ended.

[See also pp. 2938–2962.

Dr. A. Pohlhausen appears to be Dr. Karl Pohlhausen. For biographical information that is remarkably silent on his wartime work, apart from confirming that his first postwar work was on guidance systems, see: https://www.annualreviews.org/doi/pdf/10.1146/annurev.fl.16.010184.000245

Christensen also cited AFHRA documents [Christensen 2002, pp. 198–199]:

Colonel H. M. McCoy to Commanding General, AAF, Subject: "Effect of Possibly Reduced Funds for Project PAPERCLIP." Letter with Exhibits "A"–"H" dated 12 June 1947 in Air Materiel Command (AMC) History Office. "History of AAF Participation in Project PAPERCLIP, vols. I and II" May 1945–August 1948, dated August 1948, Air Force Materiel Command History Office (AFMC/HO), Boxes 340 and 341, Loose Files attached to reports.

Christensen notes: "McCoy's June 1947 letter with annexes is a full accounting of the support provided to the Air Force from German scientists. Annex 'B,' which is 29 pages long, provides a detailed summary of support given to jet, guided missile, materials, electronics, and aeromedical research by scientific specialists."]

Winston Churchill. 13 May 1945. BBC London.
[https://www.ibiblio.org/pha/policy/1945/1945-05-13a.html]

There was one final danger from which the collapse of Germany has saved us. In London and the south eastern counties we have suffered for a year from various forms of flying-bombs—perhaps you have heard about this—and rockets, and our Air Force and our ack-ack batteries have done wonders against them. In particular the Air Force turned on in good time on what then seemed very slight and doubtful evidence, hampered and vastly delayed all German preparations. But it was only when our Armies cleaned up the coast and overran all the points of discharge, and when the Americans captured vast stores of rockets of all kinds near Leipzig, which only the other day added to the information we had, and when all the preparations being made on the coasts of France and Holland could be examined in detail, in scientific detail, that we knew how grave had been the peril, not only from rockets and flying-bombs but from multiple long range artillery which was being prepared against London. Only just in time did the Allied armies blast the viper in his nest. Otherwise the autumn of 1944, to say nothing of 1945, might well have seen London as shattered as Berlin.

For the same period the Germans had prepared a new U-boat fleet and novel tactics which, though we should have eventually destroyed them, might well have carried anti-U-boat warfare back to the high peak days of 1942. Therefore we must rejoice and give thanks, not only for our preservation when we were all alone, but for our timely deliverance from new suffering, new perils not easily to be measured.

Ernst Krause. Interviewed by David DeVorkin. 10 August 1982.
[https://www.aip.org/history-programs/niels-bohr-library/oral-histories/28022]

DeVorkin: Okay. We're talking about a period that already brings us up into '44 and '45, and I don't want to leave the war years certainly without talking about your second tour to Europe and your interrogation of German scientists. Is this an appropriate time to find out, (a), how you got into it, and (b), what transpired?

Krause: All right. It's a good point in time, yes. What had happened toward the end of the war, and we're now in something like early 1945, spring [...] We went to Garmish Partenkirchen. In fact, we were in Paris, at which point I was joined by a Navy Intelligence officer from ONI, and he and I drove a jeep from Paris to Munich. I was part of the R. Porter group which had been constituted by the Army. Porter was from General Electric and had been working on some Army programs. [...]

In any case, when we went to interview the German technical people in Garmish, the incident that is of interest here is the fact that the intelligence officer said, "Now, don't you technical fellows start talking. We have to soften these people up first. We have experience in this, and let us get them softened up first and then they'll start talking. They won't want to talk initially." We agreed. Our first interview was with three of the Germans, two of whom were technical people. As soon as these three Germans sat down and we sat down at the table, the Germans began talking and talking and talking about what they had developed, what further advances they had on the drawing board, what they could do with the V-2 to improve it, to expand it, to extend its range, to improve its guidance accuracy—all of these things they had worked out in great detail, and they wanted to tell us about it.

DeVorkin: They were not speaking through a translator? You knew German well enough?

Krause: I knew German well enough. We did have a translator present. I understood German well enough so that I didn't really need the translation. In any case, the discussion went on and on. Pretty soon they pointed out that they had on the drawing boards the complete analysis and design for a V-2 which would extend its range to 3000 miles, which I think they called the V-2 A or B.

DeVorkin: The Wasserfall?

Krause: The Wasserfall was one of the German missiles, but as I recall, was not one of the V-2 long range variants. They stated that one of the V-2 design variants included small wings to provide aerodynamic glide on re-entry which would extend its range to 3000 or more miles. With this design it would be possible to set up a launch site somewhere in the state of Washington, and bomb Tokyo.

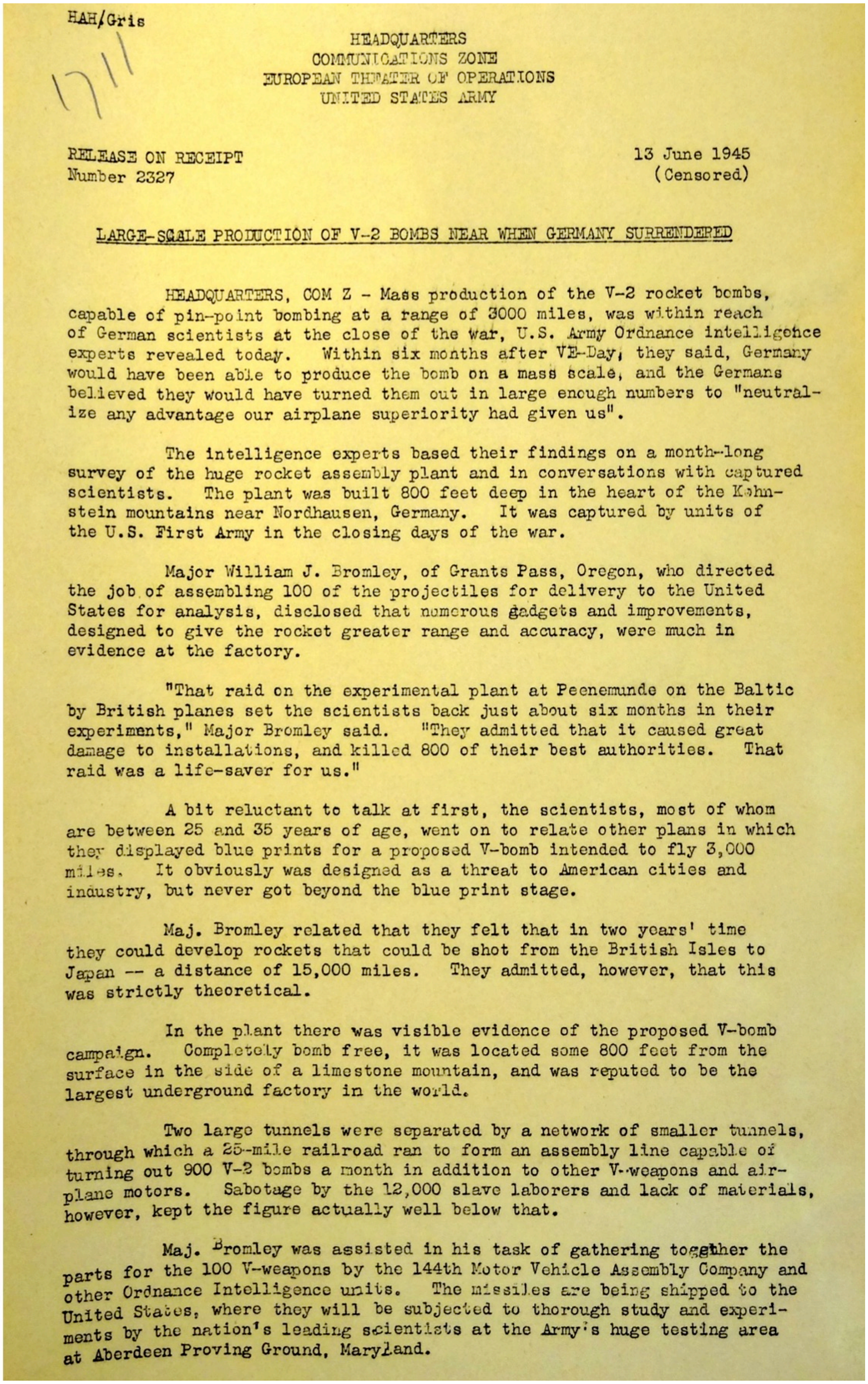
DeVorkin: That, I didn't know.

Krause: They argued that if only the Americans would now get behind us, and take them, the group, to the U.S., they could set this up in so many days, (they'd worked it all out), and they'd bomb Tokyo.

[Although Krause's memory of details is fuzzy after nearly 40 years, his description of the 3000-mile rocket agrees well with archival documents: a V-2 variant with wings, a longer range, and the letters "A" and "B" in the name (A-4b); the 3000-mile range (if used on an A-10 first stage, which was frequently assumed without being explicitly stated in documents); German experts who believed that goal was very close to being achieved; Allied officials who wanted to use as much German technology as possible against Japan in the time between V-E Day and V-J Day; etc.

One key point from this interview is that the German experts proposed to set up a 3000-mile-range rocket "in so many days" so that the United States could quickly bomb Tokyo. That demonstrates that such long-range rockets were already at a highly advanced stage of development (contradicting Krause's claim elsewhere that they were only "on the drawing board").

Another key point is that both the Germans and the Allies involved in Krause's circa May 1945 discussion would have known that the only way it would be even remotely attractive to build and launch a long-range rocket at Tokyo is if the rocket had a nuclear payload. (U.S. planes were already dropping lots of conventional bombs on Japan—why deliver one more the hard way?) The Allied officials in that discussion likely did not know that the United States would soon have its first fission bombs, and they certainly would not have told the Germans. These German engineers would not have known about the Manhattan Project from any other sources. So if the German engineers and the Allied representatives they were talking to were thinking about a nuclear weapon available for near-term use against Tokyo, they would have been thinking about a German nuclear weapon, and one already specifically designed to mount on a rocket.]



HAH/Gris

1711

HEADQUARTERS
COMMUNICATIONS ZONE
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY

RELEASE ON RECEIPT
Number 2327

13 June 1945
(Censored)

LARGE-SCALE PRODUCTION OF V-2 BOMBS NEAR WHEN GERMANY SURRENDERED

HEADQUARTERS, COM Z - Mass production of the V-2 rocket bombs, capable of pin-point bombing at a range of 3000 miles, was within reach of German scientists at the close of the war, U.S. Army Ordnance intelligence experts revealed today. Within six months after VE-Day, they said, Germany would have been able to produce the bomb on a mass scale, and the Germans believed they would have turned them out in large enough numbers to "neutralize any advantage our airplane superiority had given us".

The intelligence experts based their findings on a month-long survey of the huge rocket assembly plant and in conversations with captured scientists. The plant was built 800 feet deep in the heart of the Kohnstein mountains near Nordhausen, Germany. It was captured by units of the U.S. First Army in the closing days of the war.

Major William J. Bromley, of Grants Pass, Oregon, who directed the job of assembling 100 of the projectiles for delivery to the United States for analysis, disclosed that numerous gadgets and improvements, designed to give the rocket greater range and accuracy, were much in evidence at the factory.

"That raid on the experimental plant at Peenemunde on the Baltic by British planes set the scientists back just about six months in their experiments," Major Bromley said. "They admitted that it caused great damage to installations, and killed 800 of their best authorities. That raid was a life-saver for us."

A bit reluctant to talk at first, the scientists, most of whom are between 25 and 35 years of age, went on to relate other plans in which they displayed blue prints for a proposed V-bomb intended to fly 3,000 miles. It obviously was designed as a threat to American cities and industry, but never got beyond the blue print stage.

Maj. Bromley related that they felt that in two years' time they could develop rockets that could be shot from the British Isles to Japan -- a distance of 15,000 miles. They admitted, however, that this was strictly theoretical.

In the plant there was visible evidence of the proposed V-bomb campaign. Completely bomb free, it was located some 800 feet from the surface in the side of a limestone mountain, and was reputed to be the largest underground factory in the world.

Two large tunnels were separated by a network of smaller tunnels, through which a 25-mile railroad ran to form an assembly line capable of turning out 900 V-2 bombs a month in addition to other V-weapons and airplane motors. Sabotage by the 12,000 slave laborers and lack of materials, however, kept the figure actually well below that.

Maj. Bromley was assisted in his task of gathering together the parts for the 100 V-weapons by the 144th Motor Vehicle Assembly Company and other Ordnance Intelligence units. The missiles are being shipped to the United States, where they will be subjected to thorough study and experiments by the nation's leading scientists at the Army's huge testing area at Aberdeen Proving Ground, Maryland.

NARA RG 331, Entry 83D, Box 33, Folder
S.H.A.E.F. Releases (2 folders)/ 1 June 20 June 45

Figure E.103: U.S. Army, 13 June 1945 press release [NARA RG 331, Entry 83D, Box 33, Folder S.H.A.E.F. Releases (2 folders)/ 1 June 20 June 45].

U.S. Army, 13 June 1945 press release [NARA RG 331, Entry 83D, Box 33, Folder S.H.A.E.F. Releases (2 folders)/ 1 June 20 June 45] [See document photo on p. 5401.]

HAH/Gris

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Maj. Bromley was assisted in his task of gathering together the parts for the 100 V-weapons by the 144th Motor Vehicle Assembly Company and other Ordnance Intelligence units. The missiles are being shipped to the United States, where they will be subjected to thorough study and experiments by the nation's leading scientists at the Army's huge testing area at Aberdeen Proving Ground, Maryland.

Gladwin Hill. New York Escaped V-2 Rockets By a 6-Month Margin, Army Says. *New York Times.* 14 June 1945 pp. 1, 5.

PARIS, June 13—The Germans had planned to bomb the United States with V-2 rocket projectiles like those that crashed into London and might have succeeded by November, United States Army Ordnance experts reported today.

German scientists reached the blueprint stage in producing a 3,000-mile bomb that they believed would be accurate enough in destruction to offset our advantage in air power, which was a crucial factor in the Allied victory.

The six-month margin of safety represented by the time between V-E Day and November was provided by the RAF attack on the Germans' experimental plant at Peenemuende on the Baltic two years ago. The Germans said it killed 800 of their leading experts and set their work back six months.

This was the Allies' third escape from big Nazi schemes of destruction which the conquest of the Germans has disclosed.

The Germans had a system of V-1 bases in northwestern Europe that would have demolished London if it had not been disrupted by American bombing. They also had expected within a few months to perfect a bomber capable of attacking New York from Europe.

Purely on the basis of theoretical work, the Germans figured that in two years they could produce a rocket bomb that would go from the British Isles to Japan—15,000 miles—Maj. William Bromley reported.

The Germans' plans were learned during a five-month investigation of an amazing rocket assembly plant 800 feet underground in the Kohnstein Mountains near Nordhausen, Germany, which had 12,000 slave workers, many of them from the odious Nordhausen concentration camp. Sabotage by them, along with a shortage of materials, was credited with keeping production far below the capacity of 900 V-2's monthly, in addition to some V-1's and airplane engines.

The plant, burrowed out of limestone, was composed of two large tunnels connected by a network of smaller ones, with a twenty-five-mile railroad running through them.

The German scientists who described their work were mostly only 25 to 35 years old. One hundred of the V-2's have been assembled and are being shipped to the United States. They will be studied at the Army's Aberdeen Proving Grounds.

[For other newspaper articles based on the same 13 June 1945 press release by the U.S. Army, see:

> V2s with Range of 3,000 Miles: Would Have Been Ready by VE-Day. *Daily Mail* 14 June 1945 p. 1.
>
> "V2" with Range of 3,000 Miles If War Had Gone On. *Manchester Guardian* 14 June 1945 p. 5.
>
> V-2s, to Reach America, Were Nearly Ready. *Daily Worker* (London) 14 June 1945 p. 4.
>
> 6 Months, Foe Might Have "Veed" Toronto. *Toronto Daily Star* 14 June 1945 p. 2.

Construction of standard A-4 or V-2 rockets with a maximum range of approximately 350 km (approximately 200 miles) was ordered in 1939 and pursued with large amounts of funding and personnel for several years before mass-produced A-4 rockets could finally be used militarily starting on 8 September 1944.

This report (based on detailed on-site inspections of German rocket programs) and numerous other Allied and German sources in this appendix (e.g., pp. 5206–5208, 5337–5341, 5352, 5355–5359, 5365, 5398, 5429, 5441–5444, 5452–5455, 5465–5466, 5472, 5479–5490, and 5532) made it clear that mass-produced (not even just prototype) intercontinental rockets with a range roughly 15 times greater than that of the standard A-4 would have been ready by early November 1945, or even sooner without Allied bombing.

Publicly released postwar Allied reports and published history books also claimed that such intercontinental rockets never progressed beyond the paper design phase [e.g., Neufeld 1995, p. 283]. Given that it took over five years from the paper design of the A-4 to the first military use of mass-produced A-4 rockets, well-informed Allied inspectors and German officials could not possibly have expected a far more advanced rocket with 15 times greater range to make the leap from paper design to mass-produced deployed weapon in just six months.

The most plausible explanation for the apparent paradox is that Allied inspectors discovered well advanced hardware development, testing, and/or production programs for intercontinental rockets, but were censored from publicly revealing knowledge of anything more than paper designs.

Indeed, the press release on p. 5402 explicitly indicated that it was censored. Somewhere there must have been (and hopefully there still remains) an original, uncensored version of that press release. What information would it reveal about the mass production of 3000-mile rockets that U.S. Army inspectors reported were months away from striking the United States?

The following pages also give excerpts from some of the published inspectors' reports, which barely mentioned paper designs of advanced rockets and scrupulously avoided any mention of corresponding actual hardware. Those were likely also censored.

Where are the uncensored, full reports by these inspectors? Can they be located and declassified now?]

CIOS XXXII-125. *German Guided Missile Research.* 1945. pp. 5–7. [See pp. 5406–5417.]

A-Series of Missiles.

The complete A-series of weapons had 16 models designated A-0 through A-15. They are all associated with developments up to the V-2 or developments of improvements of the V-2 as it is known to have been used.

[Gives brief descriptions of A0 through A8 missiles]

A9 – Was the result of work on the A6, A7 and A8, and was a V-2 with wings so that instead of following a normal Hyperbolic trajectory, it would glide to earth after reaching a maximum height from the rocket propellant. Its range was increased to about 600-km or about 375 miles. Thus, the projectile could be launched well inside Germany, itself, and still reach England.

A10 – Was an experimental model of an additional thrust unit which was to be fastened to either the A4 (V-2) or the A-9 to give an additional range. It was to carry its own fuel, and when the fuel was completely burned the unit was released, at the same time starting the normal thrust unit in the A4 (V-2) or A9.

["Experimental model" sounds as if it had actually been constructed and tested.]

A-11, A12, A13 & A14 – Were development models of the A9-A10 series attempt—to produce a long range rocket projectile for attacks on the North American continent. The range strived for in these and the A15 model was 3500 miles.

A15 – Was to have been a 3500 mile range projectile using the A9 and A10 developments. This project probably never progressed beyond the drawing board stage.

[Since this comment is made about A15 but not the others, does that suggest that some or all of A10 through A14 had "progressed beyond the drawing board stage"?]

B. V-Series of Missiles.

The V-series of missiles, four known types, two being used by the end of the war in Europe, have been covered by large numbers of technical investigation teams whose reports are available; therefore it was decided that CIOS Team 367 would not make a complete Technical Investigation of them. [...]

V1 – Was a jet propelled ground-to-ground missile which was aerodynamically stabilized. [...]

V2 – Was a rocket-propeled ground-to-ground missile which was not aerodynamically stabilized. [...] At the time CIOS team 367 was at Nordhausen, there were evacuation teams moving complete V2 units back to England (and the U.S.) for study, and firing trials; therefore, very little detailed study was made of the equipment. [...]

V3 – Was a larger version of the V1 with an incendiary warhead instead of the HE as normally used. Very little information is available concerning V3 control systems.

[Although a fourth V missile was mentioned above, it is not given even a brief description here. Was that information censored?]

I. INTRODUCTION.

1. Terms of Reference of CIOS Team 367.

The "Terms of Reference" of CIOS team 367 were the study of Guided Missiles, particularly with respect to their design, and design problems encountered. Further, to study any basic research whose fundamental principles were applicable to the solution of Guided Missile problems, and to study the design of components which were used for Guided Missiles.

2. Exclusions.

Before investigating any target or target areas, the team made a survey of those Guided Missile projects which were either fully exploited, or which were reported to be in the process of exploitation. The following exclusions were decided upon. The V-series of weapons were considered to be in the process of exploitation by adequate scientific personnel to exclude further study by this team, as was Rheintokter, manufactured by Rheinmetal-Borsig. It was further decided that the field of Proximity Fuzes had been exploited by various organizations such as ALSOS, OTIT, and other CIOS teams to such an extent that further study would not be economical except to study those Proximity Fuzes which were associated with actual guided missile targets or to study any basic research encountered whose ultimate application would be Proximity Fuzes.

3. Additional Reports of Associated Investigations.

Many targets were investigated which were only partially Guided Missile targets, and where it was considered that the investigating personnel of this team was capable of thoroughly investigating and exploiting the other projects, a complete investigation of the target was carried out. These associated projects are listed below, and the reports involved are indicated. -

a. The wind tunnel installation at Kochel was investigated by Mr. Paul R. Owen of R.A.E. and a report of this investigation will be issued as an R.A.E. report, a copy of which will be sent to CIOS and to A-2, Electronics Intelligence, USAFE (REAR)

b. A battery which was reported to have very high performance, manufactured by "Martins" on the Elbe, is to be tested under the supervision of Capt. J. W. Giles of A-2, Electronics Intelligence, USAFE, and a report will be submitted to CIOS and to A-2, Electronics Section, USAFE (REAR).

c. An infra-red homing device manufactured by Kepka works of Vienna, the only model completed is now being tested by RAE and TRE, and a report on their findings will be submitted by Mr. R J. Lees of TRE to CIOS and to A-2, Electronics Intelligence Section, USAFE, (REAR).

S E C R E T

- 3 -

Figure E.104: CIOS XXXII-125, *German Guided Missile Research.*

APPENDIX I

A Weapons		V W'pns	Henschel	X Weapons	Flak & Gnd G/M's	Unguided Missiles	Developments
A0 First Model of V-2.	**A8** A-9 Development Model.	**V1** Ground to ground Jet propelled-aerodynamic stabilized projectile.	**HS-293** Models A thru I, see Technical Analysis.	**X-1 or F·X** also known as **PC 1400 - X** Radio or Wire.	**Enzian** E-4 Models I, II, III, IV & V. Technical Analysis.	**Tiafun** see Technical Report.	**MV-1**
A1 V-2 Development// Failure.	**A9** V-2 or A-4 with wings for range of 600 Meters.	**V2** Ground to ground rocket propelled projectile. Length: 40 Ft/Wt:	**HS-294** Models A & H see Technical Analysis.	**X-2** Experimental model - high velocity X-1. Only one built.	**Wasserfall** **C-2** See Technical Analysis.	**Rheinbote** Four-stage ground to ground rocket.	**MF-5**
A2 V-2 Development// Failure.	**A10** Development of additional take-off unit for A-9 or V-2.	**V3** Larger V-1 with incendiary warhead.	**HS-295** See Technical Analysis.	**X-3** Supersonic version of X-[illegible] and X-[illegible].	**Rheintochter** Models I & III, supersonic ground to air missile.	**R100 BS** Air to air rocket-assisted bomb.	**Kurt 1 & 2**
A3 V-2 Development// Failure.	**A11** Development model of A-9 & A-10 for long-range (3500 Mi).		**HS-296** See Technical Analysis.	**X-4** Air to air wire-controlled glide-bomb.	**Komet 2** See Technical Analysis.		**Rochen**
A4 Later known as V-2. V-2 Development.	**A12** Development model of A-9 & A-10 for long-range (3500 Mi).		**HS-297** Forerunner to HS-117. See Technical Analysis.	**X-5** Larger model of X-3 (2½ Ton) for use a[illegible] heavy armor.	**Feuerlilie** Models F-25 & F-55, radio-controlled, fin stabilized, flak rocket.		**L-Series** L-2, L-10, L-11, L-30, L-40, L-50, LT-950: Aerial Torpedoes.
A5 Small V-2 Model// First success.	**A13** Development model of A-9 and A-10 for long-range (3500 Mi).		**HS-298** See Technical Analysis.	**X-6** Same as X-5 with warhead designed to produce blast.	**BV-143** Aerial torpedo glider (Blohm & Voss).		**Pirat-H**
A6 A-9 Development Model.	**A14** Development model of A-9 and A-10 for long-range (3500 Mi).		**HS-117 Schmetterling** Models A-1, A-2 -C & H See Technical Analysis.	**X-7** "Rotkäppchen" Anti-tank weapon, 10 Kg warhead.	**BV-246** F-1 to F-4 Glide bombs (Blohm & Voss).		**Hecht**
A7 A-9 Development Model.	**A15** 3500 Mile range V-2 with glide wings (Never constructed).				**Peter - X**		

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Figure E.105: CIOS XXXII-125, *German Guided Missile Research*.

II. GENERAL DISCUSSION OF GERMAN GUIDED-MISSILES PROJECTS.

1. Appendix 1 to this report is a chart which lists Guided Missiles. This chart is probably not complete but lists most of the types in the German war effort.

A - Series of Missiles.

The complete A-series of weapons had 16 models designated A-0 through A-15. They are all associated with developments up to the V-2 or developments of improvements of the V-2 as it is known to have been used.

The first six A-series models resulted in the V-2 weapon :-

Ao - Was the first attempt to develop a rocket motor whose thrust was sufficient to propel a 13.75 ton projectile. The Ao was never capable of sufficient thrust, however, through the study of the Ao, A1, A2, the small version of the V-2 was developed and became the A5.

A1, A2 & A3 - Were additional attempts to develop the thrust units and fuel for a V-2.

A4 - Development completed after the A5 had been successful. The V-2 was the production model of the A4.

A5 - Was a small version of the V2. It was the first successful attempt at large scale, long range rocket propelled projectiles by Germany. Through the experience gained from the A5 and its predecessors Ao, A1, A2 and A3, the A4 (V-2) was finally perfected.

A6, A7 & A8. - Were experimental developments of the A4 (V-2) with the addition of wings so that the range could be incresed.

A9 - Was the result of work on the A6, A7 and A8, and was a V-2 with wings so that instead of following a normal Hyperbolic trajectory, it would glide to earth after reaching a maximum height from the rocket propellent. Its range was increased to about 600-km or about 375 miles. Thus, the projectile could be launched well inside Germany, itself, and still reach England.

A10 -Was an experimental model of an additional thrust unit which was to be fastened to either the A4 (V-2) or the A-9 to give an additional range. It was to carry its own fuel, and

Figure E.106: CIOS XXXII-125, *German Guided Missile Research.*

- when the fuel was completely burned the unit was released, at the same time starting the normal thrust unit in the A4 (V-2) or A9.

A-11, A12, A13 & A14 -- Were development models of the A9 - A10 series attempt- to produce a long range rocket projectile for attacks on the North American continent. The range strived for in these and the A15 model was 3500 miles.

A15 - Was to have been a 3500 mile range projectile using the A9 and A10 developments. This project probably never progressed beyond the drawing board stage.

B. <u>V-Series of Missiles.</u>

The V-series of missiles, four known types, two being used by the end of the war in Europe, have been covered by large numbers of technical investigation teams whose reports are available; therefore, it was decided that CIOS Team 367 would not make a complete Technical Investigation of them. However, all guided missile work in Germany was related to the developments of these and the A-Series weapons since they were projects which required much research work, the results, in many cases, being applicable to all jet and rocket propulsion problems. Further, the testing of most Guided-missiles was the responsibility of the scientific group at Peenemünde, and their evaluation and ideas were circulated through most of the scientific and development personnel of Germany.

V1 - Was a jet propelled-ground-to-ground missile which was aerodynamically stabilized. It flew at sub-sonic speeds and could be overtaken by an airscrew propelled aircraft. It was launched either from the ground, or from a "mother-plane." Its maximum range was about 350 km, although this depended on wind. The warhead was 830 kg for a range of 250 km but was later reduced to 500 kg for longer ranges up to 350 km. Maximum fuel load was 1000 liters. Speed between 620 and 650 km/hour. Maximum altitude 2500 meters but normal operating altitude was 1000 meters or lower, depending on cloud cover and wind conditions. Overall length 25-ft $4\frac{1}{2}$-ins, wing span 15-ft. The V-1 was gyro-stabalized and compass guided. Except in experimental launchings, no radio or other external control was used. The cut-off time was regulated by the turning of a small airscrew on the nose of the missile.

V2 - Was a rocket-propelled ground-to-ground missile which

Figure E.107: CIOS XXXII-125, *German Guided Missile Research.*

was not aerodynamically stablized. It flew at supersonic speeds. The missile was 45-ft 10-in long and and 4-ft $5\frac{1}{2}$-inches in diameter at the maximum body diameter; however. the tail fins were 11-ft $8\frac{1}{2}$-inches from opposite tips. At the time CIOS team 367 was at Nordhausen, there were evacuation teams moving complete V2 units back to England (and the U.S.) for study, and firing trials; therefore, very little detailed study was made of the equipment. However, in the Technical Analysis Section of this report is a short section on Radio Control of V2. The V2 missile was radio-controlled, especially in its early use. It had gyro-control and time-measurement control.

V3 - Was a larger version of the V1 with an incendiary warhead instead of the HE as normally used. Very little information is av ilable concerning V3 control systems.

C. The Henschel-Series of Guided Missiles.

Henschel's guided missile program was under the scientific direction of Professor Wagner. The series of guided missiles includes about 27 models for a wide variety of purposes and using several methods of control. The models will be listed below, with a brief explanation of their characteristics and reference to their control methods. A more complete explanation of their electrical and control equipment is given in the Technical Analysis Section of this report, The missiles are listed according to their serial numbers so that the evolution of their control systems can be logically followed.

HS-293-V2 - First experimental models 1940/41. Glider without rocket motor. Standard control system employing potentiometers. Lateral control by flaps, elevator control by engine unit. No rudder. Receiver Strassburg E-30. Filter and DC-Amplifier. (Aufschaltgerät Strassburg) Power supply by batteries for 24 and 210-volts. Current approx. 30 Amp. Number of valves: 27. High frequency: "Kehl" - frequency (Approx. 6-m band) Control frequencies: 1000, 1500, 8000, 12000 cycl/sec. Control-stick-contact-frequency: 10 cycl./sec.

HS 293 V3 - Improved experimental model 1941. Rocket motor attached. Wiring and separate apparatus combined in unit. (SAG) 24 volt-supply by accumulator. 210 volts converter. Production begun.

HS 293 Ac - Production model 1942. Improved 293 V3. Later equipped

Figure E.108: CIOS XXXII-125, *German Guided Missile Research.*

(1) Radar Homing Device for HS-293.

The radar homing device was to be mounted on the nose of an HS-293. The aerial system consisted of four separately fed dipoles which were situated at opposite ends of the horizontal and vertical diameters of the nose. Each had a polar diagram which squinted sideways at an angle of about 40 degrees. The aerials were connected alternately to the receiver through a 4-way rotating switch. Signals from shipborne radar are received and smoothed in four separate circuits, and the outputs from the up/down and left/right aerials are fed differentially into the aileron and elevator control circuits. The resulting split polar diagram gives linear indications of target misalignment up to angles of 40 degrees on either side. The left/right control is fed in through the roll stabilising gyro. The latter has two ganged potentiometers on its outer ring which are fed with D.C. from the left and right receiver outputs. When no control is being applied and the missile is flying straight there is no voltage difference between the two sliders. If a gust disturbs the missile, then the voltages on the sliders change in opposite directions and the resulting difference is applied to the aileron servo motor. When a misalignment is recorded, a voltage difference between the sliders is set up and bank is applied until this voltage is again zero. A rate of turn is therefore produced which is proportional to the target misalignment and, apart from delays in the servo system, the missile turns so that the misalignment decreases with time exponentially. In the vertical plane the output voltage difference between the upper and lower dipoles is fed directly to the servo motor driving the elevators.

(2) Coincidence Pulse Fusing System.

The coincidence pulse system of fusing for the HS-239 was for use when the target and the missile were both observed with the Neptune R Gerät. Pulse coincidence by visual observation of the signals on the CRT indicator was too inaccurate and so an automatic method was used. The combined signal was strobed and passed through a delay network which gave a delay of one pulse width. The delayed and undelayed signals were then multiplied and the result was peak rectified. When the two pulses were in coincidence the output from the multiplication circuit was zero, the output changing sign as they passed through coincidence. This output was therefore connected to a balanced relay which sent out the fusing signal as it passed from one pole to the other.

(3) Proximity Fuse.

A.E.G. have developed an electronic proximity fuse which was said to be in mass production. It consisted of a unipole mounted on the nose of a missile, and tightly coupled to a small CW

Oscilator. A second oscilator was also incorporated which ran at a frequency of 800c/s less than that of the first. The beat frequency was obtained in a mixer. In the proximity of an aircraft or other large conducting body the frequency of the first oscilator was pulled by the change of aerial impedance and the beat frequency increased. The latter signal was passed through a 1000 c/s filter the output of which operated the fuse.

Figure E.109: CIOS XXXII-125, *German Guided Missile Research.*

This loss in sensitivity is compensated by simplicity of construction, by absence of distortion and by compactness.

The maximum definition is about 300 lines, being limited by the focus of the electron gun. This tube was designed for mass production, but only a few experimental models were made.

3. Television System for Guided Missiles.

This consists of two units (camera and transmitter) in the missile, and a further two circuits (receiver and indicator) in the controlling aircraft.

All units measure 7" x 7" x $14\frac{1}{2}$". Only the camera and indicator were designed by Fernseh, the radio link being designed by another firm.

In the early models a 441 line interlaced picture was used, the picture frequency being 25 per second (frame frequency 50 per second). This utilized a sinusoidal master oscillator running at about 22 kilocycles. This was followed by a frequency halving stage to provide the line frequency (11 kc) and by three dividing stages (dividing by 7, 7 and 9 respectively) for the frame frequency. Subsequent models dispensed with the interlace and gave a 225 line picture, this change being made for the sake of simplicity and because the receiving cathode ray tube was only 13 cm. in diameter and was not good enough to do justice to higher definition. In this case the master oscillator ran at line frequency (11 kc) and was reduced to frame frequency by three blocking oscillator dividing stages, dividing by factors of 4, 7 and 8 respectively. The picture frequency was therefore 50 cycles.

The pick-up tube used is the super-iconoscope described above. In the early cameras an attempt was made to mount the optical lens on a platform stabilized by a free gyro, in order to stabilise the line of sight of the camera. This was eventually abandoned owing to frictional difficulties and instead, a gyro-stabilized spot of light was superimposed on the picture. This was, in practice, used merely to enable the missile to be headed in the right direction, if the target could not be distinguished in the early part of the flight, and was ignored as soon as the target became visible. While the Fernseh people agreed that it would have been preferable to stabilize the whole picture, it seemed that they did not fully appreciate the advantages of so doing, i.e. the reduction of the effects of drift and steering yaw.

The remainder of the camera follows normal practice, blanking and "blacker than black" line synchronising pulses being injected in the normal manner. The 225 line camera gives no frame synchronising signal, the framing being adjusted manually by the operator at the receiver.

The video amplifier has a gain of 10^4. Its frequency response is flat to 2.5 mc. and then falls to nearly zero at 4.5 mc. The noise output of the tube is considerably below the noise level of the first ampli-

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Figure E.110: CIOS XXXII-125, *German Guided Missile Research.*

fier stage, so that the signal/noise ratio is improved by using a high load resistor on the signal plate. The frequency is corrected by the application of negative feedback.

Negative carrier modulation is employed (a bright signal reduces the carrier level) modulation being effected by varying the cathode potential of a diode shunted across the tuned circuit of the transmitting R.F. oscillator. It is claimed that this rather unusual method permits modulation as deep as 90% with negligible frequency modulation.

The R.F. oscillator is at a frequency of about 430 Mc. and has a power output of above 15 watts. The oscillator valve is a single triode type TU.50/1.

One point of practical interest is the method of stabilising the current in the iconoscope focussing coils. A valve stabilising circuit is employed, with a neon tube as a reference. The voltage of this neon is found to vary to some extent with temperature. To compensate for this, a resistance coil is wound round the neon tube so that it attains substantially the same temperature as the tube. Any temperature variations will have the effect, both of altering the neon voltage, and of altering the value of the resistance. This resistance is inserted at a suitable point in the stabilizer circuit, so that it compensates to a large extent for the variations of the neon.

The Camera is fitted with the following preset adjustments :-

(a) X Centering
(b) Y Centering
(c) Focus
(d) Beam Current
(e) Potential of iconoscope collecting ring.
(f) Line shading
(g) Frame shading.

The power consumption of the camera plus transmitter is 12 amps. at 24 volts. About 200 equipments were made and some are in the hands of CIC in Paris, though most are in Russian hands. The receiver and indicator are of fairly conventional design. As already mentioned there are no frame synchronising signals. The line signal is extracted and the fundamental component is filtered and applied to the suppressor grid of an L.C. oscillator running at the line frequency, thus pulling this oscillator into phase with the line synchronising signal. The oscillator is followed by dividing circuits, identical with those in the camera, which produced the frame signal. The frame signal is phased manually by the operator, and provided the line signals are received continuously the picture should stay accurately framed.

The line oscillators in the camera and in the indicator are designed to be very stable and are temperature compensated. They are both

Figure E.111: CIOS XXXII-125, *German Guided Missile Research.*

adjusted to oscillate at very nearly the same frequency. Thus, if the line signal is interrupted, due to jamming or other causes, there will only be a very slow shift of phase. This is intended to improve the resistance of the equipment to jamming.

The picture quality obtained would appear to be excellent. Some photographs have been obtained of the picture given by the 441 line interlaced equipment. These pictures were taken using the whole equipment, including the radio link, but a large, good quality receiving tube was used. The photographs indicate that the definition was about as good as can be obtained with a 441 line system.

THE TESTING OF THE FERNSEH TELEVISION EQUIPMENT FOR THE HS. 293

1. General

The D.F.S. have been concerned with the testing and installation of the Fernseh television in the HS. 293. Their work falls into three categories, testing the radio link, testing of the camera and testing of the complete missile.

2. The Radio Link

Much trouble has been experienced due to ground reflections providing a secondary transmission path between the missile and the aircraft. Early tests were carried out with the transmitter on the ground and the receiver in the aircraft, and these troubles did not arise. However, when air/air tests were started, the transmitter being carried in a second aircraft, ground reflections had the effect of producing "bars" on the television picture.

Englebrecht was of the opinion that this trouble was largely due to residual frequency modulation being present in the transmitter, although this frequency modulation was probably less then 500 Kc/s. This, however, appears to have been a subject of disagreement as Fernseh were of the opinion that frequency modulation of their transmitter was negligible and that the "bars" were due to changes in the path length difference between the direct and reflected rays. Englebrecht made a crystal controlled transmitter in order to prove his point, but it apparently never got to the stage of being air-tested.

Whatever the cause of the "bars" it appears to have been agreed that the best solution was to reduce the reflected signal as much as possible. Very extensive experimental work was carried out with a variety of aerial systems including an aerial with a very elaborate parabolic reflector on the receiving aircraft. Vertical polarisation was found to give less trouble due to reflections and very satisfactory results were eventually obtained by mounting a four-element Yagi aerial above the fuselage of the receiving aircraft

Figure E.112: CIOS XXXII-125, *German Guided Missile Research.*

(an HE.111) and by mounting a similar aerial aft of the tail of the HS. 293. The receiving aerial was gyro stabilized in azimuth giving the aircraft freedom of manoeuvre.

When the HS. 293 was close to the controlling aircraft, additional fading trouble was experienced due to the fairly sharp vertical polar deagram of the aerial on this aircraft and to the fact that the HS. 293 dropped rapidly soon after release. The picture became steadier, however, after the HS. 293 had been flying for a short while.

After the various troubles had been overcome, ranges of about 110 kms. were obtained using the standard 73 cm. link, the gain of each Yagi aerial being about 4.

An experimental link was made working on 3.5 metres. On one test a range of 263 kms. was obtained with the controlling aircraft at a height of 4,000 metres and the bomb at a height of 1,000 metres.

3. <u>The Camera</u>

Herr Lutz carried out some work on the spectral sensitivity of the Fernseh super-iconoscope. For this work he used an extremely good spectrometer which, using two interchangeable prisms, had a range of 1,500 angstroms to 45,000 angstroms. Unfortunately, this spectrometer was destroyed.

The infra-red iconoscope was found to peak in sensitivity at about 0.9 u and to have an upper limit of about 1.1 u. The blue iconoscope peaked in the blue/green region. Under twilight conditions, The blue tube was found to give a signal about three times as strong as that from the infra-red tube. About 100 lux was sufficient to give a just visible picture using a F/2.8 lens.

Although its sensitivity was rather poor, the infra-red tube was found to give improved contrast and gave a very remarkable improvement under conditions of light haze. On one particular occasion, the maximum range at which objects could be distinguished, using the blue camera, was 1.5 kms. The corresponding range with the infra-red camera was 45 kms. In thicker haze and fog, the infra-red camera gave little improvement.

In general it was found that improved contrast resulted from cutting out the blue components of the picture and a Shott OG.2 orange filter was found to give improved contrast when used with the blue camera, although it caused a three-fold reduction in the sensitivity of this camera.

One trouble experienced with the blue camera, has been due to the presence of ion-spots on the screen, which can easily be confused with the target under certain circumstances, These appeared to

Figure E.113: CIOS XXXII-125, *German Guided Missile Research.*

be absent in the infra-red tube, although this may have been due merely to more careful manufacture.

It is understood that the Fernseh television camera using the infra-red tube was also used in the robot tank.

4. Installation and Testing in the HS.293.

The camera was mounted in a fairing forward of the war-head while the transmitter and power pack was mounted in the fuselage immediately aft of the war-head. The Yagi aerial was mounted aft of the tail

The aerodynamics of the HS.293 were found to be rather unsuitable for use with television owing to the severe yawing and banking resulting from the application of control. An attempt was made to improve this by stabilizing the camera lens by linking it mechanically with "ears" projecting outside the fuselage, but it is believed this effected little improvement.

Dr. Englebrecht had witnessed the testing of seven HS.293's against a wrecked ship near Peenemunde. One of the seven hit the target, the others all falling short. Dr. Englebrecht is of the opinion that the operator was extremely bad and that with a good operator a large proportion of hits would have been obtained. He was none the less of the opinion that this television equipment was wasted in the HS. 293, and had been advocating its use in the project "Beethoven" which was understood to be similar to the American "Weary Willie" project.

NOTES ON A VISIT TO THE FORSCHUNGSANSTELLE DER DEUTSCHE REICHSPOST AT AACH

Persons contacted: Dr. Wunderlich, Dr. Michealis and others.

1. Fernseh Television

The F.A.D.R. have been closely associated with Fernseh in the development of this equipment. They were in possession of a considerable number of the equipments and one camera was demonstrated. Picture quality was extremely good and it was noted that the receiving tube had remarkably good focus and brilliance. A complete HS. 293 fitted with the television equipment was also examined. One point of interest was that the Yagi aerial was fed from the end, not from the centre, as is the usual practice. A resonant feeder was used.

Television for Wasserfall

An interesting television camera of very compact design is being developed for Wasserfall. Apart from the iconoscope only nine

Figure E.114: CIOS XXXII-125, *German Guided Missile Research.*

valves are used.

The frame and line signal are produced on the ground at the receiver, the line frequency being 4,000 c/s. and the frame frequency 10 c/s. The line and frame signal are transmitted to the missile via a fifth tone channel in the E.230 control link. This channel is modulated with a 4,000 c/s. sine-wave, giving the line frequency, and the amplitude of this sine-wave is doubled for a period of 10 c/s., ten times per second, giving the frame frequency. In the missile a five-valve circuit extracts the line/frame signals and produces the time base waveforms for the iconoscope. This is a small in-line iconoscope developed by Telefunken using a semi-transparent mosaic, the signal plate consisting of a very thin layer of silver. It is very similar to the in-line iconoscope developed by Fernseh. The video from the iconoscope is amplified by a four-valve video amplifier about 800 Kc/s. wide and the output of this amplifier modulates a small 1 watt oscillator working in the region 500 - 600 Mc/s.

This arrangement has several distinct advantages. First the more complex parts of the line and frame circuits are on the ground and the synchronising signal passes from ground to air so that if the missile aerial has adequate gain backwards, jamming should have little effect on synchronisation. Also there is no need for the normally fairly complex circuits to add blanking and synchronising pulses to the video from the iconoscope, as this can be done on the ground.

The experimental camera was examined and was found to give reasonably good picture quality, although the 10 c/s. flicker was very objectionable.

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Figure E.115: CIOS XXXII-125, *German Guided Missile Research.*

[Note the quality, quantity, and variety of revolutionary new rockets and missiles listed in the table from CIOS XXXII-125 (p. 5407).

The table says that A15 was "never constructed" but does not make that statement about A10 through A14. Were some or all of those partially or fully constructed? The text of the report uses similar wording that suggests there may have been significant progress on rockets up to A14 (p. 5405).

For more information on both proximity fuses and anti-radar missiles (p. 5411), see Section 6.8.8.

For more information on miniaturized television cameras/transmitters and receivers/picture tubes (pp. 5412–5417), see Section 6.3.9).

For more information on robots with which the miniaturized television cameras could be used (p. 5416), see Section 6.7.4.]

CIOS XXVIII-45. *Investigation of Group 2 Targets in Nordhausen Area.* 1945.

[The mention on p. 12 of this report that Walther Riedel was located in Thuringia and brought to Nordhausen has made some authors wonder if Riedel may have still been at a Thuringian rocket installation other than Nordhausen.

The facts are much more unfortunate. Riedel was "found in a jail in Saalfeld, where U.S. soldiers had knocked out his teeth while questioning him about his alleged development of a 'bacteria bomb'" [Neufeld 2007, p. 206 and note 17 on p. 505 for Neufeld's sources]. Walther Riedel was a noted rocket engine designer, not a bacteriologist. The documented facts of this incident raise questions about both the intelligence and the morality of the U.S. forces operating at this place and time that do not appear to have been addressed in history books.

Of course, that information does nothing to settle questions about whether Riedel may have visited Thuringian rocket installations other than Nordhausen anytime prior to that time.]

Wolfgang Hirschfeld and Geoffrey Brooks. 1996. *Hirschfeld: The Story of a U-Boat NCO 1940-1946.* Annapolis, Maryland: Naval Institute Press. pp. 212–213.

Not long after, the stern lookouts reported the approach of a destroyer on the port quarter. This was the USS *Sutton*, which gave us orders by lamp to head for the Gulf of Maine and ignore all further communications from Halifax. [...]

Dr Schlicke had quietly joined me on the bridge and tossed a few rolls of microfilm into the sea. We watched them slowly sink. 'And there goes the rocket that could fly the Atlantic,' he told me.

Unit History, 28th Air Disarmament Squadron (Prov), August 1945 [AFHRA A0708 frames 0758–0764]

C.I.C. Activity

One day this month a German civilian, a Herr Hering, presented himself at our installation gate and expressed a desire to speak with the Commanding Officer. He intimated that he had information of great value. The interview was granted and the German civilian was taken to Higher Headquarters after the C.O. was satisfied that the man was not "playing possum". As a result of this episode our country has been greatly enriched with pictures, blue prints and plans of Germany's dreaded jet and rocket bombs. To the German they are know as the Vergeltungs Waffe. To the American they are the V-1, V-2, V-3, and V-4. The majority of this squadron were subjected to incessant bombing by the V-1 and V-2 and are quite familiar with the horror and damage they create.

CIOS XXVIII-56. *Rockets and Guided Missiles.* 1945.

[One section of this report is an English translation of a short summary of rocket development written by Wernher von Braun. It provides useful information, although one must bear in mind that it would have been in von Braun's best personal interests to self-censor some details, and also that it would have been standard U.S. government procedure to further censor his account in making the English translation. See pp. 5420–5428.]

SURVEY OF DEVELOPMENT OF LIQUID ROCKETS IN GERMANY AND THEIR FUTURE PROSPECTS

by Prof. W. von Braun.

We consider the A.4 stratospheric rocket developed by us (known to the public as V-2) as an intermedicate solution conditioned by this war, a solution which still has certain inherent short comings, and which compares with the future possibilities of the art about in the same way as a bomber plane of the last war compares with a modern bomber or large passenger plane.

We are convinced that a complete mastery of the art of rockets will change conditions in the world in much the same way as did the mastery of aeronautics and that this change will apply both to the civilian and the military aspects of their use. We know on the other hand from our past experience that a complete mastery of the art is only possible if large sums of money are expended on its development and that setbacks and sacrifices will occur, such as was in the case in the development of aircraft.

A few private groups of inventors started serious work on liquid rocket development in Germany in the years 1929-1930. One of hese groups, called "Rocket Flying Field Berlin", located at Berlin-Reineckendorf, had Prof. Dr. von Braun as a student among its members. Simple fundamental tests with rocket combustion chambers were carried out there, and small uncontrolled liquid rockets were fired, which reached heights up to 1,000 meters, and landed by means of a parachute. At the end of 1932 the work of these groups were slowed down by lack of cash, but the Army Weapons Department was interested in carrying on the work, and took over the services first of Prof. von Braun, and later of most of the other engineers.

This special division of the Army Weapons Department was put under the direction of Dr.Ing. h.c. DORNBERGER, and the first rockets developed by them were designed solely for experimental purposes, and were of no military value. In 1934, liquid rockets of the "A-2" type were successfully tried out. They had a thrust of 300kg., were directly stabilized by means of a large gyro, and reached a height of approximately 2,000 meters. In 1938 the first trials were carried out with liquid rockets of the "A-3" and A-5" types, which were fitted with an automatic control system and rudders in the gas stream. These rockets reached a height of

Figure E.116: CIOS XXVIII-56. *Rockets and Guided Missiles.*

12km when fired vertically, and had a range of 18km when fired at an angle. They could land in both cases by means of parachutes, and be used again.

In view of the successful results achieved with liquid rockets, it was decided in 1936 to begin with the construction of a large experimental establishment for rocket development at Peenemunde on the Baltic. It was already recognized at that time that the development of rocket showed great promise in the field of aeronautics as well as in that of artillery, and it was therefore decided to build two separate establishments at Peenemunde, one for the Army and one for the Air Force, which are two distinct branches of the "Wehrmacht" in Germany. At Peenemunde-Ost, comprehensive test beds and work-shop facilities were set up for the construction and testing of rocket drives and controls, whilst at Peenemunde-West an airfield was built for testing rocket aircraft, and pilotless rocket propelled aircraft, as well as auxiliary drives for standard aircraft, such as rocket assisted take off devices. The cost of construction of the complete installation at Peenemunde totalled approximately 300,000,000 Marks after completion. This close proximity of the rocket development work to the aeronautical development side is one of the principal reasons for the success of the work undertaken at Peenemunde.

The following considerations were decisive in the choice of Peenemunde, and these considerations will always be important when choosing a site for rocket development work.

a) Secluded position, far away from large towns (Safety during launching, nuisance caused by noise of large test beds).

b) Favourable weather conditions (during firing and flight trials of rocket and rocket aircraft blue skies are always desirable).

c) Reasonably satisfactory communications. The development work necessitates constant close contact between development engineers and certain branches of industry.

The successful experimental rocket "A-5", previously mentioned had a thrust of 1500kg lasting 45 seconds. Basing on the results obtained with the rocket, the order was given to develop a long distance rocket with a range of 250km., as high an accuracy as possible, and a warhead weighing 1,000kg. This rocket, known as "A.4", was first

Figure E.117: CIOS XXVIII-56. *Rockets and Guided Missiles.*

launched successfully in October 1942. The "A.4" has a thrust of 25 tons, for combustion period of 68 seconds max. It is fired vertically from a firing table, without guides of any sort, as was the case with all the previous rockets. The steering of the rocket to an inclined position is effected by means of a "programme" apparatus. The lateral direction is determined by the exact setting of a turn-table on the firing table. The exact range is determined by shutting off the propulsion unit upon reaching a previously calculated speed.

The development of the "A.4" required a great number of preliminary scientific investigations, the most important of which are briefly outlined below:

a) Wind tunnel tests at all ranges of air speeds between 0 and 1500 meters per second. During these tests, such factors as the stability of the rocket, the distribution of the air pressure, the working of the rudders and several moves were investigated, apart from the drag measurements, both with and without exhaust gas stream. Both the supersonic wind tunnel and the measuring methods had to be developed over a period of years of hard work.

b) Test bed investigations on the combustion chamber of the rocket, and on the complete propulsion unit. This too necessitated the development of appropriate test beds and measuring methods.

c) Investigations connected with the steering of the rocket at all ranges of airspeeds covered by the rocket. For this purpose, a special technique of models, reproducing the attitude of the rocket in flight, was developed.

d) Development of measuring methods for plotting the complete flight path of the rocket.

e) Investigation connected with the influence of the exhaust gas stream on the wireless communication between rocket and ground, etc.

In view of the increasing strength of the numbers of flight aircraft in England, and the resulting increased losses of bombers operating against England, orders were given at the end of 1942 to produce the "A.4" rocket in quantities. The accuracy of aim was still unsatisfactory,

Figure E.118: CIOS XXVIII-56. *Rockets and Guided Missiles.*

and limited the use of the rocket to large area targets, foremost of which was London. Nevertheless, some 60 to 65,000 drawing modifications were required before the first experimental "A.4" rocket became a real series production job. This indicates how many absolutely new problems arose during the trials of the "A.4", which was subjected to hither unknown physical conditions.

Meanwhile the development side was attempting to improve the accuracy of aim of the rocket. To this end, radio guide beam devices were developed to improve the lateral direction; and improved propulsion unit out off devices to reduce the dispersion in range. These improvements however were incorporated operationally on a small scale only, and were in use chiefly in the attack on the harbour at Antwerp.

The original objective of further development was to produce long distance rockets of greater range. It should be noted here that the maximum ranges up to 480km. were achieved thanks to certain improvements, which however never came into operational use.

Certain A.4 rockets were used to carry out vertical trajectory trials, and a maximum ceiling of 172 km was reached during these trials.

It was planned in the spring of 1945 to fire vertically from an island situated near Peenemunde a few A.4 rockets equipped with special instruments for research into the top layer of the atmosphere. The measuring instruments were put in a watertight container capable of floating, which was to have descended by parachute. This project, all preparations for which were completed, could not be carried out on account of military events. It could be done in a short time however, with some of the A.4 rockets still in hand.

The problem of increasing the range of the A.4. after completion of the A.4 development programme could only be carried on at a greatly reduced rate, as the development of a guided anti-aircraft rocket was given first priority and absorbed much of the personnel, in consequence of the increasing air superiority of the Allies. A rocket for this purpose was developed at Peenemunde, bearing the code name "Wasserfal". This rocket was also propelled by liquid fuel, and could be guided by radio from the ground on to flying targets. Various successful tests were carried out, but series production of the weapon was not achieved.

Figure E.119: CIOS XXVIII-56. *Rockets and Guided Missiles.*

A further development of the "A.4" long distance rocket is the "A.9", on which work was done as far as the priority work on "Wasserfal" would allow. The propulsion unit was the same as for A.4. The A.9. rocket however had wings, which enabled it to glide through the stratosphere. This enables the flight path to be increased to such an extent that the range of the A.9 was nearly double that of the A.4, v.e. approx. 600km., notwithstanding the fact that the fuel consumption of the A.9 was no greater than that of the A.4 owing to development could not be completed on account of the end of the war. Special control devices would have given the A.9 at least the same accuracy as the A.4. It was proposed that the weapon should go into a vertical dive at the end of the glide, similar to that of the V.1.

As a further development, it was intended to design the A.9 winged rocket to carry a crew. For that purpose the rocket was to be equipped with a retracting undercarriage, a pressurized cabin for the pilot, manually operated steering gear for use when landing, and special aerodynamic aids to landing. The landing speed of this piloted A.9 rocket would have been as low as 160km per hour, as it would have contained very little fuel on landing, and would consequently have been light. This piloted A.9 rocket would cover a distance of 600km in approx. 17 minutes.

The range of the A.9, both in the piloted and the pilotless versions, could be increased considerably if the propulsion unit were switched on only after the rocket had attained a certain initial velocity. There were two possible ways of achieving this end.

1) Use of a long catapult with only a slight gradient, which would have given the rocket an initial velocity of approximately 350m/sec. There was experience of this type of catapult to hand at Peenemunde, as such a catapult developed by an industrial firm for launching the V.1, was tried out at Peenemunde. Experience showed that catapults could be built for launching at supersonic speed. These high speeds are essential for rockets such as A.9, because the rocket is completely filled with fuel at the start and would not fly if it left the catapult at lower speeds.

2) Development of a large assisted take off rocket of 200 tons thrust, on which the A.9 rocket would be mounted, and which would give the latter an initial velocity of 1200 meters per second. After the

Figure E.120: CIOS XXVIII-56. *Rockets and Guided Missiles.*

assisted take off rocket has exhausted its fuel, the A.9 would become separated from it, and its own propulsion unit would be switched on. The maximum speed of the A.9 at the end of its power drive under these condition would be approx. 2800 meters per second, which would mean that this combination could give the A.9 a range of approx. 5000 km., both in the piloted and the pilotless versions. The large assisted take off rocket, called A.10, was to be equipped with air brakes and a special parachute, which would have enabled it to be used again after alighting on water.

It was proposed to launch the A9/A10 combination vertically this obviating the necessity of erecting large ground launching devices.

In the more distant future, the development of liquid rockets offer in our opinion the following possibilities, some of which are of tremendous significance:

1) Development of long range commercial planes and long range bombers for ultra high speeds. The flight duration of a fast rocket aircraft going from Europe to America would be approx. 40 minutes. It would even be possible to build very long range bombers, which would turn round at supersonic speeds in a very wide curve after having released their bombs, and return in and glide to land at their point of departure. The high speed of such aircraft would make defence against it ineffective with present day means.

2) Construction of multistage piloted rockets, which would reach a maximum speed of over 7500 meters per second outside the earth's atmosphere. At such speeds the rocket would not return to earth, as gravity and centrifugal force would balance each other out. In such a case the rocket would fly along a gravitational trajectory, without any power, around the earth in the same way as the moon. According to the distance of the trajectory from the earth, the rocket would complete one circuit around the earth in any time between 1 1/2 hours and several days. The whole of the earth's surface could be continuously observed from such a rocket. The crew could be equipped with very powerful telescopes, and be able to observe even small objects, such as ships, icebergs, troup movements, constructional work etc. They could

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Figure E.121: CIOS XXVIII-56. *Rockets and Guided Missiles.*

also carry out physical and astronomical research on problems which could only be tackled at that altitude, due to the absence of the atmosphere. The importance of such an "observation platform" in the scientific, economic and military spheres is obvious when the crew of the rocket want to return to earth, all they need to do is to reduce the speed of the rocket slightly, which can be done by rocket propulsion. The rocket then entered the upper layers of the atmosphere tangentically, and its speed is gradually reduced by friction. Finally it can land like an ordinary aeroplane by means of wings and auxiliary gear. It would also be possible to relieve the crew and provision the "observation platform" by means of another rocket, which would climb up to the platform and pull up beside it.

3) Instead of having a rocket set up an "observation platform" outside the earth, it would be possible later on to build a station specially for the purpose, and send the components up into the interstellar spaces by means of rockets, to be erected there. The erection could be easy, as the components would have no weight in the state of free gravitation. The work would be done by men who would float in space, wearing divers suit, and who could move at will in space by means of small rocket propulsion units, the nozzles of which they would point in the required direction.

4) According to a proposal by the German Scientist Prof. Oberth, an observation station of this Type could be equipped with an enormous mirror, consisting of a huge net of steel wire on to which thin metal foils could be suspended. A mirror of this nature could have a diameter of many kilometers, and its component facets could be controlled by the station which would enable the heat and light of the sun to be concentrated on selected points of the earth's surface. This would enable large towns for instance to get sunlight during the evening hours. The weather, too, can be influenced by systematic concentration of the sun's rays on to certain regions. Rain could be induced to fall on regions hit by drought, by concentrating the sun's rays on to distant lakes and seas, and increasing their evaporation. The clouds thus formed could be driven to the required spot by influencing the centres of low and high

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Figure E.122: CIOS XXVIII-56. *Rockets and Guided Missiles.*

pressure through radiation from other facets of the mirror. If the mirror is made large enough, and it could be of extremely light construction, it would even appear possible to generate deadly degrees of heat at certain spots of the earth's surface.

5) When the art of rockets is developed further, it will be possible to go to other planets, first of all the moon. The scientific importance of such trips is obvious. In this connection, we see possibilities in the combination of the work done all over the world in connection with the harnessing of atormic energy together with the development of rockets, the consequence of which cannot yet be fully predicted.

To conclude, we think after what has been said above, that a well planned development of the art of rockets will have revolutionary consequences in the scientific and military spheres, as in that of civilization generally, much in the same way as the development of aviation has brought revolutionary changes in the last 50 years.

A prophecy regarding the development of aviation, made in 1895 and covering the next 50 years, and corresponding to the actual facts, would have appeared at least as phantastic then as does the present forecast of the possibilities of rocket development.

In the same way as the development of aviation was not the work of a single man, but became possible thanks to the combined experience of many thousands of specialists, who concentrated exclusively on this one branch of science for years, so the development of the art of rockets will require a systematic effort by all specialists who have gained experience on this subject.

Figure E.123: CIOS XXVIII-56. *Rockets and Guided Missiles.*

PROJECTILES SERIES "A" (LIQUID OXYGEN AND ALCOHOL)

NUMBER	YEAR	DIA. CMS	LENGTH M.	THRUST KG	TOTAL WT	FUEL	POWER TIME SECS	NOTES
1	1933	30	1.4	300	150	40	16	Directly stabilized by one large gyro (weight 40Kg) in the nose. Never launched. Many difficulties. N_2 expulsion. Intended to launch from a table vertically. S.I. 143
2	1934	30	1.4	300	150	40	16	As in A.1 but gyro placed in the centre. Successfully launched to 2000 metres. Launched vertically from table. S.I. 143
3	1938	75	7.6	1,500	750	450	45	Shape similar to A.4, launched vertically from table. Auto steering and rudders in gas stream. Did not obtain supersonic speed. Reached 1200m. in height. S.I. 167
4	1940 1942	1700	14	25,000	12,500	8000	68 max	Range 250 Kms. Warhead 1000Kg. Propam motor to bend over the trajectory. Vertical launch. Bearing from launching table. Range by fuel cut off. S.I. 208
5	1938	75	7.6	1,500	750	450	45	Experimental unit. Prototype of A.4. First model to use graphite blades. Could be landed by parachute and used again. Maximum range with slanting launch 18 Kms.
9	1945	1700	14	25,000	13,000	8000	68 max	As A.4 but with wings permitting a guide in the stratosphere. Total range increased to about 1600 Kms. Same accuracy as A.4 Vertical dive at end of glide. Also one man crew so retractable undercarriage. Pressure cabin and hand control for landing at 140-160metres/hr. 80% of construction as in A.4.
6								Designed but not constructed. A.5 did not reach supersonic speeds. Design modified to give higher speed and considerably different from A.5 so given new number.
7	1941	75	7.6	1,500	800	500	45	Designed only. A.5 plus wings. Launched horizontally from aircraft to obtain experimental data.
10		350	8	200,000	87,000	62000	50	Project only. Calculations completed for a unit to be used as a starting device for A.9. When A.9 and A.10 reach 1200m/sec, A.10 is jettisoned and descends by parachute. A.9 continues and reaches an "all burnt" velocity of 2800m/sec. Then A.9 glides. Total range A.9 + A.10 = 5000km.
								GARMISCH 23.5.45.

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Figure E.124: CIOS XXVIII-56. *Rockets and Guided Missiles.*

NavTechMisEu 237-45. ***Survey of German Activities in the Field of Guided Missiles.*** **August 1945. [NARA RG 38, Entry P5, Box 38]**

[...] It must be borne in mind that the magnitude of the Germans' basic research program was tremendous and that it was equally thorough for all types of controlled missiles. Once they realized the defensive potentialities of various types of this new weapon, a program was inaugurated, which if given six more months uninterrupted time, might well have resulted in the achievement of what had become a basic policy: to drive bombers from the sky at altitudes below fifty thousand feet. [...]

The FX and Hs missiles were predicated on the assumption that the Luftwaffe would maintain air supremacy and while this condition existed they were used to good advantage. Contrary to popular idea, that the Allies succeeded in effectively jamming the radio control used in these missiles consequently arresting their use, the contributing evidence from enemy operational and developmental personnel is definitely negative. [...]

With the increase in Allied air power, Axis interest began to focus on the development of controlled anti-aircraft missiles. This interest grew rapidly and a highly competitive development program for AA missiles expanded with the steady increase of Allied aerial might until at one time in 1943 there were under development in Germany 48 different anti-aircraft missiles. [...] 12 were to be carried through to full development for operational use. [...]

The V-1 was the first long range missile operationally used as a self-controlled, non-piloted guided or controlled weapon. It is estimated that over 20,000 of these were used against the Allies. [...]

During this same period, the development of the A series, i.e., V-2 missiles, for supersonic speed ranges was carried on in spite of continual handicaps caused by Allied bombings. A large modern well-equipped missile development and testing center was established at Peenemünde on the Baltic Sea. This station which cost 300 million gold marks for the initial installation was started in 1936 and was reported in operation in 1937. [...] After the expenditure of a tremendous amount of money and energy on this project, the A-4 missile went into operational use in 1944. It is estimated that 3000–5000 of these missiles were built.

To increase range, the A-4b was made by the simple addition of wings to the A-4. This approximately doubled the A-4's range. With the ultimate operational range in sight for the A-4b, design work was immediately started on more radical weapons. There is little of humorous nature in the statements so often heard that the Germans intended to bombard New York from launching sites in Europe, as two missiles, the A-9 and A-10, were under development for use against the U.S. in the early months of 1946. This contemplated use was scientifically possible and undoubtedly would have been realized had time permitted.

The German guided missile program during the last stages of the war provided for development of every conceivable basic type, one classification of which follows:

(a) Surface launched to air targets.

(b) Air launched to air targets.

(c) Air launched to surface targets.

(d) Surface launched to surface targets.

(e) Underwater launched to underwater targets.

(f) Underwater launched to surface targets.

(g) Underwater launched to air targets.

Every known type of remote control, self-seeking or homing device, and proximity fuse was being developed or exploited for use in guided missiles. This included radio control, wire control, radar, continuous wave radio, acoustics, infra red, light beams, magnetics, etc. It was in this field, however, that the missile program was suffering the most serious difficulties.

All types of jet [rocket] propulsion were being incorporated into the power plants of the missiles which were being built to fly at speeds both subsonic and supersonic.

Work on the science of controlled missiles was being carried out in every area visited in Allied occupied territory, from the border of Denmark to Switzerland and from the coast of France to the Russian zone of occupation. It is a known fact that some work was being done in Denmark, Norway and Poland, and it is estimated that 50% of the total German effort in this field was in what is now Russian-occupied territory, to which investigators have not had access. The results of the enemy's guided missile work are evident on the targets in England, Belgium, and Holland.

It is estimated that one-third of the energy directed to aerodynamic research in Germany was devoted to the problems of guided missiles. The research laboratories at Braunschweig, Goettingen, Darmstadt, Ainring, etc., were involved in major projects and the above establishments have capacities exceeding anything previously dreamed of in America. There exists in Germany numerous wind tunnels with a Mach number of 4, i.e., four times the speed of sound. One tunnel with a Mach number of 10 was under construction. Some degree of guided missiles research was being carried out in all of the above tunnels.

It has been gratifying to find a few isolated items relating to the field of guided missiles in which the German product was inferior to similar accomplished in America. However, this is subject to being misconstrued if used to magnify our virtues or exonerate our failures by so-called experts who have "surveyed the field" in a few weeks, returned to America and announced they are disappointed to find the Germans have nothing to offer. Such a statement is evidence of the individual's refusal to accept the obvious fact, inexcusable if made in innocent though stupid sincerity, and criminal if made for ulterior motives.

From observation of the enemy's work, it is concluded that:

(a) If given a relatively short period of time, Germany would have succeeded in bringing into the war an effective counter measure against aerial bombers. She would have produced infinitely superior assault weapons through intensive exploitation of the science of guided missiles.

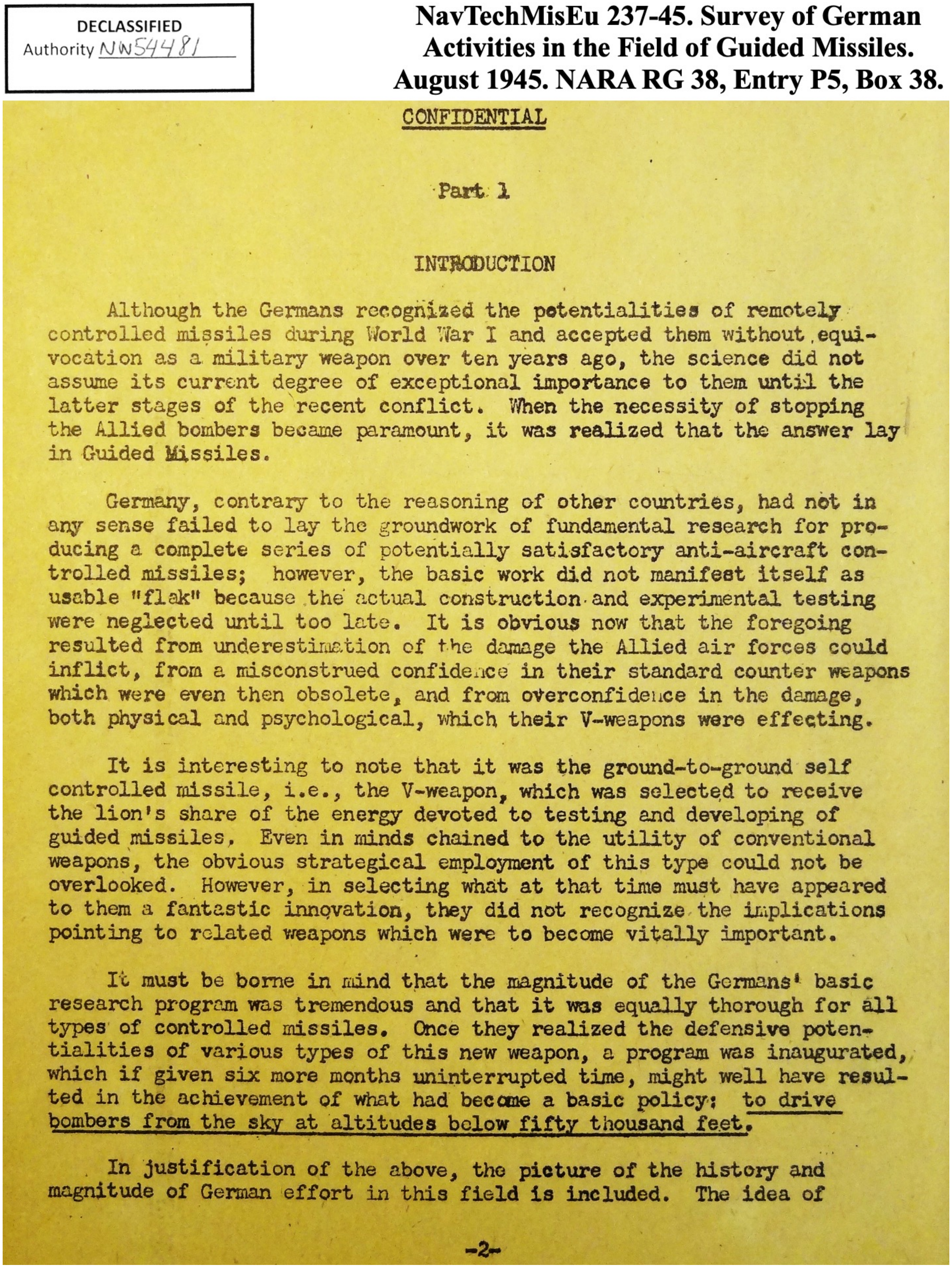
(b) From the standpoint of future warfare, the work of the Peenemünde and associated groups without question ranked among the most important being done in Germany on any subject. Although the apparent results of this organization have been extensively covered by investigators, determination of the group's ultimate goal remains an assumption based on the trend of their developments. Undoubtedly they expected to produce weapons from the A series with which they could accurately hit any area on the face of the earth. It is equally obvious that with the V-2 they were not only working out in advance the aerodynamic and control problems of such weapons, but that in the present weapon they had a proven vehicle ready to receive whatever radically new explosive and propulsive substance they expected to become available. It is inconceivable that the V-2 was considered by the German scientists to be an end in itself, nor that with all its complexities, it was developed at the cost of billions of dollars and manufactured in great quantity with highest priority merely to deposit 750 kilograms of ordinary explosive on British territory.

With the relaxation to a practical degree of the impenetrable screen that has surrounded the investigation of German atomic disintegration research, some of the hitherto inexplicables of their guided missile program are now subject to an analysis from which reasonable answers can be derived. It is now obvious that Germans realized and have accepted for years the fact that a controlled missile is the natural vehicle with which to transport atomic explosive. At last, the reasoning behind the design specifications which provided for very small warheads and the invariable orders to terminate missile projects upon completion of development are no longer mysteries or absurdities. [...]

[NavTechMisEu 237-45 is over 450 pages long, with concise yet informative sections on most German rockets and missiles that were developed or under development. What is quoted above and shown on pp. 5432–5437 is just the introduction.

Further Allied investigations appear to have confirmed the conclusions of NavTechMisEu 237-45. In fact, the introduction of NavTechMisEu 237-45 was deemed worthy of being repeated almost verbatim in:

H. H. Smith, N. W. Dickson, V. P. Kovac, and E. H. Bennett. 10 January 1946. German Developments in the Guided Missile Field. Project 2874. [NARA RG 319, Entry NM3-82, Box 2879, Folder Project 2784]]



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NavTechMisEu 237-45. Survey of German Activities in the Field of Guided Missiles. August 1945. NARA RG 38, Entry P5, Box 38.

CONFIDENTIAL

Part 1

INTRODUCTION

Although the Germans recognized the potentialities of remotely controlled missiles during World War I and accepted them without equivocation as a military weapon over ten years ago, the science did not assume its current degree of exceptional importance to them until the latter stages of the recent conflict. When the necessity of stopping the Allied bombers became paramount, it was realized that the answer lay in Guided Missiles.

Germany, contrary to the reasoning of other countries, had not in any sense failed to lay the groundwork of fundamental research for producing a complete series of potentially satisfactory anti-aircraft controlled missiles; however, the basic work did not manifest itself as usable "flak" because the actual construction and experimental testing were neglected until too late. It is obvious now that the foregoing resulted from underestimation of the damage the Allied air forces could inflict, from a misconstrued confidence in their standard counter weapons which were even then obsolete, and from overconfidence in the damage, both physical and psychological, which their V-weapons were effecting.

It is interesting to note that it was the ground-to-ground self controlled missile, i.e., the V-weapon, which was selected to receive the lion's share of the energy devoted to testing and developing of guided missiles. Even in minds chained to the utility of conventional weapons, the obvious strategical employment of this type could not be overlooked. However, in selecting what at that time must have appeared to them a fantastic innovation, they did not recognize the implications pointing to related weapons which were to become vitally important.

It must be borne in mind that the magnitude of the Germans' basic research program was tremendous and that it was equally thorough for all types of controlled missiles. Once they realized the defensive potentialities of various types of this new weapon, a program was inaugurated, which if given six more months uninterrupted time, might well have resulted in the achievement of what had become a basic policy: to drive bombers from the sky at altitudes below fifty thousand feet.

In justification of the above, the picture of the history and magnitude of German effort in this field is included. The idea of

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Figure E.125: NavTechMisEu 237-45. *Survey of German Activities in the Field of Guided Missiles.* August 1945. [NARA RG 38, Entry P5, Box 38]

NavTechMisEu 237-45. Survey of German Activities in the Field of Guided Missiles. August 1945. NARA RG 38, Entry P5, Box 38.

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Introduction (Cont'd.)

increasing the accuracy of a weapon by controlling it to its target was conceived during the first World War. This thought manifested itself in the form of an aerial bomb guided in range and azimuth by signals transmitted down a wire which unreeled as the missile fell. Projects related to the above lay dormant until World War II, when the modern controlled missile program made its appearance in the form of the FX high angle bomb and the Hs glide bomb series in the Mediterranean. However, the intervening time was not wasted, as it was during this period between wars that the experimental rocket groups were most active. One faction of these groups later formed the nucleus of the Peenemunde personnel.

The FX and Hs missiles were predicated on the assumption that the Luftwaffe would maintain air supremacy and while this condition existed they were used to good advantage. Contrary to popular idea, that the Allies succeeded in effectively jamming the radio control used in these missiles consequently arresting their use, the contributing evidence from enemy operational and developmental personnel is definitely negative. It appears that a routine strike against an airport by Allied airmen had the good fortune of unknowingly destroying all enemy aircraft modified to carry the missiles, and that by the time new planes could be made available, the fuel shortage had effectively put the Luftwaffe out of operation. Our radio jamming activities are said to have been effective on one channel of one frequency. The effort did not put an end to the use of Strassburg-Kiel radio control unit, but it did succeed in stimulating the enemy's thought and subsequent development activities relative to new control systems. Their first reaction was the return to the wire control method of transmitting intelligence. This was closely followed by programs designed to cover all eventualities.

With the increase in Allied air power, Axis interest began to focus on the development of controlled anti-aircraft missiles. This interest grew rapidly and a highly competitive development program for AA missiles expanded with the steady increase of Allied aerial might until at one time in 1943 there were under development in Germany 48 different anti-aircraft missiles. To counteract the increasing abuse Allied air power was delivering to German industry, it was necessary to streamline the program to produce greater emphasis and efficiency. Therefore, the 48 different anti-aircraft development projects were surveyed and after an analysis as to completion of development and effectiveness of the missiles, all but 12 of the 48 were discontinued. The remaining 12 were to be carried through to full development for operational use.

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Figure E.126: NavTechMisEu 237-45. *Survey of German Activities in the Field of Guided Missiles.* August 1945. [NARA RG 38, Entry P5, Box 38]

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During the period of growth of the Allied air power, the heretofore visualized need of long range remote controlled or self controlled missiles for area bombing became an actual necessity. Resulting from the successive defeats, the Luftwaffe was suffering, it became less and less advisable to send bombing squadrons against the enemy; therefore, increased effort was placed on the development of supersonic missiles which were visualized as early as 1936 as potential weapons. These were hastily and prematurely thrown into the fray. In addition to the development of long range supersonic weapons, there was simultaneously carried out through developmental to operational use, the V-1 weapn or "buzz-bomb". The V-1 was the first long range missile operationally used as a self-contained, non-piloted guided or controlled weapon. It is estimated that over 20,000 of these were used against the Allies.

As a substitute for the V-1, the BV series of glide bombs were developed as an inexpensive long range (100 miles) bomb for area bombing. Approximately 400 of these were built and tested, but they were never put to operational use due to a shortage of suitable bombers to carry and launch them.

During this same period, the development of the A series, i.e., V-2 missiles, for supersonic speed ranges was carried on in spite of continual handicaps caused by Allied bombings. A large modern well-equipped missile development and testing center was established at Peenemunde on the Baltic Sea. This station which cost 300 million gold marks for the initial installation was started in 1936 and was reported in operation in 1937. Regardless of Peenemunde's tremendous size and its influence on the program, it in no way portrays the extent of the energy being exerted by other governmental agencies and commercial firms within the Reich. After the expenditure of a tremendous amount of money and energy on this project, the A-4 missile went into operational use in 1944. It is estimated that 3000-5000 of these missiles were built.

To increase range, the A-4b was made by the simple addition of wings to the A-4. This approximately doubled the A-4's range. With the ultimate operational range in sight for the A-4b, design work was immediately started on more radical weapons. There is little of humorous nature in the statements so often heard that the Germans intended to bombard New York from launching sites in Europe, as two missiles, the A-9 and A-10, were under development for use against the U.S. in the early months of 1946. This contemplated use was scientifically possible and undoubtedly would

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Figure E.127: NavTechMisEu 237-45. *Survey of German Activities in the Field of Guided Missiles.* August 1945. [NARA RG 38, Entry P5, Box 38]

NavTechMisEu 237-45. Survey of German Activities in the Field of Guided Missiles. August 1945. NARA RG 38, Entry P5, Box 38.

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Introduction (Cont'd.)

have been realized has time permitted.

The German guided missile program during the last stages of the war provided for development of every conceivable basic type, one classification of which follows:

(a) Surface launched to air targets.

(b) Air launched to air targets.

(c) Air launched to surface targets.

(d) Surface launched to surface targets.

(e) Underwater launched to underwater targets.

(f) Underwater launched to surface targets.

(g) Underwater launched to air targets.

Every known type of remote control, self-seeking or homing device, and proximity fuze was being developed or exploited for use in guided missiles. This included radio control, wire control, radar, continuous wave radio, acoustics, infra red, light beams, magnetics, etc. It was in this field, however, that the missile program was suffering the most serious difficulties.

All types of jet propulsion were being incorporated into the power plants of the missiles which were being built to fly at speeds both subsonic and supersonic.

Work on the science of controlled missiles was being carried out in every area visited in Allied occupied territory, from the border of Denmark to Switzerland and from the coast of France to the Russian zone of occupation. It is a known fact that some work was being done in Denmark, Norway and Poland, and it is estimated that 50% of the total German effort in this field was in what is now Russian-occupied territory, to which investigators have not had access. The results of the enemy's guided missile work are evident on the targets in England, Belgium and Holland.

It is estimated that one-third of the energy directed to aerodynamic

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Figure E.128: NavTechMisEu 237-45. *Survey of German Activities in the Field of Guided Missiles.* August 1945. [NARA RG 38, Entry P5, Box 38]

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Introduction (Cont'd.)

research in Germany was devoted to the problems of guided missiles. The research laboratories at Bräunschweig, Goettingen, Darmstadt, Ainring, etc., were involved in major projects and the above establishments have capacities exceeding anything previously dreamed of in America. There exists in Germany numerous wind tunnels with a Mach number of 4, i.e., four times the speed of sound. One tunnel with a Mach number of 10 was under construction. Some degree of guided missiles research was being carried out in all of the above tunnels.

It has been gratifying to find a few isolated items relating to the field of guided missiles in which the German product was inferior to similar accomplished in America. However, this is subject to being misconstrued if used to magnify our virtues or exonerate our failures by so-called experts who have "surveyed the field" in a few weeks, returned to America and announced they are disappointed to find the Germans have nothing to offer. Such a statement is evidence of the individual's refusal to accept the obvious fact, inexcusable if made in innocent though stupid sincerity, and criminal if made for ulterior motives.

From observation of the enemy's work, it is concluded that:

(a) If given a relatively short period of time, Germany would have succeeded in bringing into the war an effective counter measure against aerial bombers. She would have produced infinitely superior assault weapons through intensive exploitation of the science of guided missiles;

(b) From the standpoint of future warfare, the work of the Peenemunde and associated groups without question ranked among the most important being done in Germany on any subject. Although the apparent results of this organization have been extensively covered by investigators, determination of the groups' ultimate goal remains an assumption based on the trend of their developments. Undoubtedly they expected to produce weapons from the A series with which they could accurately hit any area on the face of the earth. It is equally obvious that with the V-2 they were not only working out in advance the aerodynamic and control problems of such weapons, but that in the present weapon they had a proven vehicle ready to receive whatever radically new explosive and propulsive substance they expected to become available. It is inconveivable that the V-2 was considered by the German scientists to be an end in itself, nor that with all its complexities, it was developed at the cost of billions of dollars and manufactured in great quantity with highest priority merely to deposit

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Figure E.129: NavTechMisEu 237-45. *Survey of German Activities in the Field of Guided Missiles.* August 1945. [NARA RG 38, Entry P5, Box 38]

NavTechMisEu 237-45. Survey of German Activities in the Field of Guided Missiles. August 1945. NARA RG 38, Entry P5, Box 38.

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Introduction (Cont'd.)

750 kilograms of ordinary explosive on British territory.

With the relaxation to a practival degree of the impenetrable screen that has surrounded the investigation of German atomic disintegration research, some of the hitherto inexplicables of their guided missile program are now subject to an analysis from which reasonable answers can be derived. It is now obvious that the Germans realized and have accepted for years the fact that a controlled missile is the natural vehicle with which to transport atomic explosive. At last, the reasoning behind the design specifications which provided for very small warheads and the invariable orders to terminate missile projects upon completion of development are no longer mysteries or absurdities.

(c) There existed in Germany no guided missile project which would warrant exact duplication with the expectation of using it as a practical weapon by the Allies. However, the knowledge we can gain from intensive sudy of their progress is infinite. Therefore, serious consideration should be given to the practicability of producing a limited number of representative German types to be used in a development and operational educational program conceived to bring the Allies abreast of the field.

(d) If in any country the development of the weapons with which to fight a future war is, as it has been in the past, dependent only on the impetus of the war for support, that country when attacked will not survive the first operation!

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Figure E.130: NavTechMisEu 237-45. *Survey of German Activities in the Field of Guided Missiles.* August 1945. [NARA RG 38, Entry P5, Box 38]

Theodore von Kármán. *Where We Stand.* 22 August 1945 [von Kármán 1945].

The present war started on both sides with "conventional" weapons and equipment; "conventional" because their principles of action, design, and performance were fundamentally known to the enemy. During the war both sides produced equipment and weapons of astonishing effects which will certainly change the whole picture of future aerial warfare.

This report is concerned with the main fields in which significant advances have been made and tries to show "where we stand" with some indications as to "where we shall go."

For future planning of research and development, the following new aspects of aerial warfare have to be considered as fundamental realities:

1. that aircraft—manned or pilotless—will move with speeds far beyond the velocity of sound;

2. that due to improvements in aerodynamics, propulsion and electronic control, unmanned devices will transport means of destruction to targets at distances up to several thousand miles;

3. that small amounts of explosive materials will cause destruction over areas of several square miles;

4. that defense against present-day aircraft will be perfected by target seeking missiles;

5. that only aircraft or missiles moving at extreme speeds will be able to penetrate enemy territory protected by such defenses;

6. that a perfect communication system between fighter command and each individual aircraft will be established;

7. that location and observation of targets, take-off, navigation and landing of aircraft, and communication will be independent of visibility and weather;

8. that fully equipped airborne task forces will be enabled to strike at far distant points and will be supplied by air. [...]

German Development of Guided Missiles and Pilotless Aircraft [...]

Dr. von Braun, leader of the Peenemünde group which developed the V-2, was a student of Professor Hermann Oberth, a well-known inventor and writer in the field of rockets, who had published books on interplanetary rocket travel. A group of Oberth's students became interested in rockets and organized an amateur rocket group. All were well-trained scientists. In 1935, Dr. von Braun was employed by the German War Department and sent to Peenemünde. In 1941, von Braun brought Oberth there as head of the Patent Section. By 1941, Peenemünde was an active test station. The Me-163 was brought there in September, 1941 and in October, 1941 flew at a speed of 1,003 km hr (about 623 mph). In October, 1941, the first supersonic wind-tunnel tests were made on a projectile at a Mach number of 4.4. After the bombing of Peenemünde in August, 1943, the activities were decentralized. The wind-tunnel group went to Kochel, where it was in operation in January, 1944. The first use of the V-2 was on 8 September 1944. [...]

The German military agencies, research institutions, and industrial designers devoted a large effort to guided missiles and considered them very promising weapons. In August, 1944, there were some 25 projects for homing devices under developments. The major research laboratories of the air and ground forces made many wind-tunnel and flight tests, some at high supersonic speeds, and made many theoretical studies of problems related to guided missiles and pilotless aircraft (Fig. 6).

Looking over the great variety of projects one finds that the V-2 rocket was the most outstanding technical achievement and that the Peenemünde group of scientists, working for the ground forces, was the most capable missile research group in Germany. It is important for us to note that one element in their success was the fact that they had under a single leadership in one organization, experts in aerodynamics, structural design, electronics, servomechanisms, gyros and control devices, and propulsion; in fact, every group required for the development of a complete missile. The letters and papers in the files of industrial groups, like Messerschmitt, show rapid progress in the field of vehicle and propulsion, the fields in which the firm itself had qualified people, but delay after delay on controls and electronic devices which had to be secured elsewhere. The Luftwaffe research laboratories made little progress in the actual development of specific weapons, largely because of the absence of electronics experts and their lack of facilities for the construction of experimental missiles.

In addition to the German view that the final guided missile would be completely automatic in operation, the possibilities of long-range strategic bombing were fully understood. There is no question but that the diversion of the efforts of the Peenemünde scientists in 1943 to the development of an antiaircraft guided rocket delayed the introduction of the winged V-2 rocket (A-9) and its successor, the transoceanic rocket (A-9 plus A-10). Drawings and computations had been completed for the A-10, a rocket weighing 85 T with a thrust of 200 T to be used as a launching rocket for the A-9, accelerating it to a speed of 3,600 ft/sec. The motor of the A-9 would accelerate it further to a speed of 8,600 ft./sec, giving it a range of about 3,000 miles. Some consideration was given to the design of one version of the A-9 carrying a pilot. The Scientific Advisory Group agrees that the German results of wind-tunnel tests, ballistic computation, and experience with the V-2 justify the conclusion that a transoceanic rocket can be developed.

The principal German advantage in the field of guided missiles was the lead in time in the development of rockets, which were considered to have serious military applications as early as 1935. Much effort was put into this field and as a result the supporting industrial developments were ready as a foundation for missile designers. They could buy rocket motors and rocket fuels from commercial sources. In this respect they lead us. The V-2 development was successful not so much because of striking scientific developments as because of an early start, military support, and a boldness of execution. In the electronic field, radar in particular, we are definitely one or two years in the lead, although we have not put as much effort in the experimental determination of the limits of application of acoustic and infrared devices. [...]

However, beyond that the implications of the accomplishments of the German Peenemünde group and of the recent development of the atomic bomb by United States and British scientists, future methods of aerial warfare call for a reconsideration of all present plans. A part, if not all, of the functions of the manned strategic bomber in destroying the key industries, the communication and transportation systems, and military installations at ranges of from 1,000 to 10,000 miles will be taken over by the pilotless aircraft of extreme velocity. The use of supersonic speeds greatly reduces errors due to wind drift and other atmospheric conditions and the tremendous zone of damage of the atomic bomb diminishes the required precision. Hence, the difficult control problem is made easier.

For the future long-range strategic bomber, the Scientific Advisory Group foresees two types of pilotless aircraft, both with wings, one with a high trajectory reaching far into the outer atmosphere, and the other designed for level flight at high altitudes. The first one can be considered as a further development of the V-2 rocket. In fact, this was planned by the German scientists. By using two or more step-rockets for the acceleration, a very high speed is imparted to a missile, perhaps as high as 17,000 mph or more, to give ranges of several thousand miles. In this case, the wings are required mainly for control purposes, but they also serve to extend the glide path in the lower atmosphere. The German scientists have suggested a second type of trajectory requiring less initial energy, in which the wings are caused to curve the path of the missile when it returns to the region of increasing air density so that it rebounds to great heights. After a number of rebounds the winged missile settles down to a steady glide. Such a trajectory would seem difficult to control accurately (Fig. 8).

The second future strategic bomber is a supersonic pilotless aircraft, flying at altitudes of from 20,000 to say, 60,000 ft. It appears to us now that the speed will be about twice the speed of sound and that the aircraft will be powered by a turbojet motor. An intermediate step might be a pilotless aircraft traveling at high subsonic speeds with a Mach number of about 0.9 about 600 mph at 40,000 ft (Fig. 9). [...]

Leadership in the development of these new weapons of the future can be assured only by uniting experts in aero-dynamics, structural design, electronics, servo-mechanisms, gyros, control devices, propulsion, and warhead under one leadership, and providing them with facilities for laboratory and model shop production in their specialties and with facilities for field tests. Such a center must be adequately supported by the highest ranking military and civilian leadership and must be adequately financed, including the support of related work on special aspects of various problems at other laboratories and the support of special industrial developments. It seems to us that this is the lesson to be learned from the activities of the German Peenemünde group. [...]

Problems of Organization

The following problems relating to the long range research and development program of the Air Forces deserve consideration:

1. Scientific Planning: It is necessary that the Commanding General of the Air Forces and the Air Staff be advised continuously on the progress of scientific research and development in view of the potentialities of new discoveries and improvements in aerial warfare. A permanent Scientific Advisory Group, consisting of qualified officers and eminent civilian scientific consultants, should be available to the Commanding General, reporting directly to him on novel developments and advising him on the planning of scientific research. The scientific material collected by the organizations for military intelligence (G-2 and A-2) should be made available to this group for evaluation. Correspondingly, the scientific branch of G-2 and A-2 should be greatly strengthened by qualified personnel and facilities.

2. Research and Development within the Air Forces: It is necessary to organize a broad training program for officers in scientific and engineering fields, not merely to impart information on scientific and technical matters but to accustom them to working in cooperation with scientific institutions and scientists. [...]

3. Securing the Interest and Collaboration of Scientific Institutions and Individual Scientists: The Air Force should have access to the best qualified scientific talent and the best equipped laboratories of the nation for collaboration on their problems.

Experimental investigations desired by the scientific leaders the Air Forces to be carried out in any laboratory should be obtained by direct contract for the services desired.

Forrestal Urges Arms Inventions. ***New York Times*** **29 August 1945 p. 10.**

At the time of her defeat Germany had almost perfected a submarine that could stay under water virtually indefinitely and a "spider" torpedo that could be guided by a thin wire attached to its firing point, Secretary of the Navy James Forrestal revealed today. Germany was also far ahead of the Allies in many phases of experimentation with speeds faster than sound, he said.

He also disclosed that Germany was feeding technical information to Japan "to keep us as busy as possible in the Pacific." Thus, although he did not mention atomic-bomb experiments, it is possible that Germany either forwarded or tried to forward to Japan whatever information she could develop on the splitting of the atom, since Germany was competing with the United States in this field.

Predicting that, "if, unhappily, there should be another war, it would be fought with fantastically new weapons," Mr. Forrestal urged that the United States stay awake in the field of military research, even to the extent of creating actual models of new weapons.

Germans "Six Months Too Late"

"In general," he declared, "it may be said that the Germans were about six months too late in the development and mass production of new weapons. If in the future some maniac has delusions of world empire, he will start where the Germans left off. For our own defense and for the future peace of the world, it behooves us to continue research in military subjects so that no such maniac can ever feel that he has monopolized an advanced weapon which will put the world in general and the United States in particular at his mercy."

"For that reason I again urge the necessity of a substantial and alert post-war research program in military fields—and this research should be carried through to the actual production of pilot models"

Mr. Forrestal reported that the Germans had used submarines to transmit technical information to Japan, sometimes sending technicians to help the Japanese.

Foe's Submarines Better

He disclosed that, on his inspection trip to Europe between July 26 and Aug. 7, he had investigated the work of the Naval Technical Mission, composed of naval and civilian experts who had followed in the tracks of the invasion and occupation armies gathering useful German technical knowledge. He indicated that Germany had developed a submarine superior in many respects to ours despite previous statements made during the war by some of our naval officers who insisted that our submarines were the finest.

Mr. Forrestal said that present-day submarines might properly be described as submersibles—vessels that can submerge but must spend most of their time on the surface. The Germans, however, were developing a "true submarine" that "would almost never operate on the surface of the sea," and they had achieved "considerable success." [...]

"This submarine, known as Model 21, was capable of traveling under water at eighteen knots. That speed is markedly faster than any previously known craft had attained under the sea and was four knots faster than the Model 21 itself could do on the surface. It could not sustain this very high speed for much over an hour, but the Germans had in advanced states of development new propulsion methods which would have permitted even higher under-water speeds for much longer periods." [...]

Mr. Forrestal said that the Germans had had in development "at least two or three rockets which represented advances over what we call V-2." [...]

German experimentation with supersonic speed was carefully studied, he continued. To perfect the V-2, which had a speed far faster than sounds, and other weapons, the Germans had developed wind tunnels "far in advance of any we have in this country." In these tunnels, the Germans reproduced conditions existing at supersonic speed and tested devices to travel under such extreme conditions.

Nazi Secrets Given Japan to Use on U.S. *Washington Post.* 29 August 1945 p. 3.

The Germans were within six months of mass production of new weapons of great destruction when VE-Day closed their laboratories and shut off their production lines, Naval Secretary Forrestal disclosed yesterday.

His description of specific Nazi projects—new submarines, torpedoes, rockets, fuel—indicates that it was a scientists' race almost to the end.

Forrestal did not mention the Germans' atomic bomb work, but indicated they had a substantial lead over American scientists in many other fields. [...]

Gave Japs Information

Germany, Forrestal said, gave her technical information to Japan to keep us busy in the Pacific. He revealed that some German technicians said they had made the round trip to Japan by submarine.

This explained one reason for our Navy's concern over Japan's still-powerful sub fleet in the closing months of the war. It is known the Germans also passed on their electronics secrets.

The larger German subs could make the trip to Japan without refueling.

The naval secretary based his report on a trip to Europe, during which he observed the work of the Naval Technical Mission. These experts also discovered that the enemy had:

1. "The Spider," a torpedo always connected to its firing point by a thin wire spun out behind it. Through impulses sent over the wire, the missile could be made to change its course or depth, "even make it jump out of the water like a porpoise." This was intended for shore defense and, as far as is known, never was adapted to ships or submarines.

Were Developing Better Rockets

2. In the development stage at least two or three rockets better than the V2, which were to be mass-produced in large underground factories.

3. Devices [gas turbine engines] to control and use steam in some cases at double the pressure and temperature our high-pressure, high-temperature propulsion machinery can handle.

4. Developed a method for using hydrogen peroxide as a fuel, "with what looked like surprisingly good results" for the powering of naval units. Its first known use was in launching V-1 rockets and the auxiliary pumps for the V-2s.

5. Wind-tunnels "far in advance of any we have in this country" to promote basic research in supersonic speeds. In them they could simulate supersonic speed conditions and thus experiment on devices which go faster than sound.

[...] The resulting U-boat, labeled the Model 21, was able to make 18 knots submerged, or four knots better than it could on the surface.

The 18 knots couldn't be sustained, but the Germans were rushing development of new methods permitting even faster speeds for longer periods.

Germany was building nothing but Model 21s at the end of the war. The timetable called for 360 a year and they were to be assembled in 24 days each in huge reinforced concrete shelters between Bremen and Bremerhaven.

[Forrestal stated that "at least two or three rockets" more advanced than the V-2 were "in the development stage" "to be mass-produced in large underground factories," which seems to imply that they were not merely paper designs. He also seemed to include those rockets in the category he was discussing of potential war-winning weapons that were within six months of readiness, which again seems to indicate that they had already progressed well beyond paper designs. Was he implying that by the end of the war, Germany had in fact "monopolized an advanced weapon which will put the world in general and the United States in particular at his mercy"?

Forrestal gave a number of other examples of how much more advanced German technology was compared to American technology in many fields. Even the journalists writing these articles noticed that he carefully avoided saying anything about Germany's atomic bomb work, probably due to tight censorship on that topic.]

R. P. Linstead and T. J. Betts. 15 September 1945. *The Intelligence Exploitation of Germany. Report of Combined Intelligence Objectives Subcommittee.* G-2 Division, SHAEF. Ch. 4, pp. 37, 47–51. [AFHRA A5186 electronic version pp. 904–1026]

Certain items have been omitted because of security considerations. [...]

The exploitation of intelligence concerning German directed missiles and rocket development was one of the primary objectives of CIOS. In the initial phases of the Committee's work, considerable information was obtained from captured launching sites, propellant storage facilities and actual specimens of early V-weapons. However, it was not until the entire Peenemünde staff, together with most of their files and much of their equipment, were seized at dispersal points in southern Germany that the full story of German V-weapon research and development became available. The resultant intelligence has proven to be one of the most significant and important discoveries in the European Theater.

German authorities responsible for this work have expressed the opinion that the V-1 and V-2 were crude and elementary weapons. They have compared the present state of directed missile design with the technical status of the aircraft industry on the eve of World War I. These same authorities confidently predict that a continuation of present research in this field for another decade would change the strategical and tactical concepts of modern war.

[p. 49 of the document is missing on the microfilm roll. Can that page be located in a surviving hardcopy, or is that page still classified?]

United States and British specialists have obtained complete information covering all German directed missiles from the pioneer model "A sub-o", which employed oxygen and alcohol fuel in attaining a range of 18 miles, to the latest model of the A-9 which was capable of a 3400 mile per hour speed and a range of 2400 miles. The A-9 was an improved development of the V-2 or A-4, and was equipped with wings thereby enabling it to level off at a height of 70,000 feet. One model of this missile was equipped with a Lorin tube which provided propulsion at the peak of the trajectory, the missile was expected to result in a maximum range of 2400 miles. Other variations of this model were capable of attaining altitudes 60 miles above the earth's surface and speeds in excess of 7300 feet per second. Improved radio controls were developed to supercede the "integrating accelerometer" used in early V-weapons. Some measure of the accuracy which could be achieved with these controls is evidenced by the fact that the radio controlled models were capable of an accuracy of plus-or-minus 150 feet in contrast to a plus-or-minus 50 mile error inherent in the V-2.

German scientists engaged in directed missiles envisaged important commercial applications of the long range missile. Experiments had already been conducted on piloted models. Missiles capable of trans-Atlantic crossings in approximately 40 minutes were found on design boards and scale models were undergoing wind tunnel tests. Amazing performances were considered practical because of the lessened atmospheric resistance and gravitational pull in stratospheric regions.

The Germans particularly concentrated on controlled rockets and missiles for anti-aircraft defense. One of the most promising of the AA missiles under development was the "Wasserfall". This was a ground-to-air guided missile capable of a 2200 mile per hour speed. The "Wasserfall" was equipped with a homing device which would enable it to pick up and track a target airplane at a range of one mile. The acoustic fuse provided was designed to detonate the explosive charge within a radius of 20 meters from the target.

The "Enzian" was another type of controlled missile designed for ground-to-air or air-to-air anti-aircraft defense. This weapon was equipped with a homing device and was capable of a 900 mile per hour speed. Other German anti-aircraft missiles included the Taifun and the X-4. The Taifun was a comparatively simple and inexpensive aimed rocket capable of high speed and a 60,000 foot altitude. The X-4 was designed for air-to-air operations and wire control in order to prevent jamming or effective counter-measures.

One of the most important results of Allied investigations of German directed missile development was the vast amount of data obtained concerning aero-dynamic research in the range of supersonic speeds. This information is expected to provide invaluable assistance to research in the United States and United Kingdom.

Of particular significance were the statements, made by German experts in the rocket and controlled missile field, that much of the priority accorded their work by the German High Command was in anticipation of the use of atomic explosives. These authorities stated that KWI had repeatedly assured Hitler that an atomic explosive would be available for use within a comparatively short time. During the last months of work by the Peenemünde staff, V-weapons were designed with much smaller war-heads. Quite possibly this trend was in anticipation of the successful development of a German atomic explosive.

[See document photos on pp. 5446–5447.

This report was written by the CIOS chairs, U.S. General Thomas Jeffries Betts, Deputy G-2 of SHAEF (pp. 3287, 5028–5029), and U.K. Ministry of Supply chief advisor and F.R.S. Professor Reginald Patrick Linstead. Based on specific discoveries by their CIOS investigators, these high-ranking officials reported that:

- "The latest model of the A-9 ... was capable of a 3400 mile per hour speed and a range of 2400 miles." That statement sounds like a description of completed hardware, not a mere drawing board design. The report also mentioned an A-9 equipped with a ramjet (Lorin) engine. From this and other reports, it sounds as if there were multiple versions of the A-9. What specific hardware and information were discovered that are not discussed in the presently unclassified reports? Can any reports that are still classified be located and released? Much more research is needed to elucidate the wartime versions and actual progress on the A-9.

- With regard to advanced versions of "the long range missile," "experiments had already been conducted on piloted models." Were they referring to the two-man V-4 rocket or something else? For "experiments" with "piloted models," was the rocket launched with or without pilot(s)? If the former, did the pilot(s) survive? Did German or Austrian pilots accomplish in 1944–1945 what Alan Shepard did in 1961? If so, their names should be in the history books.

- Hitler, the German High Command, and the leading experts in the rocket programs had been "repeatedly assured ... that an atomic explosive would be available for use within a comparatively short time." Thus the CIOS chairs contradicted the public statements of the Alsos Mission and confirmed that there was indeed a German program to develop an atomic bomb, and that it was far more than a paper design program—its hardware had passed through sufficient development, production, and testing by the end of the war that it was ready or nearly ready to be used in combat.]

 AFHRA A5186 frame 0965

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Figure E.131: R. P. Linstead and T. J. Betts. 15 September 1945. *The Intelligence Exploitation of Germany. Report of Combined Intelligence Objectives Subcommittee*. G-2 Division, SHAEF. Ch. 4 [AFHRA A5186 frame 0965].

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Figure E.132: R. P. Linstead and T. J. Betts. 15 September 1945. *The Intelligence Exploitation of Germany. Report of Combined Intelligence Objectives Subcommittee.* G-2 Division, SHAEF. Ch. 4 [AFHRA A5186 frame 0966].

W. G. A. Perring. 1946. A Critical Review of German Long-Range Rocket Development. *Journal of the American Rocket Society.* 65:1–17. Reprinted from a paper read before the Royal Aeronautical Society, London, 1 November 1945.

Serious rocket development was started in Germany in the years 1929–1930 by a few groups of private inventors. This work attracted the attention of the Army Weapons Group in 1933, and in 1937–1938 a special research and development station was set up at Peenemunde at the cost of 300 million marks, and the work was transferred from Berlin to this new station at about that time.

Peenemunde concentrated mainly on bi-fuel rockets, employing liquid oxygen as the source of oxygen for the combustion of the fuel. Work was started on a range of rockets which they designated Al to A10, only one of which, namely, A4 or as we know it V2, ever being used operationally. [...]

Apart from these main rocket developments, there were many other developments going on all over Germany; in some of these solid fuels were used, and in others nitric acid was the oxygen carrier, and Diesel oil or alcohol the other fuel. [...]

The highest velocity reached is at all burnt, the rocket is then traveling at 5000 ft. per sec. and it is interesting to note that at this velocity the rocket motor is developing well over 600,000 horsepower. The stagnation temperature corresponding to a velocity of 5000 ft. per sec. is about 1400^{o}K, and in view of this it might be expected that the skin temperatures of the rocket during flight would tend to be high and approach the stagnation value.

To check this point a careful examination of the rocket skin was undertaken, and both from an examination of the condition of the paint, and a metallurgical examination of the skin material, it was concluded that the skin temperatures had not exceeded about 900^{o}K. This figure agrees very closely with measurements that the Germans were able to make on an actual rocket in flight. In their tests the Germans inserted small discs of various metals of known melting point into the skin of the rocket and connected these into electrical circuits. As each disc melted, a signal was transmitted by telemetering to a ground station. It was found that the skin temperatures nowhere exceed 920^{o}K, conduction and radiation losses therefore must have kept the skin temperature down well below the stagnation temperature. [...]

A10 was a still more ambitious rocket, in the project stage only; it was to weigh about 85 tons, and was intended to carry the A9 rocket into the stratosphere, and then be jettisoned, A9 and A10, therefore, were separate stages of a two-stage rocket.

Table II gives the specific impulse of a number of fuels, calculated on the basis of working conditions corresponding to the venturi characteristics of the A4 rocket.

Most practical values of the S_I [specific impulse] lies between 180–240, but it will be seen from the table that by using hydrogen and oxygen the value could be pushed up to well over 300 while still retaining a moderate combustion temperature, and some still further improvement in this S_I would be possible at the expense of the working temperatures and pressures.

[...] Starting with the A4 rocket, we have assumed that the warhead is removed, and replaced by a pressure cabin and pilot, and in addition, the rocket is fitted with wings; the wing area being arranged to provide for a landing wing loading of 35 lb. per sq. ft.

Three cases will be touched on briefly. In the first, the A4 rocket with wings is assumed to be fired vertically, and controlled in the same manner as a normal A4 rocket until it reaches the top of its trajectory, when the pilot takes over and glides the rocket to the ground along its optimum glide path.

In the other two cases, the A4 rocket with wings, has been assumed to be taken up by means of a booster rocket rather on the lines of the German A10 project mentioned earlier in the lecture. In this way the rocket reaches a height of 80,000 feet before being released at a speed of 3000 m.p.h. (these conditions corresponding to the height and speed reached by the A4 rocket with wings at all burnt, when it is fired vertically upwards in the normal way). From this point onwards the rocket with its full fuel continues the flight, and in the first of these boosted cases it has been assumed that the rocket venturi is redesigned, and now provides a thrust corresponding to level flight at 1640 m.p.h., at 80,000 feet, while in the other the redesigned venturi provides a thrust which enables the rocket to continue the climb. The results of these calculations are compared with the trajectory of the normal A4 rocket without wings.

The first striking thing about the results is the effect that the addition of wings has on range. The range of 180 miles of the normal A4 rocket without wings has now been raised to 350 miles.

Still more striking however is the effect of the booster on the general performance. Ranges of 1500 to 3000 miles now appear to be possible, and the advantage of continuing the climb at the end of the booster stage is also very marked. It is interesting to note that with a rocket boosted in this way it would be possible to complete the journey from London to New York in well under the hour.

The first of the two cases of the rocket with wings presents no problem that is outside of the experience already gained by the Germans during their work on the A4 rocket, the third case however does raise many new problems. It contemplates for example flight at over 8000 m.p.h., this means a stagnation temperature of nearly 7000^{o}K, so that even though radiation may play an important part in keeping, the temperature down, the pilot would nevertheless find himself enclosed in a body the skin of which, to say the least of it, was uncomfortably hot. Over a large part of the flight too, the rocket would be moving on a free trajectory, since the wings cannot provide sufficient lifting force to control the motion. Over this part of the trajectory the pilot would be subject to zero g, and it would not be until the rocket returned, to a point about 28 miles above the earth's surface that the pilot could begin to assume control of his machine.

The booster contemplated in connection with these schemes would of course be very large; it would certainly weigh about 100 tons, and the Germans in planning their schemes had hoped that the booster after being jettisoned, would be recoverable. [...]

I should like in conclusion to say how much I am indebted to the many workers in this field who took part in the A4 rocket investigations, on whose work I have drawn quite freely in preparing the present lecture.

[W. G. A. Perring, Deputy Director of Research and Development at the Royal Aircraft Establishment (RAE) in Farnborough, studied intelligence reports and recovered pieces from wartime German rocket tests in order to accurately inform the British government of the design and capabilities of V-2 rockets before they were launched against Allied targets.

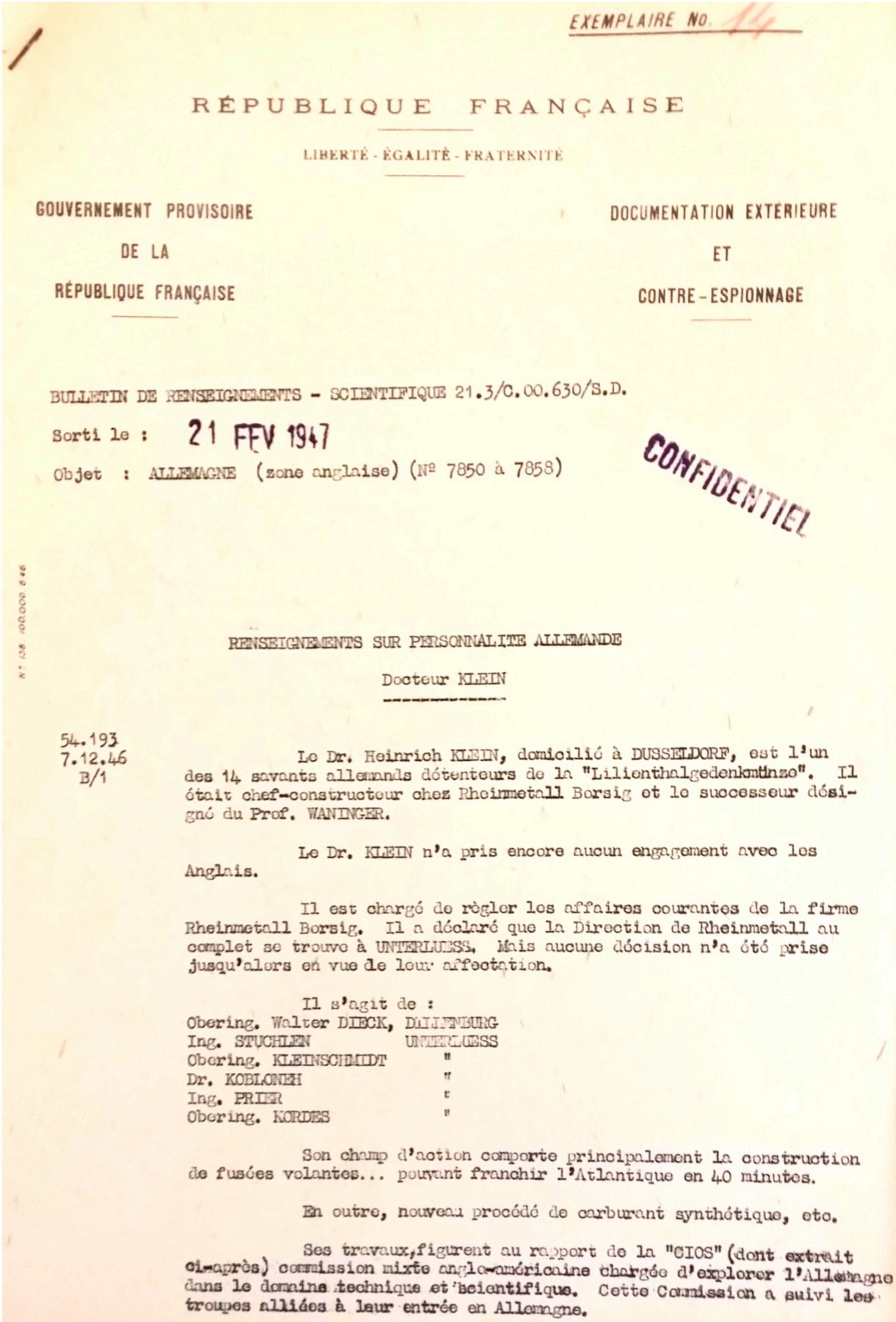
Perring's report here is "drawn quite freely" from detailed postwar investigations of later, more advanced German rocket research and development, and it reports presumed German work on:

- "Rocket developments... going on all over Germany," not just at Peenemünde.
- Development of solid propellant rockets.
- Development of storable and hypergolic liquid rocket propellants, such as inhibited fuming nitric acid oxidizer and Diesel fuel.
- Work on liquid hydrogen and liquid oxygen rocket propellants to obtain specific impulse values "well over 300 while still retaining a moderate combustion temperature." Compared to the alcohol and liquid oxygen propellant in the standard A-4, that would increase a rocket's exhaust velocity by well over 50% and double or triple the rocket's range.
- Both well-known trajectories in which rockets follow a parabolic arc before reentering the atmosphere, and also less well-known trajectories in which the rockets level off at some fixed altitude and continue powered flight horizontally toward their target, as described by the German prisoner of war on p. 5334.
- A reusable A-10 booster stage, which suggests that it was never planned or necessary to build many of them.
- Construction of a modified A-4 (A-9) rocket having a pressure cabin and pilot.
- Experimental measurements of and work to deal with heat transfer to rockets during reentry into the earth's atmosphere.]

MR. W. G. A. PERRING, WITH HIS REMARKABLY ACCURATE RECONSTRUCTION OF A V-2 ROCKET, BASED ON FRAGMENTS FOUND IN SWEDEN BEFORE THE ATTACKS BEGAN.

Mr. W. G. A. Perring was concerned with research work on the German V-2 rocket, and was able to make a remarkably accurate reconstruction of this weapon and assess its potentialities from some two tons of fragments found after one of these weapons had exploded over Sweden before the attacks on Britain were made. He is seen holding his diagrammatic model.

Figure E.133: W. G. A. Perring, Deputy Director of Research and Development at the Royal Aircraft Establishment (RAE) in Farnborough, studied wartime and postwar information on advanced German rocket programs.



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CONFIDENTIEL

RENSEIGNEMENTS SUR PERSONNALITE ALLEMANDE

Docteur KLEIN

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7.12.46
B/1

Le Dr. Heinrich KLEIN, domicilié à DUSSELDORF, est l'un des 14 savants allemands détenteurs de la "Lilienthalgedenkmünze". Il était chef-constructeur chez Rheinmetall Borsig et le successeur désigné du Prof. WANINGER.

Le Dr. KLEIN n'a pris encore aucun engagement avec les Anglais.

Il est chargé de règler les affaires courantes de la firme Rheinmetall Borsig. Il a déclaré que la Direction de Rheinmetall au complet se trouve à UNTERLUESS. Mais aucune décision n'a été prise jusqu'alors en vue de leur affectation.

Il s'agit de :
Obering. Walter DIECK, DILLENBURG
Ing. STUCHLEN UNTERLUESS
Obering. KLEINSCHMIDT "
Dr. KOBLONEH "
Ing. PRIER "
Obering. KORDES "

Son champ d'action comporte principalement la construction de fusées volantes... pouvant franchir l'Atlantique en 40 minutes.

En outre, nouveau procédé de carburant synthétique, etc.

Ses travaux, figurent au rapport de la "CIOS" (dont extrait ci-après) commission mixte anglo-américaine chargée d'explorer l'Allemagne dans le domaine technique et scientifique. Cette Commission a suivi les troupes alliées à leur entrée en Allemagne.

Figure E.134: 21 February 1947 French background investigation on Heinrich Klein: "His field of experience mainly involves the construction of flying rockets... capable of crossing the Atlantic in 40 minutes." [Archives of the French Army Ministry of Defense, courtesy of Norberto Lahuerta].

WAAF Tells of Aid in Saving New York. *New York Times*, 6 October 1945, p. 18.

British Woman, Now Assigned to U.S., Shows How Her Unit Upset V-Bombing Plans

Standing high over the skyline of New York, the city her military intelligence is credited with helping to save from German rocket-bombing, Flight Officer Constance Babington-Smith of the British Women's Auxiliary Air Force explained yesterday how she did it, at a press conference sponsored by the British Information Services on the sixty-fifth floor of 30 Rockefeller Plaza.

For all her mastery of the intelligence officer's technique in interpreting air reconnaissance photographs for secret information pertaining to enemy aircraft operations, it became apparent during the interview that Flight Officer Babington-Smith's sky-blue eyes, ready imagination and leaping logic were the real clues to her success in the war work that she "really loved." [...]

Miss Smith used only a stereoscope and a measuring magnifier, but she maintained that "one's eyes are the most important—not instruments." Her mission was to detect, from aerial reconnaissance photographs, new developments of German aircraft and aircraft factories, and thus to provide the Allied raiders with vital bombing targets and other intelligence.

In May, 1943, Miss Smith became the first Allied person to detect the enemy's new "vengeance weapon," the V-1, or robot plane, as it was being developed by Germany at an experimental center in Peenemünde, on the Baltic. In a reconnaissance photograph of this place, she interpreted a small, curving black shadow as a ramp; and a tiny, T-shaped, white blot above it as an airplane, the V-1.

On the basis of her discovery Allied air raiders bombed Peenemünde, killing 800 German scientific experts and thereby, by Germany's own admission, retarded the enemy's aeronautical development work by six months so that Germany's elaborate plans for rocket-bombing the United States could not be completed in time.

[In this remarkable article, the U.K.'s most celebrated wartime aerial reconnaissance photo interpreter, the British Information Services, and the *New York Times* all stated clearly and unequivocally that Germany was within only months of attacking New York with rockets when the war ended, and that the New York rockets would have been ready six months sooner if not for Allied bombing of relevant sites in Europe. This information also strongly suggests that the German atomic bomb was ready or almost ready at the end of the war, since a conventional explosive warhead would not do much damage or justify all the costs and resources required to develop a rocket that could reach New York.

If the German atomic bomb and the New York rocket were within months of completion at the end of the war, they could not have been merely at the stage of paper designs when the war ended. German, British, and U.S. experts were all keenly aware that it required years of intensive work both for atomic bombs and for long-range rockets to progress from paper designs to deployable final products.

For more information on Constance Babington-Smith, see:

https://www.theguardian.com/news/2000/aug/12/guardianobituaries]

U.S. Army Air Forces General Henry H. Arnold. 9 January 1945 address to Scientific Advisory Group. Quoted in Thomas A. Sturm. 1967. *The USAF Scientific Advisory Board: Its First Twenty Years 1944–1964.* Washington, D.C.: U.S. Government Printing Office. p. 2

I don't think we dare muddle through the next twenty years the way we have... the last twenty years. I have worked with von Kármán the last twenty years, and I was sometimes scared by the knowledge he had that we weren't using. ... I don't want ever again to have the United States caught the way we were this time.

Arnold Urges Single Defense Department. *Washington Post.* 20 October 1945 pp. 1–2.

AAF Head Asks Co-Equal Status for Air Arm as Best Peace Insurance.

Gen. Henry H. Arnold yesterday warned Congress the next war will come through the air and asked co-equal status for air power in a unified defense system as "the best insurance of peace."

The graying Chief of Army Air Forces backed the War Department's call for one strong department of national defense with statistics charting the "terrifying possibilities" of new air weapons. [...]

Flanked by a group of veteran Air Corps officers, the Army Air Forces commander told how the German V-2 bombs alone, perfected with wings, radar and electronic devices, can now travel over 3000 miles and at 2000 miles hit a target "on the button." [...]

He said there can no longer be defense against the missiles themselves—blows at the source of them must be the goal. [...]

Discussing the atom bomb, the German V-2, jet, bomber and cargo plane developments, Arnold stressed the "extraordinary versatility" of the new air weapons and glimpsed future "more radical" uses. [...]

Arnold said one German jet plane was capable of knocking down 17 American Flying Fortresses. Had Germany concentrated on its jet fighters, he said it would have been "far more difficult to get into Germany."

[How did General Arnold know that German rockets "can now travel" 2000–3000 miles and "hit a target on the button"? That public statement suggests that Germany successfully conducted such a test before the end of the war, and that Arnold had obtained evidence detailing that test. For another document that appears to describe such a test, see Alfred Gründler's testimony on p. 5347.]

Arnold Advocates Co-Equal Air Force. ***New York Times*** **20 October 1945 p. 3.**

He Calls This Vital to U.S. as Only Fliers Could Hit Quickly at Atomic Bomb Source

Creation of a single national defense organization, in which the air arm will have coequal strength and influence with the Army and Navy, is essential if this country is to be prepared against future aggression, Gen. Henry H. Arnold, commander of the Army Air Forces, told the Senate Military Affairs Committee today. [...]

Pleading for unification, which would give the nation's air arm the same position it won with difficulty during the war, General Arnold said:

"It is apparent from any school room globe that war can come through the air to the very heart of this country. It can come with weapons of types now in our possession, and without any land or naval action.

Speed Declared Essential

"Such developments as the atomic bomb, the V-2 and the whole range of radio-directed and homing missiles accentuate the security problems of the air. Responsibility for a rapid and powerful offensive against the source will rest on the air force."

3,000-Mile V-2 Near, Says Arnold. ***New York Times*** **20 October 1945 p. 3.**

General Arnold said that a future war might start with air attacks launched from bases 3,000 miles away, pointing out that the United States even now could blanket most of Asia and Europe and a large part of Africa from bases within this country.

The German V-2 rocket now has a range of 250 miles, he said, but by attaching wings and electronic guiding devices it can easily travel 3,000 miles or more. Such a development, he said, "is just in the offing."

He also said that if Germany had concentrated on the jet-propelled fighter it used toward the end of the war, the Allies would have had a much harder time destroying the Luftwaffe.

"According to our information," he said, "one German pilot in one German jet plane could knock down seventeen to twenty of our Flying Fortresses."

Henry H. Arnold. 12 November 1945. *Third Report of the Commanding General of the Army Air Forces to the Secretary of War.* Baltimore, Maryland: Schneidereith & Sons.

[pp. 8, 10:] The ME-262 jet plane, Germany's greatest hope, and, we must state frankly, the greatest threat to continued bomber operations, was then in production. Under no circumstances, Hitler declared, would the ME-262 be used as anything but a bomber. [...]

Hitler persisted in this amazing decision from April until October, a period which saw the Invasion and the sweep across France. As a bomber, the ME-262 did nothing. The ME-262s which our airmen fought during that period were a few Galland had secured, despite Hitler's edict, for an "Experimental Unit." In October, when Hitler relented, only a handful were released to the fighter arm, and it was 1945 before the bomber idea was finally discarded.

[p. 30:] Very important work remains to be done. [...] One is the making of a large-scale photographic map of the conquered country, something sorely needed and partially obtained only with great difficulty during the war—a bird's eye view of Germany, just in case. Another is the job of disarming the Luftwaffe—not only pullings its fangs but plucking its brains.

Air disarmament includes seeking out and impounding Luftwaffe documents, locating its technicians, scientists and experimental specialists for interrogation, and securing the records of their work and experiments. There is materiel of vital interest for testing and development at Wright Field. Strange devices are being ferreted out, crated, and shipped for study—from blind landing equipment to infra-red meteorological instruments and range finders, from radar apparatus to crew chief stands, from jet engines to bomb sights, flak guns to airborne cannon, compasses and cameras to medical documents and automatic pilots.

Whatever the Germans had of worth, we shall have. Whatever they hoped to develop, we shall know about. We want to make sure it is not being worked on under the guise of a peacetime product. Winning this war was a hard job. Air power intends to do its share toward keeping the peace.

[pp. 66–68:] At lower right is the X-4, a wire controlled, rocket-propelled gyro-stabilized missile, to be launched from parent plane against bombers. X-4 was almost ready for use. [...] Potency of X-4 (right) was tremendously increased by proximity fuse.

[...] We must look at the future of aerial warfare in the light of the following considerations:

1. Aircraft, piloted or pilotless, will move at speeds far beyond the velocity of sound, well over 700 miles per hour.

2. Improvements in aerodynamics, propulsion, and electronic control will enable unmanned devices to transport means of destruction to targets at distances up to many thousands of miles. However, until such time as guided missiles are so developed that there is no further need for manned aircraft, research in the field of "conventional" aircraft of improved design must be vigorously pursued.

3. Small amounts of explosive materials, as in atomic bombs, will cause destruction of many square

miles.

4. Defense against present day aircraft may be perfected by target-seeking missiles.

5. Only aircraft or missiles moving at extreme speeds will be able to penetrate enemy territory protected by such defenses.

6. A communications system between control center and each individual aircraft will be established.

7. Location and observation of targets, take-off, navigation and landing of aircraft, and communications will be independent of visibility or weather.

8. Fully equipped airborne task forces will be able to strike at far distant points and will be totally supplied by air.

[...] Further, the great unit cost of the atomic bomb means that as nearly as possible every one must be delivered to its intended target. This can be done in one of several ways, all of which involve air power. For example, the following evolution may be suggested:

a. Today, our Army Air Forces are the recognized masters of strategic bombing. Until others can match the present efficiency of our own antiaircraft defenses, we can run a large air operation for the sole purpose of delivering one or two atomic bombs. Our experience in the war suggests that the percentage of failures in an operation of this kind would be low.

b. When improved antiaircraft defenses make this impracticable, we should be ready with a weapon of the general type of the German V-2 rocket, having greatly improved range and precision, and launched from great distances. V-2 is ideally suited to deliver atomic explosives, because effective defense against it would prove extremely difficult.

c. If defenses which can cope even with such a 3,000-mile-per-hour projectile are developed, we must be ready to launch such projectiles nearer the target, to give them a shorter time of flight and make them harder to detect and destroy. We must be ready to launch them from unexpected directions. This can be done from true space ships, capable of operating outside the earth's atmosphere. The design of such a ship is all but practicable today; research will unquestionably bring it into being within the foreseeable future.

[...] Complete dispersal of our cities and moving vital industries underground on a sufficiently large scale would be overwhelmingly expensive. [...]

Although there now appear to be insurmountable difficulties in an active defense against future atomic projectiles similar to the German V-2 but armed with atomic explosives, this condition should only intensify our efforts to discover an effective means of defense. [...]

Jet propulsion is in its infancy despite the fact that this war has evolved six distinct methods of utilizing atmospheric oxygen for propulsion, such as (1) *motorjet*—or reciprocating engine plus ducted fan, (2) *turboprop*—a gas turbine plus propeller, (3) *turbofan*—a gas turbine plus ducted fan, (4) *turbojet*—a gas turbine plus jet, (5) *ramjet*—a continuous jet with compression by aerodynamic ram, and (6) *pulsojet*—or intermittent jet. These new and strange sounding words will be familiar ones in our speech in the near future, and right now they carry more meaning for Americans than any other six words I know.

[Arnold's statements in the above report, especially those regarding the use of long-range rockets or spacecraft to deliver atomic bombs, were widely reported in newspapers. As just one example, see:

Space Ships Flying A-Bomb Rockets Visioned by Arnold. *Los Angeles Times* 12 November 1945 p. 1.

For an example of the press reporting this idea in detail, see p. 5460.]

Traitor Suspect Holds Secret Key of Nazis' V-Ten. *Toronto Daily Star* 12 November 1945 p. 28.

Stockholm, Nov 12—(AP)—The newspaper Aftonbladet today quoted an unnamed British lieutenant as saying that the Swedish engineer, Nils Werner Larsson, on trial for delivering military secrets to both Germany and the Allies, held the key to construction of the whole series of Nazi vengeance weapons from V-1 to V-10.

The V-10 was the weapon which the Germans expected to hurl across the Atlantic in 35 minutes to bombard North America. It was in blueprint stage when Germany surrendered.

The newspaper said plans for the V-10 reached the United States seven weeks ago and formed the basis for Gen. Henry H. Arnold's reference to "space ships" in his report yesterday to the U.S. secretary of war.

In the report, Gen. Arnold envisaged space ships travelling 3,000 miles an hour "operating outside the earth's atmosphere."

Larsson is charged specifically with offering German military secrets to Allied military representatives in Sweden and of delivering an improved Swedish machine pistol to the Germans, presumably to create confidence in him.

The newspaper quoted the lieutenant, who recently visited Sweden from Hamburg, as saying that Larsson had great technical knowledge and had worked in the German experimental laboratories in Peenemuende in 1943, where V weapons were developed.

Larsson left Sweden in 1943 for Germany and assisted German discoverers and builders of the V weapons, the newspaper said. After the German collapse, Larsson was said to have had freedom of movement in Germany. The British officer was reported to have met Larsson in an officers' barracks in Hamburg a few weeks ago.

Larsson was arrested by the Swedes at the border, apparently while en route home from Germany.

Swede Arrested as Double Agent. *New York Times* 13 November 1945 p. 5

Accused of Selling Arms Data to Germans and Allies—Tells of V-10 Space Ship

STOCKHOLM, Sweden, Nov. 12—A Swedish engineer, Nils Werner Larsson, who is said to possess the secrets of all Germany's V-weapons, is in jail here accused of having sold designs for secret Swedish weapons to both the Germans and the Allies during the war and of desertion from the Swedish Army.

The Aftonbladet quoted a British officer who said that Larsson had the key to all German V-weapons from V-1 to V-10, which was intended for wiping out American cities. Its designs are now in Washington and are probably what Gen. H. H. Arnold referred to in yesterday's sensational report on space ships.

Larsson made contact with the British Secret Service in the summer of 1943 and agreed to work for the Allies in Germany. He gained the Germans' confidence by selling their agents designs for a new Swedish submachine gun and an anti-tank gun after first having given them to the Allies. The Germans trusted him and in October he went to Germany. The Germans, realizing his great gifts as a constructor, immediately sent him to Peenemuende to work on V-bombs.

He worked for the Allies too and was permitted to move freely in Germany after her collapse. A British officer met him in Hamburg, where Larsson told about his work in Peenemuende. Larsson seemed to be extremely persona grata with the British authorities in Germany and was permitted to go to Norway, whence he returned here.

Larsson said today that all other variations of V-weapons were vastly surpassed by the V-10, which, according to German plans, was to cross the Atlantic in thirty-five minutes and devastate American industries and cities. Later it was to be developed into an "absolute stratosphere ship" with which it should be possible to cruise around in space under human control.

[Versions of this story were also published in other newspapers; see for example:

Swedes Reveal V-10 Weapon as Nazi "Space Ship." *Chicago Tribune* 13 November 1945 p. 2 [http://archives.chicagotribune.com/1945/11/13/page/2/article/swedes-reveal-v-10-weapon-as-nazi-space-ship]

U.S. Has V-10 Plans, Says Swedish Paper. *Los Angeles Times* 13 November 1945 p. 7.

"V-10" seems to have meant the A-9/A-10, which would have been capable of everything described here: carrying pilots, traveling through space from Germany to the United States, and "devastating American cities" (especially if Germany had an atomic bomb the rocket could carry, as discussed in Appendix D). The A-10 was part of Wernher von Braun's series of Aggregat rockets from A-1 through A-10. Since the V-1 (unrelated cruise missile) and V-2 (renamed A-4 rocket) were such well-known names, someone involved in reporting this German work probably tried to apply V-labels to all of the Aggregat rocket numbers. In 1949, General Henry Arnold confirmed that the V-10 was indeed the A-10, and that physical rockets were being built, not just designed (p. 5466).

Nils Werner Larsson led a very exciting life. For more information on him as well as some of the other German rocket information he provided, see p. 5670.]

The 36-Hour War: Arnold Report Hints at the Catastrophe of the Next Great Conflict. *Life.* 15 November 1945. 19:21:27. [See document photos on pp. 5461–5464.] [https://books.google.com/books?id=6UsEAAAAMBAJ&pg=PA27&dq=Life+36+Hour+War&hl=en&sa=X&ved=0ahUKEwjVgMfcr9fiAhVFh-AKHe36D0QQ6AEIKDAA#v=onepage&q=Life%2036%20Hour%20War&f=false https://blog.nuclearsecrecy.com/2013/04/05/the-36-hour-war-life-magazine-1945/]

The start of another war, said General Arnold, might come with shattering speed: "With present equipment an enemy air power can, without warning, pass over all formerly visualized barriers and can deliver devastating blows at our population centers and our industrial, economic or governmental heart even before surface forces can be deployed."

[Not even U.S. bombers could "pass over all formerly visualized barriers" at that time, since fighters, anti-aircraft guns, and anti-aircraft rockets were still potential barriers for them. Was General Arnold admitting that German intercontinental rockets, which could indeed pass over all barriers, were "present equipment" and had been fully developed by the end of the war?

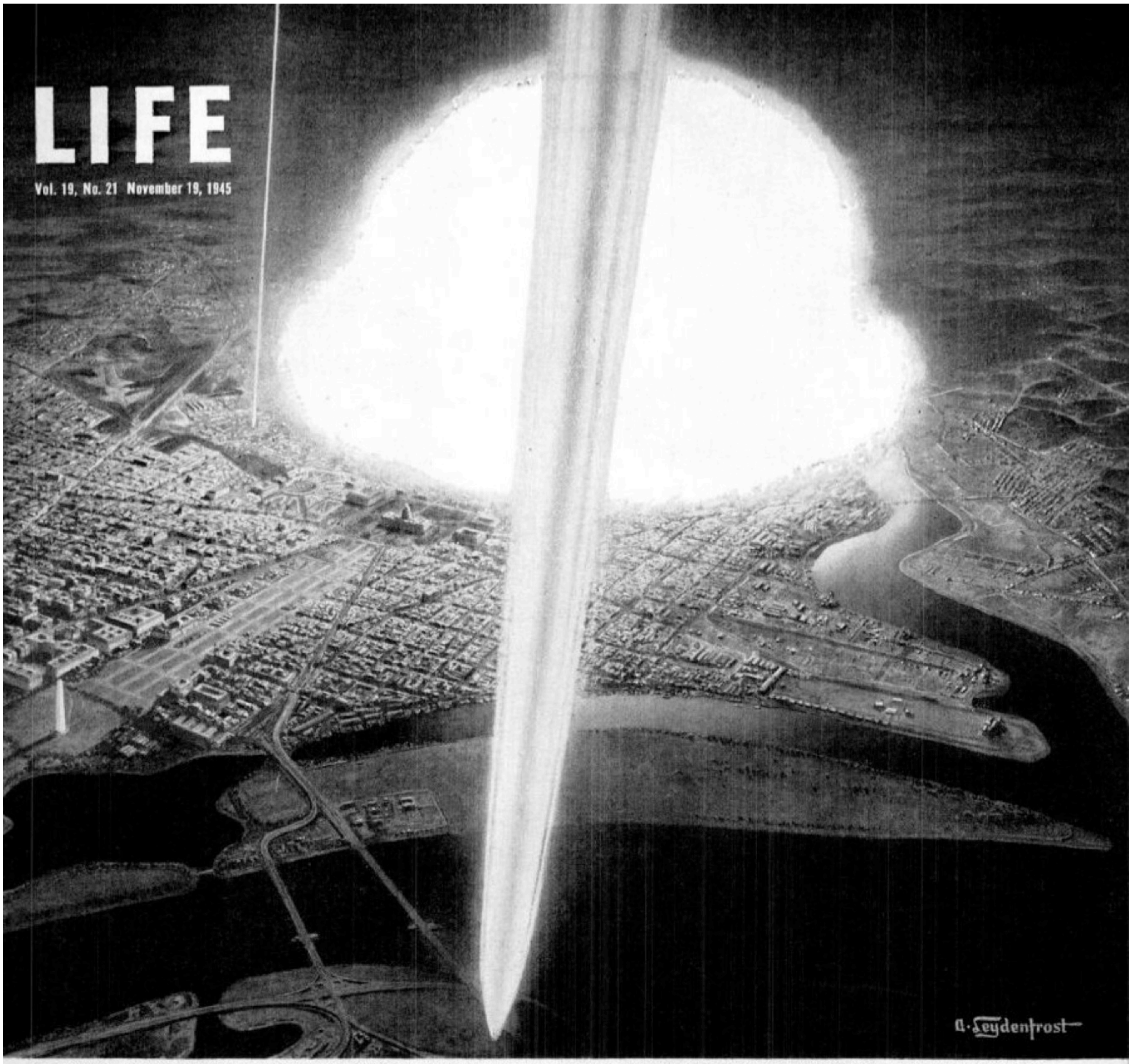
Based directly on information from General Arnold, this *Life* article presented illustrations of a number of very German-like rockets arcing over the Atlantic and delivering nuclear bombs to major U.S. cities, including a full-page illustration of a nuclear explosion in Washington, D.C., and another full-page illustration of the rubble of New York City after a nuclear explosion. Some of the illustrations are shown on the following pages. Was this General Arnold's idea of "present equipment" based on what his investigators found in Germany and Austria at the end of the war? What exactly did they find?

A two-page illustration in the article also depicted a massive underground military complex with areas for manufacturing and storing nuclear weapons and rockets, launching nuclear-armed rockets, providing living quarters for all the workers in the underground complex, and supplying power for the complex. The article portrays such a complex as something that the United States might build, but in 1945, the United States did not have such underground complexes, plans to build them, or intercontinental rockets with which to equip them. However, Germany had spent several years during the war developing just such underground complexes. How far did Germany actually get in making these sorts of underground nuclear weapons production/intercontinental rocket production/launching complexes operational? What did General Arnold know from his investigators?

One of the main engineers in charge of designing and build German underground complexes during the war, Karl Fiebinger, worked in the United States for many years after the war as a "consultant" on secretive government projects (pp. 4986–4991, 4993). His accomplishments in the United States included designing underground missile silos for intercontinental ballistic missiles, which may shed light on the nature and extent of his wartime work for Germany [Freund and Perz 1987, p. 44]. Another person who apparently did similar work for both wartime Germany and the postwar United States was Hans Brand (German, 1879–1959). Thus this arm of the long-standing postwar "nuclear triad," nuclear-armed intercontinental ballistic missiles based in underground silos, appears to have been directly derived from German-speaking creators and their creations.

For a similar but later article, see:

Robert S. Richardson. Rocket Blitz from the Moon. *Collier's Weekly* 23 October 1948, pp. 24–25, 44-46. http://www.zarthani.net/docs/rocket_blitz_from_the_moon-colliers.pdf]



THE 36-HOUR WAR BEGINS WITH THE ATOMIC BOMBARDMENT OF KEY U.S. CITIES. HERE A SHOWER OF WHITE-HOT ENEMY ROCKETS FALLS ON WASHINGTON, D.C.

THE 36-HOUR WAR

ARNOLD REPORT HINTS AT THE CATASTROPHE OF THE NEXT GREAT CONFLICT

This week General Henry H. Arnold, commanding officer of the Army Air Forces, published his third formal report to the Secretary of War. The report was not only a history of Air Forces activities at the end of the late war but a warning of future wars. Said the general: "In the past, the United States has shown a dangerous willingness to be caught in a position of having to start a war with equipment and doctrines used at the end of a preceding war. . . . Military Air Power should . . . be measured to a large extent by the ability of the existing Air Force to absorb in time of emergency . . . new ideas and techniques."

The Army Air Forces, said General Arnold, were fully prepared to absorb new ideas: "We can run a large air operation for the sole purpose of delivering one or two atomic bombs. . . . When improved antiaircraft defenses make this impracticable, we should be ready with a weapon of the general type of the German V-2 rocket, having greatly improved range and precision. . . ."

Such weapons as these, in the hands of other nations as well as the U.S., would make possible the ghastliest of all wars. Hostilities would begin with the explosion of atomic bombs in cities like London, Paris, Moscow or Washington (*above*). The destruction caused by the bombs would be so swift and terrible that the war might well be decided in 36 hours. The illustrations on these pages show how such a war might be fought if it came.

But General Arnold did not suggest that improved weapons were the only safeguard of the U.S. It would be better, he said, to use bombs for peace now rather than for war later, possibly by using them as a power to enforce decisions of the United Nations Organization's Security Council.

27

Figure E.135: Illustration from The 36-Hour War.

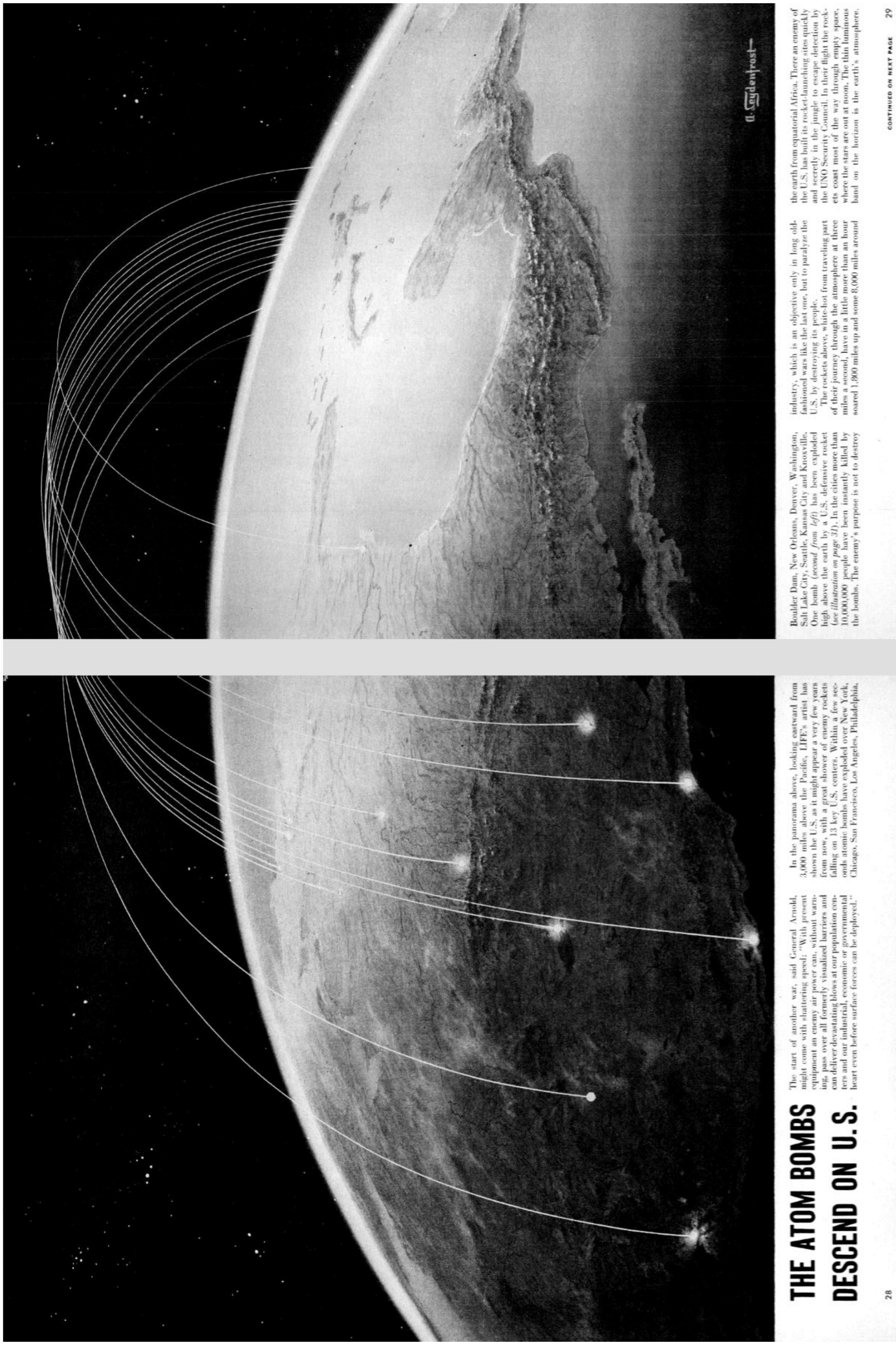


Figure E.136: Illustration from The 36-Hour War.

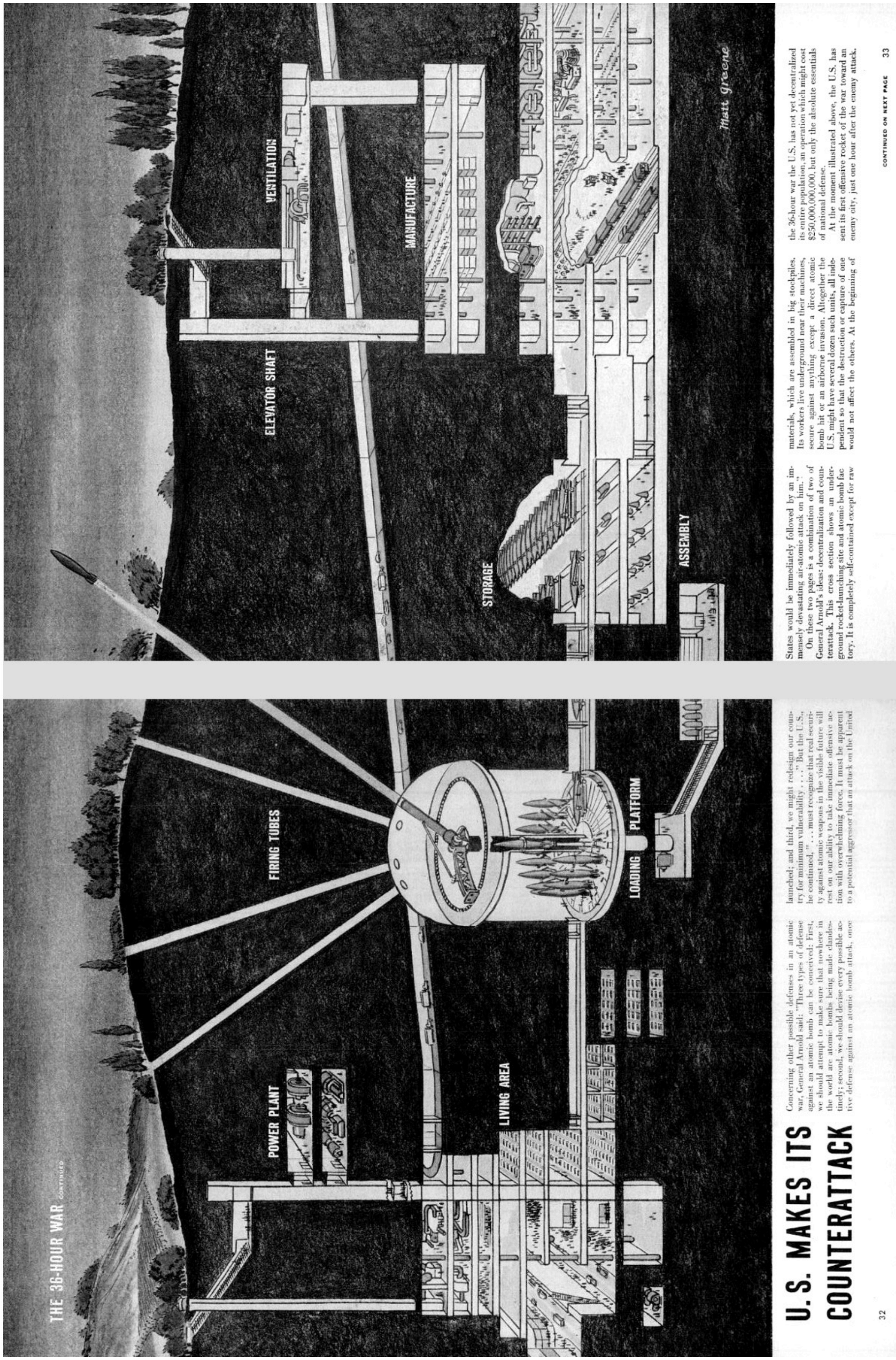


Figure E.137: Illustration from The 36-Hour War.

Figure E.138: Illustration from The 36-Hour War.

Carl A. Spaatz. Air Power in the Atomic Age. *Collier's* 8 December 1945 pp. 11–12, 83–84.

[...] At the top of its arc the V-2 traveled at an altitude of 60 or 70 miles and reached a maximum speed of about 3,500 miles an hour—approximately a mile a second. It was a bifuel rocket utilizing liquid oxygen and a hydrocarbon like alcohol or hydrogen peroxide.

Three improvements would make a similar rocket almost a perfect weapon: more range, increased explosive power, greater accuracy. The Germans were readying a transatlantic model when the war ended. Our atomic development supplies the explosive. There is no visible barrier to solution of the accuracy problem. [...]

[General Spaatz was the commander of the U.S. Strategic Air Forces in Europe during World War II and would have had a detailed knowledge of all relevant intelligence, both during and after the war. Seven months after the end of the war in Europe, Spaatz wrote that he knew the Germans had been **readying** a transatlantic rocket (presumably the A-9/A-10). Thus such rockets were far more than a blueprint design–they were actually being prepared for use against the United States. How exactly did Spaatz know that? Henry Arnold made a very similar statement in 1949 (p. 5466). Where are the U.S. reports on this topic located now? Where are any captured German documents and hardware?]

Balanced Forces Urged by Arnold. *New York Times* 9 December 1945 p. 31.

General, at Pennsylvania Dinner, Calls for Close Watch on Potential Enemies

General of the Army Henry H. Arnold, commanding general of the Army Air Forces, advocating a policy of "offensive readiness," said last night that this country needed an intelligence service that would keep us informed of the intentions and scientific developments of possible enemies. He also called for the maintenance of "balanced armed forces" to insure peace. [...]

Forecasting the further development and perfection of super-bombers—for which no military target will seem too distant—General Arnold pictured radar-directed V-2 weapons equipped with atomic bombs, and said the damage would be "a far too terrible thing to contemplate." While there are no certain means to stop such weapons, once launched, he added, our aids and destructive equipment can make their use more difficult.

Scientific Research Stressed

"One necessity to meet the future is an intelligence service that will always keep us informed of the possible intentions and the scientific developments of possible enemies," he continued. "We must use our most brilliant scientists to develop better weapons more quickly and more effectively. We must take advantage of the bases we now have to be closer to an enemy's vital points with our weapons than he is to ours. We must use the most modern weapons of all kinds so that we can beat any potential opponent to the draw. Our hope lies, then, in a policy of offensive readiness to perpetuate peace—to provide for national security."

The general pointed out that this does not mean we should ever become an aggressor nation. He emphasized it was a plan of insuring peace, since "there will be little or no time for recovery after the first blow is struck by the attacking nation" in any future war. [...]

Henry H. Arnold. 1946. Air Force in the Atomic Age: Future of the Ballistic Rocket [Masters and Way 2007].

[...] The Twentieth Air Force, using atomic bombs, could in one day's raid destroy more of Japan's industry than was actually done in the entire B-29 campaign. [...] A similar fate would have enveloped England had the Germans obtained atomic explosives for their V weapons.

We have now flown a B-29 nonstop for a distance of over 8,000 miles. Ranges of 10,000 miles for one-way trips with newer types of aircraft appear to be a possibility of the near future. [...]

Looking only a little farther to the future, we must consider developments of the V-2 rocket. By designing a rocket consisting mostly of fuel, a speed of 3,400 miles per hour and a range of 200 miles was obtained in operations against England. This rocket weighed 14 tons and delivered only 1 ton of explosive. The Germans had under design a longer range rocket, using a pick-a-back principle. A large rocket was to carry a smaller one up to a speed of 2,500 miles per hour. At this point the smaller one was to take off on its own, attaining a speed of 5,800 miles per hour, which would carry it 500 miles. The combined rocket would weigh 100 tons and deliver 1 ton of explosive. Designs incorporating winged rocket predicted an increase of range to 300 miles for V-2 by finishing the trajectory in a glide and an increase to 3,000 miles for rockets of the 100-ton class. This phenomenal increase in range was based on a trajectory in which the rocket would bounce out of the lower atmosphere into the stratosphere in a succession of jumps (like a stone skipping on water) and end up in a glide. Extensions of these techniques to rockets of more than two stages permit increasing the range indefinitely with a progressive decrease in percent of payload. However, the achievement of range alone is of little strategic value unless it leads to effective and economical destruction of specific targets. [...]

Very long-range rockets were not a serious threat before the atomic bomb because of the high ratio of the weight—and consequently the cost—of the vehicle compared to the explosive load. Even a two-stage rocket would barely break even economically—the cost of destroying a square mile by this means being comparable with, if not larger than, the damage done to the enemy. With an atomic warhead, however, the cost of the carrier is not excessive and even the expense of the most elaborate guiding and control equipment would not make the total product inefficient, for the destructive effect would exceed the total cost by a large factor.

Henry H. Arnold. 1949. *Global Mission.* New York: Harper. pp. 497.

Fortunately, judging from the mere 1100 that finally fell on England, chiefly London, the long-range V-2 rockets did not get into production until January, 1944. The planned output of 900 a month was not achieved, 50 to 300 being the number produced monthly until August. Between September, 1944, and March, 1945, the production rate was 700 a month. [...] A large bombproof launching site was under construction in France as early as May, 1943, however, and another in August, at about the same time the V-1 launching sites were begun. The V-10 (A-10), a very large rocket intended especially for New York, was being built.

[General Arnold would have had detailed classified knowledge of any wartime German development of intercontinental jet bombers, intercontinental rockets, and nuclear weapons. He stated unambiguously that the A-10 New York rocket was being built, and he confirmed that it was the same rocket as what had been called the V-10.]

Statement of Dr. Vannevar Bush to the U.S. Senate. 3 December 1945. *Hearings Before the Special Committee on Atomic Energy, United States Senate, Seventy-Ninth Congress, First Session, Pursuant to S. Res. 179, a Resolution Creating a Special Committee to Investigate Problems Relating to the Development, Use, and Control of Atomic Energy, Part 1, November 27, 28, 29 and 30, 1945. December 3, 1945.* Washington, D.C.: U.S. Government Printing Office, 1945, pp. 179–180. [Bush 1945]

Dr. BUSH. [...] Let me say this: There has been a great deal said about a 3,000-mile high-angle rocket. In my opinion, such a thing is impossible today and will be impossible for many years. [...]

They have been talking about a 3,000-mile high-angle rocket, shot from one continent to another, carrying an atomic bomb and so directed as to be a precise weapon which would land exactly on a certain target, such as a city.

I say, technically, I don't think anybody in the world knows how to do such a thing, and I feel confident that it will not be done for a very long period of time to come. [...]

The CHAIRMAN. Well, Dr. Bush, I read in this week's Collier's magazine an article by General Carl Spaatz of the Air Forces. I would like to have you read that article.

Dr. BUSH. That would not worry me in the slightest degree. I have just been criticizing the report of General Arnold of the Army Air Forces.

The CHAIRMAN. I wish that you would, sometime later on, comment on that article.

Senator TYDINGS. What does it say, Mr. Chairman?

The CHAIRMAN. What it says, Senator, is that the Germans, the year preceding the end of the war, were designing a rocket, and were pretty well along on it, that could carry from that continent to this continent and that would contain a warhead. They did not, of course, at that time have in mind an atomic warhead. That is my understanding of the article, at least.

Of course, I do not quality General Spaatz as an engineer, but he has written this article in Collier's.

Dr. BUSH. If you were talking about 400 miles or 500 miles, I would say by all means. That is what the Germans did with their V-2. I would say yes, even with 2,500 miles.

But 3,000 miles? That is not just a little step beyond, it is a vastly different thing, gentlemen. I think we can leave that out of our thinking. I wish the American public would leave that out of their thinking.

[Vannevar Bush, a doctor of engineering and vice president of MIT, created and ran the umbrella organization for all U.S. government-funded research and development during World War II (including the Manhattan Project), and developed the blueprint for postwar U.S. research programs (p. 2200). He had a deep personal knowledge of science and engineering, had access to the best scientists in the United States, and presumably had access to even the most highly classified information about what the United States had learned regarding German research and development programs.

Not only had Germany been developing long-range rockets during the war, but even as Bush gave this testimony to the U.S. Senate in December 1945, German-speaking scientists were hard at work in the United States, Soviet Union, and other countries to develop more rockets based on those wartime designs.

Because Vannevar Bush was so well informed and his other scientific statements were so accurate, it is striking that his statement about the feasibility of intercontinental rockets was so incorrect. He even ignored the evidence from U.S. Army Air Forces generals that was directly cited in this Senate hearing, insisting not only that intercontinental rockets were not feasible at the present time, but that they would not be feasible within the foreseeable future, and that no one in the world knew how to develop them.

Bush even went so far as to publicly state that it was entirely possible to increase the range of German rockets from the initial ∼190-mile range of the V-2 all the way to 2,500 miles (a 1200% increase), yet completely impossible to increase it just a little more from 2,500 miles to 3,000 miles (a further 20% increase). Such a statement seems scientifically ludicrous.

Was this a rare and extreme error by Bush, or was he intimately aware of the details of the German work—especially German work on 3,000-mile rockets capable of reaching the United States (e.g., pp. 5208, 5402, 5821)—and trying to cover it up in public? If he was trying to cover it up, what did he actually know? In retrospect, one gets the impression that whatever Bush had discovered about wartime German progress on intercontinental rockets (and/or atomic bombs they could carry) must have been sufficiently shocking for him to deny the topic so completely, despite so much evidence to the contrary.

The chairman of the Senate committee added that the Germans "did not, of course, at that time have in mind an atomic warhead." Yet that view was directly contradicted by the chairs of CIOS, U.S. General Thomas Jeffries Betts, Deputy G-2 of SHAEF, and U.K. Ministry of Supply chief advisor and F.R.S. Professor Reginald Patrick Linstead, in their written report (p. 5445). It was also contradicted by a great deal of other evidence that was known at that time to high-ranking U.S. officials (Appendix D and p. 5821).

Are any wartime and postwar papers by Vannevar Bush (and his chief deputies such as James B. Conant) still classified? If so, can they be declassified and searched for wartime or postwar intelligence on German programs to develop weapons of mass destruction and various means of delivering them to Allied targets?]

McNarney Predicts 10,000-Mile Missile. ***New York Times.*** **4 December 1948 p. 6.**

Tell Industrialists Here That Tactics, Weapons of Last War Are Obsolete

Gen. Joseph T. McNarney, Commanding General of the Air Materiel Command at Wright Field, warned yesterday that while America must not consider itself prepared for push-button warfare, it "can no longer afford to fight a war of the future with the strategy, tactics and the conventional weapons of the last." [...]

In a graphic word picture of current developments in the field of rockets, jet propulsion and supersonic flight which he admitted was "fairly well fenced in by security restrictions," the general envisioned a missile with a 10,000-mile range that he held to be representative of future push-button warfare.

Guidance Critical Problem

The critical problem in the development of such a weapon, he declared, is guidance. As ranges increase, he added, the accuracy of radio and radar guidance schemes decreases. The optimum guidance system would be one that is self-contained within the missle and is non-jammable by the enemy, he said. [...]

The general pointed out that such a weapon is one of four types of guided missiles that military and scientific leaders feel will be successfully developed. Surface-to-surface missiles, he said, may be available in three years on America's shorter-range subsonic weapons, but he refused to predict the decade in which the nation will "cross the threshold of true push-button warfare."

Attack Possible "At This Hour"

In his review of the development of another one of the four guided missiles—the air-to-air missile—General McNarney said such a weapon would be effective in the event of an enemy bombing attack on a major American city. Such an attack, he warned, is possible "at this very hour when we consider the long-distance feats already accomplished by our own B-29 Superfortresses, which are even now being relegated to the realm of obsolescence."

The air-to-air missile, he explained, would be launched from interceptor aircraft and would proceed under rocket power at supersonic speeds, guided by a radar homing device at the enemy aircraft. Its development as an operational missile, he said, would take only a relatively short period of time. A surface-to-air missile, also moving at supersonic speeds after being fired from defensive ground sites, he added, "should be available for operational use within the next few years."

The general said that the development of air-to-surface guided missiles, or large bombs of the 12,000-pound, 22,000-pound and 43,000-pound class, designed to strike a specific enemy with high accuracy, is possible in the immediate future, with the 12,000-pound bomb being available within the next year. [...]

[Wright Field was home to vast quantities of documents and equipment captured in Germany, as well as many of the German aerospace engineers who came to the United States. This report may reflect wartime German accomplishments, and in any event shows how deeply indebted postwar U.S. programs were to German creations and creators.]

Germans Had Jet 'Planes 5 Times Faster Than Sound.' ***The Ottawa Journal.*** **18 January 1946 p. 9. [https://www.newspapers.com/newspage/50100865/].**

A jet aircraft designed to travel at five times the speed of sound and a rocket motor 10 times larger than those used on V-2s at the end of the war were just two of many German developments in aeronautics viewed by Canadian-scientists during a recent tour of the battered Reich. The experts, five members of the National Research Council Staff, spent four months poking around former German research stations, airfields and underground factories. At a symposium of the Council's Science Association they reported their conclusion that many advances in German aeronautics failed to reach the production stage, only because of Hitler's "intuition and interference" and a lack of co-ordination of various projects by the Nazi air ministry. The experts were W. F. Campbell, wind tunnel expert; R. D. Hiscocks, supervisor of the airframes laboratory; M. S. Kuhring, chief of the engine laboratories; J. L. Orr, in charge of de-icing research, and D. G. Samaras, another engine expert. Mr. Samaras reported the Germans had made "considerable headway" in trans-Atlantic rockets and actually were making preparations for space travel. A lack of materials, skilled labor and proper organisation slowed this project. In rockets and jet propulsion, the Nazis had "10 times our technical facilities" and in rocket research were "miles ahead of us." Research now was extensive in Britain and the United States in this field and it was time similar work was started in Canada. Mr. Hiscocks described several advanced types of jet and propeller-driven aircraft with most of the later models featuring "sweep back" wings.

The most advanced was a fantastic jet affair resembling a paper dart, called the [Lippisch] DM-1. It was a modified glider designed to reach speeds five times faster than sound and operate at an altitude of up to 22 miles. "It was completed just in time for the United States Army to take delivery," he said. Another type in the 600 mile-an-hour bracket resembled a boomerang with a jet engine mounted in the centre. It had a 50-foot wing span and could remain in the air for three to four hours "high for a jet." Another novel feature was a "pilot ejector seat," which broke an air vice-marshall's back when he ventured to test it. Some Messerschmidt 262's had rocket boosters enabling them to climb 30,000 feet in two minutes. A late model Heinkel 162 had a climbing rate of 4,200 feet a minute and sufficient were produced to take "quite a toll of our bombers." Still another type was a tailless rocket job, "the first in the world." It had a speed of 600 miles-an-hour and climbed 30,000 feet in 2 1/2 minutes. The German scientists "knew about as much about air foils as we did," but went farther in designing wings that sweep back sharply from the nose of the aircraft. Such designs give as much as a 60-mile-an-hour boost to speeds, but lack control at lower speeds.

"Hitler's visions disrupted the whole aircraft production program," Mr. Hiscocks said. Once the German leader ordered a plane designed as an interceptor to be converted into a bomber. Mr. Hiscocks said the Germans never produced an outstanding bomber. In general the failure of Germany to win control of the air was "a tactical error by the high command and not the fault of the designers." The world's first jet plane had been flown at Rostock in 1938, about a year ahead of the first Italian effort and three years ahead of Britain.

[Five Canadian aerospace experts reported that while visiting a German research station, they viewed "a rocket motor 10 times larger than those used on V-2s." The most important parameter of a rocket motor is its thrust; if that is the measure of comparison intended here, the standard V-2 motor had a thrust of 27 tons at sea-level atmospheric pressure, so that would mean the Canadians saw a rocket motor with a thrust of roughly 270 tons. Both the A-10 booster and the Silbervogel space plane were designed to use engines with a 200-ton thrust. Thus the reported engine could have been built specifically for either one of those vehicles, and would demonstrate that those projects had progressed well beyond the paper design phase. Alternatively, the reported engine could have been for some other large rocket project that has been even less well characterized in the published literature.

If the reported motor was "10 times larger" in mass, a standard V-2 motor had a mass of approximately 930 kg, so the observed motor would have had a mass of roughly 9300 kg. The best documented design for an A-10 motor used six standard V-2 motors that all fed into a larger nozzle. The A-10 engine mass does not seem to be reported in the published literature but would have included the mass of the six standard motors plus almost as much for the large nozzle, or roughly 10 times the mass of one standard V-2 motor. Likewise the exact Silbervogel engine mass is difficult to find, but a reasonable estimate is that it was roughly half of the 10,000 kg empty mass of the Silbervogel, or roughly 5000 kg.

Conceivably the reported motor might have been "10 times larger" than a standard V-2 motor in length, width, combustion chamber volume, nozzle area, or some other parameter.

In any event, the report by the Canadian aerospace experts demonstrates that some very large rocket project had progressed well beyond the drawing board: A-10, Silbervogel, or some other rocket similarly sized for intercontinental trajectories.

Can the detailed scientific reports of these Canadian experts be located?

Similar versions of this news story were also reported in:

Calgary Herald. 19 January 1946 p. 10. https://news.google.com/newspapers?nid=Hx6RvaqUy9IC&dat=19460119&printsec=frontpage&hl=en

Courier-Mail (Brisbane, Australia). 19 January 1946 p. 1. https://trove.nla.gov.au/newspaper/article/50289068?browse=ndp%3Abrowse%20%2Ftitle%2FC%2Ftitle%2F12%2F1946%2F01%2F19%2Fpage%2F2011541%2Farticle%20%2F50289068]

Donald L. Putt. 1946b. German Developments in the Field of Guided Missiles. *Society of Automotive Engineering (SAE) Journal (Transactions)* 54:8:404-411.

[...] After watching the V-1 and V-2 firing trials at Blizna and Cracow, Poland, in April, 1944, Hitler is reported to have stated that German secret weapons were not the product of dreamers and that England and the whole world would soon feel their effect. It wasn't until allied technicians examined German developments in this field that we fully realized the tremendous achievements of German scientists, and how near they were to achieving the boasts of their leader.

The Germans were preparing rocket surprises for the whole world in general and England in particular, which would have, it is believed, changed the course of the war if the invasion had been postponed for so short a time as six months. Many of Germany's research laboratories and several large commercial firms concentrated on this field of endeavor. This tremendous effort resulted in 138 guided missiles and assorted devices, including their modifications. These were of types wholly unknown to laymen in the United States. At the outbreak of the war some of these were strictly "out of this world"—to use a current phrase. In addition, German scientists had developed other equipment of a type we had considered impracticable, such as the ram jet.

The stupendous effort in basic research expended by the Germans in the guided missile field was designed to cover the complete field of potentialities for such weapons. The losses incurred in Germany by heavy bomber raids can in no way be charged to lack of preliminary research on missiles. Weapons of this category were divided into the following classifications:

A. Ground to air.

B. Air to air.

C. Air to ground.

D. Ground to ground.

E. Underwater to underwater.

F. Underwater to ground.

G. Underwater to air.

Moreover, every known type of remote control and fusing means was exploited. These included radio control, wire control, radar, continuous wave, acoustics, infrared, light beams, and magnetics.

Likewise, all methods of employing jet propulsion for subsonic and supersonic speeds were exploited.

In all, it was estimated that one-third of the aerodynamics research in Germany was devoted to problems of guided missiles. Wind tunnels of undreamed-of speeds were under construction. A Mach number of 10 was not too great for the Germans to comprehend and strive for.

In the matter of aerodynamics and propulsion, the Germans were sufficiently advanced to handle any program desired. In the field of control they appear to have waited too long to make the necessary tests to indicate the proper directions for detail development; also, the fact that the Germans were late in being able to arrive at the answers required to utilize nuclear energy in the warheads made the German missile program more one of nuisance and worry over what might come than one of actual military damage.

Some of the classes of German missiles based on intended use are:

A. The Beethoven [...] was an air-to-ground missile. This composite aircraft consisted of an Me-109 fighter mounted on top of a Ju-88 bomber. The pilot rode in the cockpit of the Me-109, where he manipulated the controls of both craft. The nose of the Ju-88 was modified to contain an explosive. Upon reaching the target area the Ju-88 was released from the Me-109 in a dive which aimed it at the objective. This weapon was not used by the Germans to any extent; however, upon the termination of hostilities it was found that great quantities had been built up for an all-out assault at a later date.

B. The Enzian [...] was a ground-to-air missile. This small-winged flak rocket, named after the flower gentian, was controlled in flight by radio, and was intended for use against heavy-bomber formations. Its plywood fuselage was 17 ft in length and carried 990 lb of explosive. Four auxiliary starting rockets were mounted outside the fuselage, and after 5 sec of flight were jettisoned. Plans were being made to modify the Enzian so that it could attain supersonic speeds, but because of the advances of the U.S. Army only a few successful test firings were made.

C. The Wasserfall was a ground-to-air missile. A 26-ft flak rocket, the Wasserfall, meaning waterfall, is very similar in design to the V-2 rocket launched against Britain. At first it was visibly controlled by radio from the ground, but later methods employed radar tracking to guide it to the objective. Due to persistent allied bombing only 30 test launchings were made.

D. The X-4 was an air-to-air missile. It was a small rocket bomb, named Ruhrstahl or steel of the Ruhr, just under 6 ft in length, and designed to be launched from fighter aircraft. The rocket was controlled from the parent aircraft through two 4-mile lengths of wire. This fine wire was paid out from tapered bobbins enclosed in fairings at the extremities of two of the wings. Detonation occurred by means of a proximity fuse.

E. The Fitz X [...] was an air-to-ground missile. This German bomb was released from aircraft flying at a minimum altitude of 22,000 ft. It was gyrostabilized and visibly guided into the target by radio. The Fritz X was ready for operational use in January, 1943, and was first employed successfully against our shipping and assault forces at Salerno. The warhead on this bomb was armor-piercing and carried a charge of 2530 lb of standard explosive.

F. The Hs-298 [...] was an air-to-air missile. It was about 4 ft in length and could be controlled either by radio or wire. It was originally intended for use against sea targets, but early in 1945 it was being produced for air-to-air fighting in a factory in the underground railway in Berlin. A total of only 300 was built because the X-4 or Ruhrstahl bomb had become available.

G. The Hs-117 [...] was a ground-to-air missile. It was named Schmetterling or butterfly, and was a rocket-propelled, radio-controlled missile to be launched from the ground against bomber formations. It accelerated to a speed of 560 mph, and was steadied in flight by a pendulum device. The take-off rocket burned out and were jettisoned; the main propulsion unit then drove the missile until it was detonated by a proximity fuse. Large-scale production began January, 1945, in an underground factory in Nordhausen.

H. The Rheintochter [...] was a ground-to-air missile. It was a rocket-propelled anti-aircraft weapon and was controlled in flight by radio. It traveled at a speed of 1100 mph and carried an explosive charge of 330 lb, equipped with a proximity fuse, to a ceiling of 48,000 ft. The starting rocket, attached to the base, was blown off after combustion was completed. Development did not go beyond the test firing stage, but experiments were still being conducted as late as February, 1945. The code name Rheintochter means daughter of the Rhine.

I. The FZG-76 [...] was a ground-to-ground missile. It was launched either from the ground or from an aircraft. Ground launching as practiced by the Germans utilized a long run in which the working substance was the steam resulting from the catalytic action of calcium permanganate on a concentrated solution of hydrogen peroxide. The length of the gun and ramp varied from 140 to 170 ft at different sites. It carried 1870 lb of explosive, the range was 120 to 160 miles, and the circular probable error about five miles at a range of 130 miles when ground launched. The error was five times as great for air launching. The overall weight was about 5000 lb. The missile flew at an approximately constant altitude of about 2000 ft at speed varying for individual missiles from 288 to 425 mph.

Numerous techniques for controlling the missiles were evolved, only one or two of which proved satisfactory. Conventional radar units, with special coding mechanisms were used. In one instance a beam-riding system was attempted, but the disastrous test results caused an immediate cessation of the project. It appears that the missile was supposed to follow a beam of energy emanating from a radar unit and aimed at the target, in this case an airplane; however, the missile would usually reverse its direction and ride the beam down to the radar unit, with quite obvious results. As a result, it was decided to augment the control system by adding homing or seeking devices of various sorts. These included systems sensitive to heat or sound. Some of the homing devices incorporated a miniature radar unit.

The German developments being discussed here are generally grouped under the loose term "guided missiles"; however, that isn't correct, inasmuch as some of the missiles are not guided and some of the developments are not missiles. I have already discussed another widely employed classification based upon the location of the launching device and the target; for example: air-launched-to-ground targets. The classification I shall employ is based upon the type of propulsion unit.

There are six general types of direct-reaction engines.

1. The first example is the reciprocating engine with the exhaust jet.

2. The second example is the gas turbine.

3. The third example is the turbo jet.

4. The fourth example is the reed, intermittent-combustion engine. This is better known as the "buzz bomb" engine. The reed engine is similar to the ram jet engine, with the exception that it is equipped with a grill at the forward end.

5. The fifth example is the ram jet, also known as the athodyd or the Lorin engine, after the inventor. This device consists primarily of a curved, barrel-like tube into which fuel and air are introduced.

6. The sixth and last example is the pure rocket. This is subdivided into the dry fuel and liquid fuel subtypes. In either case, we have simply a combustion chamber in which the fuel burns. In the case of the dry fuel rockets, the fuel is also stored there. A great many of the German guided missiles were equipped with this type of propulsion equipment.

This discussion concerns itself with the latter three listed propulsion systems. For the purpose of simplicity, we will now consider the various engines and their applications, commencing with the reed engine and the ram jet. We have but one example of each of these, whereas we have some 30 examples of the rocket type. [...]

The next type of engine we will consider is the ram jet.

Only quite recently, now that air-speed values are approaching the velocity of sound, has it been practicable to envisage the use of the Lorin nozzle for propulsion. In the fall of 1944, while development in this country was largely limited to discussion as to whether such a powerplant would operate at all, the Germans had developed, built, and flight-tested a unit designed to produce a gross thrust of 4400 lb at 500 mph. (See Fig. 9). This development was accomplished by Walter of Kiel, Dr. Saenger of the DFS (Institute for Study of Soaring Flight), and by engineer Pabst of the Focke-Wulf plant at Bad Eilsen. [...]

A particularly effective employment of the Lorin tube is that of a jet propeller with a rotating wing. [...] Here characteristics and performance are very high; particularly in the range obtained at high altitudes. This is due to the fact that in rotating-wing aircraft the rotors can always be run at suitably high speeds. A rocket attachment can be provided to enable safe landing if the propellers are cut off. Take-offs and landings in these aircraft occur vertically, and only a small flying strip is required. [...]

The most highly publicized missile of the Germans was the V-2, or as the Germans themselves knew it, the A-4.

There were 10 variations of this weapon. [...] Three were prototypes. Four were improved models. One was a launching device intended to increase the already great range to 5000 km. Interestingly enough, one of the improved models was to be equipped with wings, wheels, a pressurized cabin, and to carry a pilot. [...]

The "A" series was considered to be an intermediate step to the practical use of guided weapons. The inherent shortcomings of this type of weapon were partly conditioned by the war, but the future will disclose improvement occurring more rapidly than was thought possible prior to the war.

It is interesting to note that this missile was extremely expensive, each requiring 20,000 man-hr for construction; however, since the Germans launched 3165 A-4's operationally, it is clearly indicated that the place of the large rocket weapon is firmly established in modern warfare. It has been pointed out that the small size of the warhead—1 ton—would hardly seem to have made the cost of the weapon worth while. In this connection it must be pointed out that it was probably the intention of the Germans that the weapon would eventually carry some sort of atomic device, in which case the warhead would have had the requisite specifications. [...]

In conclusion may I state that the Germans in the guided missile field were 10 years in advance of similar American development.

It will be noted that the Germans very largely explored the entire field of rocket-powered equipment. Their program was just beginning to become stabilized with the production of those units which were adaptable to mass production and operational use.

Very fortunately, they were never able to obtain full use of their developments. We are all familiar with the immense rocket-launching establishment on the coast of France which was to be used in destroying London.

It is now the responsibility of the American industrial machine to begin where the Germans stopped and to provide ourselves with the equipment necessary to maintaining our leadership in the scientific world.

American industry and the War Department must cooperate in exploiting this field, in which there appear to be unlimited possibilities for new and better devices and equipment, not alone in the province of weapons of war, but also in the applications to a fuller and more satisfactory civilization. [...]

[Note the similarities between Putt's presentation and the earlier reports on pp. 5429 and E.2 with which he was probably intimately involved. Putt was the U.S. Army Air Forces Colonel (later General) in charge of rounding up most of the German aerospace engineers in Europe at the end of the war, and funding them to continue their work in the United States for many years after the war. From that very well-informed position, he stated in this 7 March 1946 presentation to the Society of Automotive Engineers that among other things:

- German engineers had developed "the complete field of potentialities" of all possible types of missiles, "every known type" of electronic guidance and sensors, and jets and aerodynamics ranging from subsonic through supersonic speeds to Mach 10, or 10 times the speed of sound.

- Based on his studies of this field, the Germans were fully ten years ahead of the United States.

- There were many different types of long-range rockets. Putt's brief description of "10 variations of this weapon" could be taken to mean the well-known series from A-1 to A-10, or it might have reflected other variations that Putt had seen during his investigations of German rocket programs.

- Germany was within six months of employing rockets with much greater range than the A-4 (V-2) that would have "changed the course of the war," which would suggest that such rockets had already progressed well beyond the paper design stage.

- He believed that the Germans intended to put nuclear weapons on their rockets, which would suggest that there had been a long-running and determined nuclear weapons program operating in parallel with the German rocket program.

Interestingly, some of these statements vanished without explanation from later versions of this speech, such as the 27 June 1946 version written at Wright Field, possibly due to censorship. Censorship may also explain why he publicly stated much less than he presumably knew about the A-9/A-10 intercontinental rocket or other long-range rockets that were on the verge of changing "the course of the war." See these two related documents:

> Donald L. Putt. 1946. German Developments in the Field of Guided Missiles: An Address Before the SAE in New York, 7 March 1946. Summary Report. Report No. F-SU-1122-ND. 27 June 1946. Headquarters, Air Materiel Command, Wright Field, Dayton, Ohio. Library of Congress, Washington, DC. Call number MLCM 95/01648 (T) FT-MEADE.
>
> Donald L. Putt. 1946. World's Cities Threatened by Nazi Supersonic Bomber. *Society of Automotive Engineering (SAE) Journal* 54:7:9.

Many details from Putt's March 1946 presentation were repeated, often almost verbatim, by journalists' articles in various publications later from summer 1946 through 1947. See for example:

> Charlotte Knight. German Rocketeers: German Rockets and Guided Missiles Almost Won the War for the Nazis. *AAF Review* July 1946. 29:6:24–26, 48. (See p. 5038.)
>
> Nazis Worked on Plane to Bomb U.S. *Hartford Courant* 15 July 1946, p. 1.
>
> Hitler Planned Supersonic Bomber to Hit New York. *Los Angeles Times* 15 July 1946, p. 2.
>
> List of Terror Weapons of Nazis Revealed by AAF. *Plattsburgh Press-Republican* (Plattsburgh, New York) 15 July 1946, p. 1.
>
> Nazi Scientists Worked on 136 Secret Weapons. *Times Record* (Troy, New York) 15 July 1946, p. 3.
>
> Transatlantic Roller Coaster Designed to Bomb U.S.A. *Popular Science* October 1947. https://neverwasmag.com/2018/09/wonder-weapons-of-the-third-reich/transatlantic-roller-coaster-designed-to-bomb-usa/]

Senator Elbert D. Thomas. April 1946. Sitting Ducks in Our Air Forces. *The American Magazine*. pp. 26–124.

We won the air war against the Germans with muscle, not mind. We smothered them with the sheer weight of our planes. Their air weapons were ahead of ours at the start of the war, and far ahead at its end. Had our invasion of Europe been delayed six months, we might have lost the war, due to our inferiority in the air.

For years our Air Forces have given the American public a false sense of security by untruthful boasting. Before the war, we were told that American air power was best. It wasn't. . . . During the war, we were told that it was both best and biggest. It wasn't best; it was just biggest; it was muscle not mind. . . . We'd better learn the truth. For in the next war—God forbid!—boasting won't count, and there will be no time to build mere muscle into victory, as we did this time. Mind, not muscle, will win, and in days or hours instead of years.

Our combat airmen, the fighter pilots and bomber crews, fought magnificently with the weapons given them. But they weren't the best weapons, as they should have been. Our Air Forces high command clung stupidly and stubbornly to the ideas and weapons of yesterday, while the Germans developed and put into combat those of today and tomorrow.

After V-E Day, Allied civilian scientists and engineers visited Germany and inspected the laboratories, experimental stations, and factories which served the Luftwaffe. Their findings show not only the superiority of new German weapons, but the details of Germany's long-range research and development, a program marked by vision and eagerness to try new ideas. By contrast, the findings reveal our Air Forces' appalling lack of vision and stubborn allergy to new ideas, which were concealed from the American public. [...]

They [Germans] were first in combat with pressurized cabins, essential to high-altitude flight; with pilot-ejection, a mechanical bailout vital to high speeds and altitudes; with special high-altitude parachutes; with unified engine-control, needed by fighter pilots; with plane-to-plane rockets; with a true aircraft gun, a cannon ten times as destructive as our comparable cannon. [...]

The real shock comes when we view the Germans' unconventional developments, their really new ideas and weapons. They had most of them in combat. We had a few in partial development, none in combat. While we were being told what our new weapons were *going* to do, the new German weapons were *doing* it. [...]

This was the Messerschmitt-262 jet-propelled fighter, which first appeared in combat in the summer of 1944. Making 525 miles per hour, it was much faster than our Mustangs, Thunderbolts and Lightnings. At sea level it was *more than 150 m.p.h. faster.* [...]

Another German jet plane, the Heinkel-162 *Volksjaeger* (People's Fighter) had about the same performance. Still another, in development, was the *Triebfluegel Flugzeug* (powerwing aircraft) which had 3 wings radiating from the fuselage, like the fins on a bomb. Each wing-tip carried a jet engine. Launched vertically and shot to high altitude by rockets, its 3 jets would make it extremely fast in combat.

The Germans had jet bombers, too. The Arado-234 was made in 2 models, with speeds of 470 and 546 m.p.h. The Junkers-287, in flight test when the war ended, had more than twice the power of our B-29 Superfortress, could carry as many bombs to London as a B-17 could carry to Berlin, and made 537 m.p.h. There was to be a Junkers flying wing, with 4 jet engines and a speed of 620 m.p.h.

Even their jet bombers were *faster than our fighters*, making interception difficult and pursuit impossible. Our tactical commanders never understood why German jets, fighters, and bombers didn't raid southern England. They had the range and would have found hundreds of airfields crammed with our planes. With their great speed, they would have suffered little from antiaircraft fire. Our fighters couldn't have coped with them. Such raids would have been utterly devastating.

German rocket fighters, in combat during the last six months of the war, were even faster than the jets. One model of the Messerschmitt-163 made 550, another 590, m.p.h.

The Bachem *Natter* (Viper), in development, was launched vertically to get upstairs fast and attack bombers with rockets, and by ramming after its pilot was ejected. Though test-flown, its maximum speed was still estimated, but at more than 600 m.p.h. [...]

The V-1 made 360 m.p.h. at 3,000 feet altitude or less. Our fighters had to dive from higher altitude to catch it. [...] In terms of time and bomb-tonnage, the V-1's were much more destructive than Allied bomber raids on Germany. And much cheaper. [...]

The V-2 was still more spectacular—a rocket 45 feet long, 5 feet in diameter, weighing 12 tons, and carrying a ton of high explosive. [...] It was 6 times as fast as the German jet and rocket planes, traveling about 3,600 m.p.h. Far from catching it, our fighter pilots couldn't even see it. [...]

About a dozen new V-weapons were on drawing boards, in laboratories, and nearing production. One would carry troops in a pressurized cabin. Another would be launched from a submarine 300 feet below the surface. A third would cross the Atlantic in 14 minutes, arching to 500 miles' altitude and flying at 16,000 m.p.h. It was intended for morale-shattering mass raids on New York. It wasn't impractical. The Germans' prediction that they would do it in a year or so was no idle boast.

Had our invasion been delayed six months, the Germans could have regained air superiority, not only in Europe, but over the Channel and southern England. We could have continued night raids, but our daylight raids would have been suicidal. They could have raided England both night and day. Our planes couldn't have stopped them. Striking at airfields, troop-concentration areas, ports, and shipping—decimating our armies and destroying their equipment—they could have made an invasion of Europe almost impossible. Their better planes could have destroyed ours on the ground, as ours did theirs when muscle outweighed mind.

Between raids by their planes there would have been thunderous barrages of V-weapons. They planned to launch 1,000 V-1's a day. Rockets more deadly than the V-2 would have reached north to all important cities in England. We couldn't have prevented it.

England would have been pounded to rubble. Even if the Germans didn't invade, and they might have, a stalemate and negotiated peace would have been our best prospect, and total defeat not at all unlikely. We had a narrow escape, as it was. After our ground forces conquered the Continental coast just before V-E day, I visited a V-weapon factory. I could not help but utter to myself, and I've repeated it often, "We are just in time." That was no flight of poetic oratory; it was the stark and awful truth. And the threatened defeat which it so clearly implied *would have been due directly to our backwardness in the science of aviation.*

With more appetite for publicity than respect for the truth, our Air Forces brought us to World War II believing that we were the world's leading military air power. Press-agent activities produced such magazine articles as *Our Own War Birds Are Best*, in 1939. They weren't; they were inferior in speed, altitude, firepower, armor, and other respects. Commenting on this in 1942, a Congressional report said, "All this, despite the fact that Congressional Committees were frequently told our war planes of that period (1939) were better than those of other nations."

There was no secrecy about the Germans' superiority. They described and illustrated their planes in books and magazines, discussed them on the air and invited foreign pilots, including ours, to inspect and fly them.

Yet during the war hundreds of press agents, advertising men, and others more or less skilled at deceiving the public were hastily commissioned as Air Forces public-relations officers. Combat results, especially in bombing operations, were grossly exaggerated. Scores of enemy strong points were "wiped out" on Monday and "obliterated" on Tuesday, only to offer the bloodiest resistance to our ground forces on Wednesday.

On the home front, newspapers were deluged with misleading handouts. Magazine writers were given similarly misleading information about planes and equipment. Thousands of radio programs went on the air from hundreds of stations, with similar disdain for the truth. [...]

During and immediately after the war the new German weapons—jet and rocket planes, V-1's and V-2's—were ignored or belittled as "weapons of desperation," "fantastic," or "on the lunatic fringe," though anyone who thought so was clearly on the lunatic fringe, himself. Once the weapons were in our hands, the fashion changed. Recent articles discussed them seriously as weapons in our own air arsenal, but their German origin has never been denied. [...]

The Germans produced the weapons of today and tomorrow, while we improved those of World War I.

The defense usually offered by the Air Forces when charged with lack of progress is that they "weren't given enough money." That is largely nonsense. [...] The millions spent on most of these minor improvements, or failures, with propeller-driven planes would have produced jet planes. It was vision, not money, that was lacking. [...]

A change in leadership is not the solution of the problem. The truth is that our Air Forces suffer the ailments common to all military self-perpetuating organizations—ruling cliques, caste, politics, petty bureaucracy, fixed regulations, the purely arbitrary authority of rank and seniority, promotion for these reasons more often than for genuine ability. All these factors encourage acceptance of the past and discourage vision for the future.

[As previously noted, standard A-4 or V-2 rockets required over five years of massive effort to progress from paper designs to deployed weapons, carried one ton of conventional explosives, and could not reach England from areas still under German military control near the end of the war.

Based both on Senator Thomas's on-site inspections of German rocket programs and on his knowledge of detailed reports from scientific inspectors, he stated that Germany was within six months of deploying mass-produced versions of much more advanced rockets that were "more deadly than the V-2" (apparently meaning with payloads that were much more destructive than conventional explosives) and would have enough range to reach all of the United Kingdom from central Europe (with a much longer range than the V-2).

He also mentioned at least three other advanced types of rockets that (1) "would carry troops in a pressurized cabin," (2) "would be launched from a submarine 300 feet below the surface," and (3) "would cross the Atlantic in 14 minutes."

Senator Thomas and the other inspectors could not possibly have expected those more advanced rockets to make the leap from paper design to mass-produced deployed weapon in just six months; most likely the inspectors discovered well advanced hardware development, testing, and/or production programs for the rockets.

Senator Thomas's description of the 1940s U.S. research system seems to still be quite applicable to the modern research system.]

U.S. Army Ordnance Department. 1946. *History of Ordnance Technical Intelligence in World War II, Part 1: History, Orders & Circulars, Publicity.*
[https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1059&context=dodmilintel]

During the war, American Ordnance was tested in deadly combat against the greatest array of enemies to oppose us in all history. They were armed with weapons which were the products of years of planning and building and the best that their mobilized scientific talent could devise. Nor did they stand still—for they realized that they were in a desperate competition wherein other things being equal, the nation which led in the design and production of the most deadly weapons would win. The most obvious example of the truth of this is the atomic bomb. However, this cannot be considered the only example that has appeared in this war which has seriously affected its outcome as there have been many other cases—like that of proximity fuzes and radar.

In connection with the subject of proximity fuzes, the Germans had expended a vast amount of energy on the research and development of fuzes which would detonate ammunition without coming in physical contact with the target. We were far ahead of them on actually getting a proximity fuze into production and into active use during the war, they were very effective, particularly in antiaircraft use. However, at the time the war ended, the German research and development had progressed to such an extent that they had designs almost ready for production and had thoroughly investigated many of the possible types of proximity fuzes; e.g. acoustic, radio, photo-electric and electro-static types.

This same situation occurred in many other fields of ordnance where the Germans were advancing very rapidly at the end of the war, and had the war lasted much longer, some of the new designs may have had an effect on prolonging the war. This possibly is most evident in connection with guided missiles.

Probably because of their lack of aircraft there was a tremendous incentive to develop some kind of a weapon to combat our devastating bombings. A number of rocket propelled missiles which could be guided from the ground and which would detonate by the use of a proximity fuze when coming within the danger area of one of our airplanes were developed to the production stage and one guided missile was actually in production at the end of the war. Our understanding of the way one was to have operated was by means of radar screen which could track both the target and the missile. The operator would have the necessary controls required to direct the missile and by watching the radar screen could take the necessary steps to bring the missile as close as possible to the airplane, at which time the proximity fuze would function and the airplane would disappear.

Quite a number of types of the well-known V-2 rocket had been worked on by the Germans and the research progress was laid out in such a manner that it would appear that very long range rockets might have been used some time in the near future had the war continued and nothing else interfered with their efforts. It is frightful to consider the possibility of a guided missile with an atomic bomb as a warhead, but there is little doubt that the Germans were actively considering the possibilities of such a weapon.

[The U.S. Army Ordnance Department closely investigated advanced German weapons both during and after the war. The Ordnance investigators were actually reprimanded by General Leslie Groves for publicly revealing how advanced the Germans were. See pp. 4186–4187, 5747–5753.]

A-2 File

HEADQUARTERS
UNITED STATES AIR FORCES IN EUROPE
Assistant Chief of Staff, A-2

A.P.O. 633 U.S. Army
10 June 1946

BA 452.03

SUBJECT: Report on Large Sized Rockets

TO: Assistant Chief of Staff, T-2, Air Material Command, Wright Field, Dayton, Ohio.

The inclosed report on "Large Sized Rockets and Applications" prepared by Hugo Kalimourski and Max Gorissen, German engineers, is forwarded for your evaluation.

1 Incl:
Report on Rockets.

Approved by ..... AWB
Prepared by ..... TFN
Operations Br.

ADMIN DIV
10 JUIN 1946
DIRECTOR OF INTELLIGENCE
HQ USSTAF

Figure E.139: Report on Large Sized Rockets. 10 June 1946 [AFHRA folder 570.650 May–Aug 1946; AFHRA C5098 electronic version p. 523].

Report on Large Sized Rockets. 10 June 1946. [AFHRA folder 570.650 May–Aug 1946; AFHRA C5098 electronic version p. 523]

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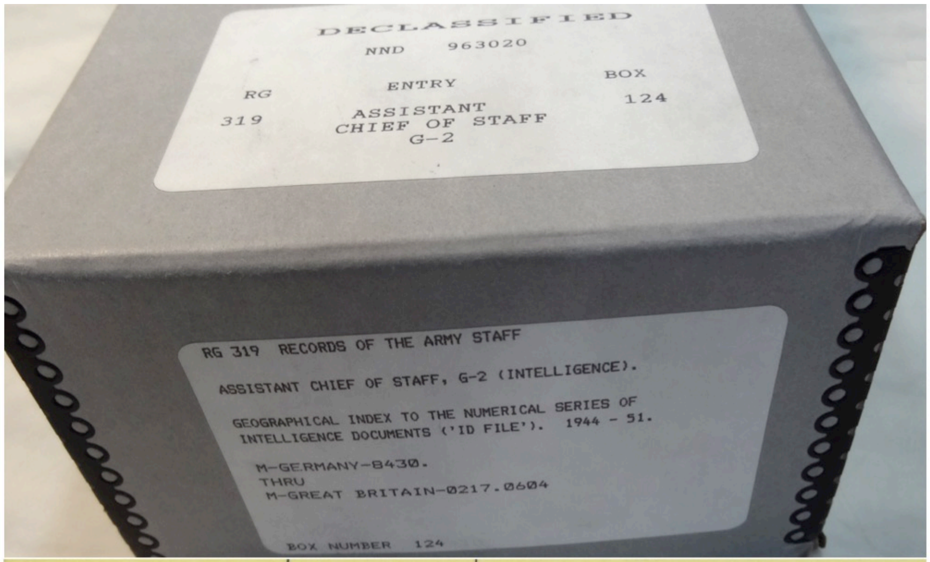
[See document photo on p. 5483. This AFHRA file folder and the corresponding microfilm reel only include this cover letter, not the actual report. Can this report be located in archives at AFHRA, NARA, Wright Patterson Air Force Base, or elsewhere?

What exactly did Hugo Kalinourski and Max Gorissen work on during the war? What did they do for the United States after the war? Was this a report of their own work, or a report or translation they wrote based on the work of other German engineers?]

Card catalog entry for *History of German Trans-Atlantic Rocket A-10.* 4 March 1947. [NARA RG 319, Records of the Army Staff, Entry A1-84E, Box 124. BID 8600.0711 Nuclear Physics (Atomic Energy)—Uses—Rockets]

[The photographs from a U.S. Army card catalog of intelligence documents on p. 5485 show that the U.S. government once possessed a complete history of the A-9/A-10 trans-Atlantic rocket, written two years after the war's end, but that this history was either destroyed or not transferred to NARA with the other files; no copies of this report have ever been located. If the A-9/A-10 never entered active development during the war, why would the U.S. government have commissioned a detailed history of its development in 1947, and why would the government have later ordered that history to be suppressed? Does the fact that the Army Assistant Chief of Staff for Intelligence specifically filed this report under "Nuclear Physics (Atomic Energy)—Uses" indicate that the A-9/A-10 had a nuclear warhead? CIG, listed as the source of the report, was the Central Intelligence Group, a U.S. intelligence agency that existed during 1946–1947 as an intermediate step between the wartime Office of Strategic Services (OSS) and the modern Central Intelligence Agency (CIA). [https://irp.fas.org/cia/ciahist.htm]]



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DATE	SOURCE	COMMENTS	M.I.S. NO.
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1947 NEW BID-NEW NUMBER

DATE	SOURCE	COMMENTS	M.I.S. NO.
4 Mar.47	CIG	(T) History of German Trans-Atlantic Rocket A-10	S.D.4622

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Figure E.140: Card catalog entry for *History of German Trans-Atlantic Rocket A-10.* 4 March 1947. [NARA RG 319, Records of the Army Staff, Entry A1-84E, Box 124. BID 8600.0711 Nuclear Physics (Atomic Energy)—Uses—Rockets]

NARA RG 319, Entry NM3-85M, Box 47, Folder 926087 (former SD-3676)

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Figure E.141: Summer 1946 reports on planned U.S. and Soviet guided missiles are still classified and withheld from the public 75+ years later, even though actual postwar Allied missiles have been sitting in museums around the world for many decades. Are these reports kept classified because they describe advanced German missiles from a year earlier from which the postwar Allied missiles were directly derived? [NARA RG 319, Entry NM3-85M, Box 47, Folder 926087 (former SD-3676)]

**NARA RG 319, Entry NM3-85M,
Box 47, Folder 926087 (former SD-3676)**

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Figure E.142: Summer 1946 reports on planned U.S. and Soviet guided missiles are still classified and withheld from the public 75+ years later, even though actual postwar Allied missiles have been sitting in museums around the world for many decades. Are these reports kept classified because they describe advanced German missiles from a year earlier from which the postwar Allied missiles were directly derived? [NARA RG 319, Entry NM3-85M, Box 47, Folder 926087 (former SD-3676)]

Charles J. V. Murphy. The State of the Armed Forces. *Life.* 2 Sept. 1946, pp. 96–108. https://books.google.com/books?id=OEIEAAAAMBAJ&pg=PA96&source=gbs_toc_r&cad=2#v=onepage&q&f=false

Yet, as matters stand now, the most important question mark in the U.S. military equation is not the conflicting rate of development of the supersonic airplane and its counter. It is whether the big, long-range supersonic rocket, such as the German V-2, will develop to a point where it will supplant the strategic bomber.

The V-2 now being tested in the New Mexico desert is, by bombsight standards, an inaccurate and unreliable weapon. On a 200-mile range it is seldom accurate within six miles. It consumes about nine tons of alcohol and oxygen to deliver a ton of explosives. But it would be a dull man indeed who considered these shortcomings decisive. As a mechanical proposition, the rocket offers the most effective way to deliver the atomic bomb. Its plunging descent at ultrasonic speed (maximum: 4,400 feet per second) makes the problem of radar tracking and interception as agonizingly difficult as coping with the atomic explosion itself. In fact, even now the 1945 model of the German V-2 with a non-atomic warhead and a 350-mile range (unfortunately none of the samples fell into our hands) has been conceded by the British Imperial Staff as rendering the British Isles indefensible. [...]

Not insignificantly the common language in the assembly sheds at White Sands is German. The fact of our dependence upon German scientists in this epochal development in the art of war explains in large measure the unprecedented preoccupation of our military planners with pure research. For in many fields of research—guided missiles (of which they invented 138 types), supersonic flight and submarine warfare—the Germans were far ahead of us. The real reparations prize of the war was not German machinery but German brains and research records.

Under the Potsdam partitioning of Germany, the Russians ended up with all the guided-missile proving grounds and most of the factories, the principal supersonic research centers (with wind tunnels far in advance of our own) as well as the underground mass-production and V-2 plant at Nordhausen. Equally precious were masses of official records, of which the some 400 tons plucked out by a handful of American intelligence officers represent but an inadequate sampling. Chance delivered into our hands the two leading V-2 research men, but the rank and file of German technicians in nearly all branches of the war sciences—nuclear physics, jet propulsion, supersonics and so on—were left in the Russian zone. The Russians have not only put them to work, but they have begun to coax across the Elbe scientists and other technicians from the American and British zone. Top-flight men are being offered the equivalent of $35,000 a year, with assurance of freedom of research and of person.

The possibility that these wandering talents, embodying billions of dollars worth of research knowledge, may drift into Russia worries U.S. strategists far more than the stripping of German machinery. An American general observes, "These German scientists are the new mercenaries." [...]

And they give point to the observation of Rear Admiral Luis de Florez, the Navy's assistant director of research: "If we had only been smart enough to grab Germany's top 1,000 scientists and technicians and cart them off to a kind of scientific St. Helena, Europe would have remained disarmed for a generation."

[Charles J. V. Murphy (U.S., 1904–1987) had a long career as a journalist specializing in intelligence and defense for *Time*, *Life*, and other publications. He also served as a colonel in the Air Force Reserve after WWII and handled public relations and speechwriting for many Air Force and NATO officials. Thus he was incredibly well connected and extremely knowledgeable regarding military technologies. For more information on Murphy, see:

https://www.washingtonpost.com/archive/local/1987/12/31/author-and-journalist-charles-murphy-dies/0c630636-8b51-4715-971d-3c64a75d5b99/

In this *Life* article, Murphy clearly stated the usual 200 mile (∼320 km) range of a standard A-4 (V-2) rocket. Then he stated that there were multiple copies of an improved "1945 model" of the rocket with a 350 mile (∼560 km) range that existed at the end of the war but were not seized by U.S. forces. From other information in the article, it sounds as if they were seized by Soviet forces. While 350 miles is much longer than the range of a standard 14-meter-long A-4 (or its postwar Soviet copy, R-1 or SS-1), it is a perfect match for the range of an upgraded 18-meter-long A-4 like the postwar Soviet R-2 or SS-2. Thus the information in this article suggests that upgraded 18-meter A-4 rockets had already been mass-produced by Germany during the war, were taken by Soviet forces at the end of the war, and were copied as the Soviet R-2 or SS-2.

A number of independent sources also indicated that upgraded 18-meter-long A-4 rockets were produced in Germany during the war (p. 5794).

Where are the German documents on these improved rockets? Note that Murphy specifically mentioned "400 tons" of captured German documents that were especially relevant.

Where are the Allied reports on the advanced rockets, or postwar interrogations of Germans who had worked on the advanced rockets?

Where are the documents in which the British Imperial Staff "conceded" these existing German rockets "as rendering the British Isles indefensible?"

Admiral Luis de Florez headed research programs in the U.S. Navy during and after WWII, and in the CIA after the war. From that highly informed position, he voiced his opinion that the top 1,000 scientists in the world who were capable of creating revolutionary military technologies were all German.

The rest of the article, supported by Murphy's highly placed sources in the U.S. military and intelligence communities, confirms that German-speaking scientists and their technologies were far ahead of those that had been home grown within the United States up to that point.]

Charles Lester Walker. October 1946. Secrets by the Thousands. *Harper's Magazine* 193:329-336.

But of highest significance for the future were the Nazi secrets in aviation and in various types of missiles.

"The V2 rocket, which bombed London," an Army Air Forces publication reports, "was just a toy compared to what the Germans had up their sleeve."

When the war ended, we now know, they had 138 types of guided missiles in various stages of production or development, using every known kind of remote control and fuse: radio, radar, wire, continuous wave, acoustics, infra-red, light beams, and magnetics, to name some; and for power, all methods of jet propulsion for either subsonic or supersonic speeds. Jet propulsion had even been applied to helicopter flight. The fuel was piped to combustion chambers at the rotor blade tips, where it exploded, whirling the blades around like a lawn sprinkler or pinwheel. As for rocket propulsion, their A-4 rocket, which was just getting into large scale production when the war ended, was forty-six feet long, weighed over 24,000 pounds, and traveled 230 miles. It rose sixty miles above the earth and had a maximum speed of 3,735 miles an hour – three times that of the earth's rotation at the equator. The secret of its supersonic speed, we know today, lay in its rocket motor which used liquid oxygen and alcohol for fuel. It was either radio controlled or self-guided to its target by gyroscopic means. Since its speed was supersonic, it could not be heard before it struck.

Another German rocket which was coming along was the A-9. This was bigger still—29,000 pounds—and had wings which gave it a flying range of 3,000 miles. It was manufactured at the famous Peenemünde army experiment station and achieved the unbelievable speed of 5,870 miles an hour.

A long range rocket-motored bomber which, the war documents indicate, was never completed merely because of the war's quick ending, would have been capable of flight from Germany to New York in forty minutes. Pilot-guided from a pressurized cabin, it would have flown at an altitude of 154 miles. Launching was to be by catapult at 500 miles an hour, and the ship would rise to its maximum altitude in as short a time as four minutes. There, fuel exhausted, it would glide through the outer atmosphere, bearing down on its target. With one hundred bombers of this type the Germans hoped to destroy any city on earth in a few days operations.

Little wonder, then, that today Army Air Forces experts declare publicly that in rocket power and guided missiles the Nazis were ahead of us by at least ten years.

The Germans even had devices ready which would take care of pilots forced to leave supersonic planes in flight. Normally a pilot who stuck his head out at such speeds would have it shorn off. His parachute on opening would burst in space. To prevent these calamitous happenings an ejector seat had been invented which flung the pilot clear instantaneously. His chute was already burst, that is, made of latticed ribbons which checked his fall only after the down-drag of his weight began to close its holes.

A Nazi variation of the guided air missile was a torpedo for underwater work which went unerringly to its mark, drawn by the propeller sound of the victim ship from as far away as ten miles. This missile swam thirty feet below the water, at forty miles an hour, and left no wake. When directly under its target, it exploded.

All such revelations naturally raise the question: was Germany so far advanced in air, rocket, and missile research that, given a little more time, she might have won the war? Her war secrets, as now disclosed, would seem to indicate that possibility. And the Deputy Commanding General of Army Air Forces Intelligence, Air Technical Service Command [Donald L. Putt], has told the Society of Aeronautical Engineers within the past few months:

The Germans were preparing rocket surprises for the whole world in general and England in particular which would have, it is believed, changed the course of the war if the invasion had been postponed for so short a time as half a year.

[What Army Air Forces publication reported: "The V2 rocket, which bombed London, was just a toy compared to what the Germans had up their sleeve"???

The German news magazine *Der Spiegel* published a translated and heavily censored version of Charles Walker's 1946 article [Charles Walker 1946], and even that only came after an extraordinary five-year publishing delay [Der Spiegel 1951-06-05] Among the many details from Walker's article that were deleted by *Der Spiegel* were the precision guidance systems for the A-4 rocket, any mention of the A-9 or A-9/A-10 rockets, the fact that the Silbervogel was intended to be piloted, and the public declaration by U.S. Army Air Force experts that Germany was at least ten years more advanced than the United States in these areas. *Der Spiegel* also censored Donald Putt's quote, "The Germans were preparing rocket surprises for the whole world in general and England in particular which would have, it is believed, changed the course of the war if the invasion had been postponed for so short a time as half a year."]

Colonel George Bryant Woods. 1946. *The Aircraft Manufacturing Industry: Present and Future Prospects.* New York: White, Weld & Co. Frontispiece and p. 32.

[See pp. 5072–5073 for this extraordinary 1946 statement by a U.S. Army Air Forces intelligence expert on "Germany's Plans for the 'A-9' with Atomic Bomb."]

Senator Harry F. Byrd. 1948. Hitler's Experts Work for Us. *The American Magazine* (March) 145:24–25, 136–138.

[...] Who are these Germans—Zobel, Lippisch, Hermann, von Braun, Heinrich, Doblhoff, Goethert, Eckert, and the rest? Air Force authorities tell us that they are the scientists who put Germany years ahead of everyone in aeronautical science. They put some of their astounding new air weapons into combat before the war ended. Their jet and rocket fighters slashed through our bomber formations almost unmolested by our slower propeller-driven fighters. Their guided missiles, almost invisibly fast, were conceived to track down planes in flight and explode automatically when near them. Their jet V-1 and rocket V-2 did great damage in England and Europe; we had developed little defense against either the former or the latter. Almost ready was a V-2 of much greater range, for more widespread destruction. As the war ended, I personally saw the progress they had made on the super V-2 type, rocket-powered, which they thought might blast New York across 3,000 miles of Atlantic Ocean.

They started research on supersonics (speeds faster than that of sound) years before we did. Air Force officers concede that they were so far along that uncharted road that findings we captured made radical changes necessary in our supersonic plans, as applied to both planes and guided missiles.

"It will probably cost $100,000,000 to achieve practical supersonic flight" (with a piloted plane), wrote Lt. Gen. Nathan F. Twining, former Wright Field commander, in THE AMERICAN MAGAZINE for August, 1946. There is no estimate on what it would have cost without benefit of the earlier German research.

General Putt states: "Our Washington people say that in guided-missile development alone the Germans we've brought to American will save us 10 years and $750,000,000, and that seems reasonable to me. I'm sure that the total saving will amount to billions of dollars, but the actual figure must be anyone's guess today."

It may be said that German scientists, including those now working for us, were revolutionizing the entire character of air warfare. They were making nearly all the conventional air weapons of World War II obsolete. Jet and rocket propulsion is now virtually a requirement for all combat planes except the longest-range bombers. Guided missiles of fantastic speeds, altitudes, ranges, and destructive force—atomic or high-explosive—are in the making.

These German scientists are showing us how their tricks were done. They are helping us to catch up in our research the easy way. They are carrying on for us the research projects they were forced to interrupt in Germany. They are helping to ensure our aeronautical superiority. [...]

In Germany in the summer of 1945, Maj. Gen. Hugh J. Knerr, now Air Inspector, sent a memorandum to Lt. Gen. Carl A. Spaatz, who then commanded the AAF in Europe. "Occupation of German scientific and industrial establishments," he wrote, "has revealed the fact that we have been alarmingly backward in many fields of research."

General Putt, then a colonel, was in Germany leading the Air Force Intelligence teams which took over the research laboratories, experimental stations, and production plants. "I visited a great many of them," he said, "and talked with the German specialists who manned them. Their research progress in jet and rocket propulsion, aerodynamics, thermodynamics, supersonics, and other fields was clearly far ahead of anything of the kind we had done." [...]

The Air Force Intelligence teams harvested 1,200 tons of German scientific records, screened out the most important 150 tons, and shipped them to Wright Field for translation and evaluation. "But the records weren't enough," said General Putt. "The real need—and it's still greater today—was to put the Germans to work again at their research projects, but now for us. That's what started the procession of German specialists to America." [...]

Col. W. R. Clingerman, chief of the group which administers the Germans' affairs at Wright Field, explains, "They were paid the regular civil-service $6 per diem for detached service. From that they paid 25 to 35 cents for ordinary army mess, per meal, plus 50 to 75 cents a day for janitor or orderly service. They spent about a day's pay each week on packages of lard, coffee, cigarettes, dried eggs, candy, and such things, which they sent to their families in Germany. They also paid for all their clothes, laundry, tobacco, transportation, entertainment, magazines, books, and incidentals.

"Theoretically, they were paid salaries, but they never saw the money. [...] All of it went to their families or dependents, who weren't allowed to leave Germany. Most their families lived in an army housing area at Landshut, Bavaria, where they were guaranteed food, fuel, light, and some other things at fair prices." [Thus the scientists had to spend the "salaries" they were given to pay the U.S. military for keeping themselves and their families in custody.] [...]

When they first arrived they were hungry, and correspondingly meek. Once fed, their native German arrogance reasserted itself. Under the Nazis they had been pampered with special housing, rations, and privileges. Now there were desk-pounding complaints about their surveillance, contracts, housing, delays in getting mail—and even pay—possible loss of assets in Germany, and the security and welfare of families still there. [...]

They complained, and with truth, that they were given no constructive work. For months they wrote routine reports, or twiddled their thumbs, until their made-in-Germany records were translated and evaluated and they were interviewed, by Air Force and industrial engineers, to extract usable information about their past scientific and technical accomplishments. But in this their native German vanity proved valuable. [...]

It was succeeded by a formal contract, renewable yearly for a maximum of five years. [...] But in nearly all its provisions—as to duration, pay, hours, administration, patents, housing, subsistence, surveillance, mail, termination, return to Germany, and even burial—the U.S. Government is judge, jury, and jailer. [...]

"The Germans' salaries," said General Putt, "range from $2,200 to $8,000 per year, and average about $5,500. To establish them, we submitted standard applications, giving detailed qualifications, to Air Force civilian personnel authorities. In all cases salaries were set *one grade lower* than would be paid to Americans with the same qualifications. [...]

Among the first to arrive, in September, 1945, was Dr. Theodor Zobel, wind-tunnel expert of Germany biggest research institute, at Brunswick near Berlin. [...]

Evaluating Dr. Zobel's work, Wright Field's Dr. Wattendorf said, "It has saved us about five years of extremely expensive research time. In fact, five years would fairly measure the research savings of each of the top-flight German scientists working for us."

Also at Wright Field is Dr. Bernhard Goethert. He, too, specialized in high-speed airflow research, especially as applied to wing shapes. His findings influenced the design of the V-1 and the fastest German jet and rocket fighters. Their swept-back wings are believed by many aerodynamic authorities to be best for supersonic flight. [...]

The aerodynamic work on the devastating V-2 was done largely by Dr. Rudolf Hermann who, like Dr. von Braun, was at Peenemünde. He designed a 7,000-m.p.h. wind tunnel, for testing guided-missile models, and was supervising its construction in the Bavarian Alps when the war ended. He brought with him to Wright Field his own staff of 7 expert laboratory assistants, together with much unpublished data on his most important supersonic experiments. The Air Force has plans for his super-supersonic wind tunnel in the great air-research center which the Air Force wants to establish.

Meanwhile, Dr. Hermann is contributing his scientific talents to our guided-missile program. For the Nazis, he designed a 3,000-mile missile. For us, he might produce one with a range of 4,000 to 5,000 miles.

Even faster than the German jet fighters was the rocket-powered ME-163, which got into combat late in the war. Its designer was Dr. Alexander Lippisch, known for his glider experiments before the war. He did research work on supersonics and ballistics, notably on the V-2, and was a leading authority on the flying wing. He was one of the group of German specialists who were making preliminary plans for a "space base"—to be used for refueling rocket ships—which would revolve around the earth as a satellite at a distance of about 4,000 miles. That idea probably sounds fantastic, but the Air Force has listed it as a future project.

The Germans flew their first jet plane in 1939. We didn't start developing ours until 1942. Fuels, combustion processes, and cooling play very important roles in jet engines. Dr. Ernst Eckert, a thermodynamicist, was in charge of such research at the Brunswick institute. Despite Germany's lack of critical heat-resistant alloys, thought to be vital in jet turbines, Dr. Eckert produced substitutes which got their jet planes into combat. He is now working in the Wright Field power plant laboratory, continuing his thermodynamic research for the improvement of our jet engines, especially the supersimple ram-jet types.

During the war we were led to believe that our Norden bombsight was infinitely superior to all other bombsights, but the Germans are said to have had bombsights as good as ours in some respects, and superior in others. Joseph Shugt played an important part in their development. He is now experimenting with new bombsights in the Wright Field armament laboratory, where about 10 other German specialists are also working on research in ballistics, dynamics, and automatic instruments of various kinds.

Dr. Helmut Heinrich and Gerhard Aichinger, M.S., conducting research at Stuttgart, developed the "ribbon" type of parachute for very high speeds and altitudes. Even our propeller-driven planes had reached speeds so high that bailouts with our conventional chutes were often fatal. With their "ribbon" chutes, German pilots could bail out safely at greater speeds and higher altitudes. This chute also made it possible to recover the instrument-bearing sections of experimental guided missiles such as the V-2, something we had not done. Both Dr. Heinrich and Mr. Aichinger are now continuing their research for the Air Force, experimenting with rescue devices for extremely high speeds and altitudes.

The Germans were advanced also at the start of the war in the field of aero-medicine. They studied the physiological effects of oxygen-deficiency and low air pressures at very high altitudes, and the “blackout” results of the terrific accelerations encountered in very high speeds. In the latter research they were among the first to use a “human” centrifuge—which actually spins the flier’s body at high acceleration.

Much of this research was carried on at the Berlin Aero-Medical Institute by Dr. Otto Gauer. Now conducting further research in these fields at Wright Field’s aero-medical laboratory, Dr. Gauer is assisted by nearly a score of other German specialists, most of whom did similar research work at the Heidelberg Aero-Medical Institute. [...]

We have in our employ—or custody, if you prefer—German scientists and specialists whose work has been outstanding. They know every foot of that arduous research road, because they were the first to explore and travel it. In doing so they displayed great scientific imagination and technical competence. In my opinion, we are entitled to exploit these talents to our best possible advantage.

[Harry Byrd was a U.S. senator from Virginia 1933–1965. By 1948, he had already been in the Senate for 15 years, was a member of the Senate Armed Services Committee, and was a very well-known and powerful senator.

He wrote that after the war, he had personally seen rockets that were much more advanced than the V-2 and were ready or nearly ready by the end of the war. That agreed well with other sources quoted in this section. Byrd also wrote that at least some of the German scientists who had worked on those rockets were brought to the United States, where they were extensively interrogated and wrote reports. Where are all of those interrogation transcripts, reports, original documents, and inspection details on the rockets that Byrd saw in person? Can those be located and declassified?

Byrd’s article agreed with a number of other descriptions that German-speaking scientists were at least 10 years ahead of the United States in many fields, and that the transfer of German and Austrian innovators and innovations to the United States was worth many billions of 1940s dollars.

With regard to the general topic of producing revolutionary innovators and innovations, one should compare this U.S. senator’s description of:

- How these revolutionary innovators were treated in the German-speaking world vs. how the same innovators were treated in the United States.
- How much support was provided for developing revolutionary innovations in the German-speaking world, vs. how the United States was consciously spending as little money as possible just to transfer existing innovators and innovations from the German-speaking world to the United States.

As openly described by this high-ranking senator, from its national establishment in the 1940s, the U.S. research system was based on exploitation (e.g., “the total saving will amount to billions of dollars” vs. “Theoretically, they were paid salaries, but they never saw the money”), avoidance of challenging intellectual work (“These German scientists are showing us how their tricks were done. They are helping us to catch up in our research the easy way.”), and prejudice (“Once fed, their native German arrogance reasserted itself” and “their native German vanity proved valuable”). It would be difficult for a research system founded on such cornerstones to go on to produce as many new revolutionary innovators and new revolutionary innovations all of its own as a system that is more supportive of people and ideas. 75+ years later, it appears that has indeed proved to be the case (Section 11.3).]

Nazis Were Working On 100-Ton Rocket. ***The Courier-Mail*** **(Brisbane, Australia). 5 December 1946 p. 1.** [**https://trove.nla.gov.au/newspaper/article/49363386**]

NEW YORK, December 4.—When the war ended the Nazis were building a 100-ton rocket with which to strike at the United States.

This has been revealed by the brilliant German scientist, Wernher von Braun, who invented the V2 rocket.

Von Braun is now in the United States working with American experts on rocket experiments.

The super-rocket, he said, was on the drawing-board when Germany was over-run. It would have carried an explosive charge of six tons, and would have been capable of travelling thousands of miles.

He claimed that the V2 rocket failed in only about 5 per cent of its tests in Germany.

Von Braun and his associates from Germany are being kept at work under the utmost secrecy by the Army as they help to train American ordnance men, industrialists, and scientists from leading American universities in the secrets of rocket bombs.

U.S. Gain

An estimate that German and Austrian scientists had saved the United States more than £235 million in basic research in rockets alone was disclosed by the War Department in announcing that 730 additional experts were to be brought to the United States.

Former enemy brain-power, the department said, had advanced American research in several fields by from two to 10 years.

Already 270 former enemy scientists are at work in the United States. They include the former chief designer for the Messerschmitt aircraft works and the technical director of the Nazis' Peenemunde rocket proving ground. They came to the United States voluntarily.

The scientists are being paid on contract, the maximum being £975 annually, plus 37/ daily expense allowance. This is considerably less than the salaries paid to American civil service workers doing comparable work.

The work of the foreign scientists covers the fields of electronics, supersonics, guided missiles, jet propulsion, and fuels.

["100-ton rocket" was a name sometimes used by the Peenemünde engineers for the A-9/A-10.

Usually the expected payload of the A-9/A-10 is given as 1 ton. That could be stretched to 2 tons without much trouble. But why is the payload given here as 6 tons? Was this a different version of the A-9/A-10, or a different rocket entirely?

Why did the payload need to be 6 tons? Did that include two pilots, guidance systems, bomb, etc.? Was it an attempt to fit 6 tons of conventional explosive on the rocket to better justify the expense? Was it a 6-ton fission bomb or hydrogen bomb?]

Nazi Scientists Work On U.S. Rocket Experiment. *Newcastle Morning Herald and Miners' Advocate* (New South Wales, Australia). 5 December 1946 p. 3. [https://trove.nla.gov.au/newspaper/article/133178482]

NEW YORK, Dec. 4.—Before the war ended the Nazis were building a 100-ton rocket to strike the United States. This was revealed by the brilliant German scientist Wernher von Braun, who invented the V2 rocket, and who is now in the United States.

Von Braun is at present working with American experts on rocket experiments.

He said the Nazis' super-rocket was on the drawing board when Germany was overrun. It would have carried an explosive charge of six tons and be capable of travelling thousands of miles.

Von Braun claimed the V2 failed in only about five per cent of its tests in Germany.

Von Braun and his associates from Germany are being kept at work under the utmost secrecy by the army as they help to train American ordnance men, and industrialists and scientists from leading American Universities in the secrets of rocket bombs.

Saved U.S. Millions

A statement issued by the War Department in Washington said it was estimated that German and Austrian scientists had saved the United States more than 750 million dollars (£A234 1/2 millions) in basic research in rockets alone.

The department announced that about 730 additional experts would be brought to the United States.

The statement said that former enemy brainpower had advanced American research in several fields two to ten years. The number of experts put to work since September 1945 had grown to 270, and the total would be increased to about 1000 as soon as transportation arrangements were completed.

The scientists and technicians include the former Chief Designer for the Messerschmitt Aircraft Works and the Technical Director of the Nazis' Peenemunde rocket-proving ground. They came to the United States voluntarily.

Nazis Planned Rocket to Hit U.S. *New York Times.* 4 December 1946.

Wernher von Braun, 34-year-old German scientist who invented the deadly V-2 supersonic rocket, revealed today that before the war ended the Nazis were building a 100-ton rocket to strike at the United States.

Von Braun told reporters that the 100-ton rocket was on the drawing board when the Allies overran Europe. He said it would have carried a "pay-load" of six tons and would have traveled thousands of miles to strike the United States.

Frank H. Winter. George Sutton, the (Other) Father of American Rocketry. *Smithsonian*, 16 November 2020. https://www.smithsonianmag.com/air-space-magazine/george-sutton-other-father-american-rocketry-180976306/

Born Georg Paul Erich Schulhof in Vienna, Sutton was compelled to leave Austria for the United States in June 1938, just three months after the Anschluss. Traveling alone, the 17-year-old was listed as a student on ship passenger lists. After settling in Los Angeles with the family of his uncle, he later anglicized his name to George Paul Sutton and applied to become a U.S. citizen. Although he originally intended to follow family tradition and become a medical doctor, his interests soon took a different direction. After obtaining an associate of arts degree in Mechanical Engineering from Los Angeles City College in 1940, he went on to earn a master's degree in the same field from Caltech in 1943.

Following his graduation that spring, he joined the Aerojet Engineering Corporation (now Aerojet Rocketdyne), which had just opened its doors in Pasadena a year earlier as the second liquid-propellant rocket company in the United States. During this formative period of the American rocket industry, the main focus was not missiles but JATOs—Jet-Assisted-Take-Off units—to shorten the take-off distances for heavily loaded aircraft.

Sutton's first jobs at Aerojet involved rocketry, however, under the guidance of Theodore von Kármán, the company's first president. Sutton became a test engineer on a nitric acid/aniline thrust chamber, then worked on Aerojet's unique, double-chambered rocket engine intended to power the ill-fated Northrop XP-79 Flying-Wing interceptor, which was canceled after one fatal test flight.

He stayed at Aerojet until 1946, then joined North American Aviation as a research engineer to continue his work in rocketry. The U.S. Army Air Forces had recently invited aviation companies to bid on preliminary designs for guided missiles, and NAA's proposal for a 100- to 500-mile range missile called Navaho (for North American Vehicle [using] Alcohol [and] Hydrogen Peroxide and [Liquid] Oxygen) was accepted.

Although North American had no experience in rocketry, it did have highly competent engineers and planners, and the company established a new Aerophysics Laboratory to take on the challenge. Along with his experience working with liquid-fuel rocket motors at Aerojet, Sutton's native German was especially prized, as the Navaho team intensely studied blueprints and hardware from captured V-2 rockets. Sutton was one of the first U.S. rocket engineers sent to Fort Bliss, Texas, to interrogate Wernher von Braun, the former technical director of the V-2 program who had surrendered to the Americans at the close of the war. Besides interviewing other Germans on von Braun's team, he was among the engineers who completely dismantled a V-2 engine or two to see how they worked and how they were made. These engines, as one later historian of Rocketdyne put it, "were torn down and dissected in fine detail."

Under Phase 2 of the Navaho project, NAA began constructing replicas of the V-2 engine under Sutton's supervision, one of which is in the collection of the National Air and Space Museum. These weren't precise copies—the Americans used English rather than metric measurements, along with American screw threads, O-rings and other parts. The captured V-2 engines had come to the United States minus their turbopumps, so American-manufactured aluminum pumps were substituted for the original German steel pumps.

George P. Sutton. 2006. *History of Liquid Propellant Rocket Engines.* Reston, Virginia: American Institute of Aeronautics and Astronautics.

[p. 269:] It is an ironic twist of history that Goddard's pioneering work in LPREs [Liquid Propellant Rocket Engines] and sounding rocket vehicles had relatively little impact on U.S. LPRE development. The large U.S. LPREs, which were developed later by General Electric, Rocketdyne, and Aerojet, were designed and produced without the benefit of the work done by Goddard. [...] At that time (1947–1951) my fellow designers and I had not even heard of Goddard or any of his know-how[....] Instead, Rocketdyne received a lot of help and data from the Germans and their V-2 LPRE information, which was very useful.

[pp. 752–753:] In January 1945, when it was obvious that Germany was losing the war, the personnel at Peenemünde were ordered to evacuate the facility, and Wernher von Braun and his team left the facility, but took many documents and drawings with them. The majority of the key technical personnel surrendered to the American military, were transported to the United States, and eventually joined NASA, where they worked on launching U.S. satellites and on the Saturn Apollo project. During the 1946 [to] 1971 period, the author had repeated meetings with von Braun and about 15 of the Germans who came with him from Peenemünde. These interchanges were in connection with the Rocketdyne development of the large LPREs for the NASA Saturn/Apollo SLVs [Space Launch Vehicles], which were then designed by this team. A lot of information about German LPRE efforts came from this elite German team, and the data were very useful in the U.S. LPRE efforts. Several members of the former Peenemünde team joined various U.S. aerospace companies. For example, Walter Riedel, Dieter Huzel, and Kurt Rothe joined Rocketdyne; Rudi Beichel went to Aerojet[3]; Krafft Ehricke went to Convair[4]; and Walter Dornberger and a few others went to Bell Aircraft.[5] Other German rocket experts went to the Soviet Union, France, and Britain.

It is worth repeating that the V-2 LPRE was an outstanding historic achievement. Its thrust was ten times larger than any other engine at or before that time. The engine incorporated novel features that were copied, adapted, or modified by many subsequent large rocket engines. All the other nations in the LPRE business studied the V-2 engine and two (Soviet Union and the United States) built copies to learn the fabrication process.

[pp. 406–413:] Rocketdyne developed more large LPREs than any other company (except for USSR's Energomash). The first effort was to *copy, build, and flow test three American copies of the German V-2 rocket engine.* Your author was responsible for the effort of copying the thrust chamber of the V-2. [...]

The first indigenous large engine development effort was a pump-fed LPRE of 75,000 lb thrust, which soon became known as the engine for the Army's Redstone ballistic missile. The missile was built by Chrysler, but some of the vehicle's engineering was done by the Germans, formerly of Peenemünde under the leadership of Wernher von Braun.[6] The Rocketdyne-developed Redstone engine is shown in [p. 5500....] Some people consider it to be an upgraded V-2 engine because it used the same propellants (liquid oxygen and 75% ethyl alcohol) and had some similar features.

[3] Other German-speaking experts such as Karl Klager also went to Aerojet, and Aerojet was founded and run by Theodore von Kármán and Fritz Zwicky.

[4] Other German-speaking experts such as Hans Rudolf Friedrich and Walter Schwidetzky also went to Convair.

[5] Other German-speaking experts such as Heinz E. Mueller also went to Bell.
A number of other German-speaking experts such as Konrad Dannenberg, Hans Hueter, and Hans Lindenberg (died 1946) were also important for rocket engine design in the United States.

[6] See pp. 5354, 5502.

Like the V-2 engine, it had a heavy steel sheet, double-walled regenerative cooling jacket with supplementary film cooling, the turbopump had an aluminum turbine between the aluminum fuel and the oxidizer pumps, and jet vanes were used for thrust vector control during powered flight.

[...] The Redstone engine thrust and chamber pressure were higher, namely, 78,000 lpf vs 56,000 lbf and 317 vs 220 psia. [...]

The first static test of the complete Redstone engine took place in late 1950, and the first flight was in August 1953. It was part of the first U.S. ballistic missile to become operational, and the missiles were also deployed overseas in June 1958. This engine propelled a Redstone missile on 31 July 1958 at Johnston Island in the Pacific; it was carrying a live nuclear warhead to its first high-altitude detonation (at altitude of 47.7 miles). This engine also launched the first U.S. satellite (Explorer on 31 January 1958). [...] The modified Redstone missile also launched two U.S. astronauts in their Mercury capsule on their first suborbital space flights in 1961.

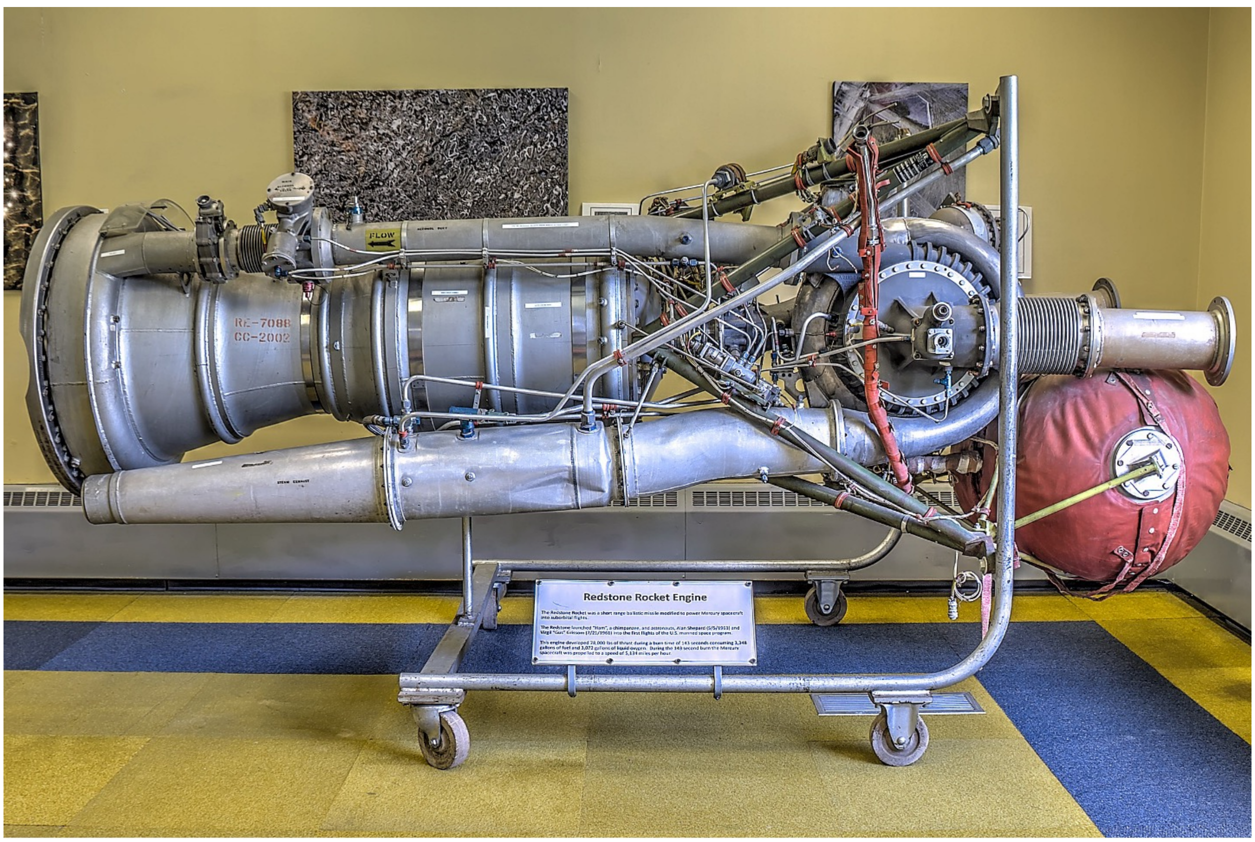

Figure E.143: The Redstone rocket engine (first flown in 1953) was directly derived from the earlier A-4 (V-2) engine and was designed by German-speaking experts including Georg Schulhof/George Sutton, Wernher von Braun, Konrad Dannenberg, Hans Hueter, Dieter Huzel, Hans Lindenberg (propellant injectors, before his death), Walter Riedel, Kurt Rothe, and others. German experts working independently in other countries after the war also produced remarkably similar rocket engine designs, demonstrating that they were using the same German design principles and likely even the same advanced wartime engine designs; see for example pp. 1880, 1884–1885. For wartime production of engines with advanced propellant injectors, see pp. 5284–5285. For another example of North American Aviation (home of Rocketdyne) using German engineers, German documents, German information, and German hardware, see p. 1768.