ABSTRACT

Title of Dissertation:	ENGINEERING CONSENT: PEENEMUENDE, NATIONAL SOCIALISM, AND THE V-2 MISSILE, 1924-1945
	Michael Brian Petersen, Doctor of Philosophy, 2005
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This dissertation is the story of the German scientists and engineers who developed, tested, and produced the V-2 missile, the world's first liquid-fueled ballistic missile. It examines the social, political, and cultural roots of the program in the Weimar Republic, the professional world of the Peenemünde missile base, and the results of the specialists' decision to use concentration camp slave labor to produce the missile. Previous studies of this subject have been the domain of either of sensationalistic journalists or the unabashed admirers of the German missile pioneers. Only rarely have historians ventured into this area of inquiry, fruitfully examining the history of the German missile program from the top down while noting its administrative battles and technical development. However, this work has been done at the expense of a detailed examination of the mid and lower-level employees who formed the backbone of the research and production effort. This work addresses that shortcoming by investigating the daily lives of these employees and the social, cultural, and political environment in

which they existed. It focuses on the key questions of dedication, motivation, and criminality in the Nazi regime by asking "How did Nazi authorities in charge of the missile program enlist the support of their employees in their effort?" "How did their work translate into political consent for the regime?" "How did these employees come to view slave labor as a viable option for completing their work?" This study is informed by traditions in European intellectual and social history while borrowing from different methods of sociology and anthropology. I argue that a web of professional ambition, internal dynamics, military pressure, and fear coalesced in this project. The interaction of these forces made the rapid development of the V-2 possible, but also contributed to an environment in which terrible crimes could be committed against concentration camp prisoners in the name of defending National Socialist Germany.

ENGINEERING CONSENT: PEENEMUENDE, NATIONAL SOCIALISM, AND THE V-2 MISSILE, 1924-1945

by

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In Germany, I had the benefit of expert advice from other notable historians, archivists, and curators. Andreas Heusler provided me with helpful research advice for German archives. Jens-Christian Wagner shared his first rate knowledge of Dora-Mittelbau and the incumbent historical issues that are wrapped up in what Jeffrey Herf has called the "Divided Memory" of the post-war Germanys. Dirk Zache and Manfred Kanetzky of the *Historisches Technisches Informationszentrum Peenemünde* paid me the great privilege of making available their raft of archival and museum holdings that are normally not open to the public. Their contribution is writ large across the pages that follow. Frau Bärbel Galonska, archivist at the Stasi Archive in Berlin, went well beyond the call of duty to provide me with many important documents while regaling me with stories of her childhood outside of Peenemünde and stories of the fall of the Berlin Wall. Peggy Schmidt generously opened her wonderful apartment in the center of Berlin and gave me not only a comfortable couch to sleep on, but also a trove of great memories that include trips to see the Berlin Philharmonic Orchestra perform and thrice-weekly jogs through the Brandenburg Gate.

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Introduction

The Community of Innovation and Culture of Consent in the *Raketen-Stadt*

> It's a factory-state here, a City of the Future full of extrapolated 1930s swoop-facaded and balconied skyscrapers, lean chrome caryatids with bobbed hairdos, classy airships of all descriptions drifting in the boom and hush of the city abysses, golden lovelies sunning in roof gardens and turning to wave as you pass. It is the *Raketen-Stadt*.
>
> Thomas Pynchon, *Gravity's Rainbow*[1]

It occurred just after twelve noon on October 3, 1942, a clear, unseasonably warm day on the Baltic coast. With great anticipation and a deafening roar, twenty-five tons of thrust lifted the forty-six foot tall A-4 (or V-2), the world's first large, liquid-fueled ballistic missile, from its launch moorings and into the sky. The black and white test missile accelerated rapidly until it hurtled through the air at nearly 3500 miles per hour, cut off its thrust, slipped out of Earth's atmosphere, and then came careening back to the planet at over three times the speed of sound, landing five minutes later some 125 miles away in the Baltic Sea.[2] The scientists and engineers at the huge missile research facility at Peenemünde had carried out the first successful launch of the A-4. For the first time, humans had managed to launch an object into space, an epochal achievement which was accomplished with virtually no previous practical knowledge and only a few years of theoretical experience. This feat is made even more impressive when one considers that the plans for this particular rocket were hammered out and facilities constructed for its development in 1937 and it only

[1] Thoms Pynchon, *Gravity's Rainbow* (New York: Viking Press, 1973), 674.
[2] Walter Dornberger, *V-2* (New York: Viking Press, 1955), 3-15.

took a mere five years for this first successful test to take place. It was a scientific and technical event of nearly unparalleled magnitude and of fundamental importance to the modern world.

However, though many of its ambitious developers would argue after the war that they dreamed of nothing but spaceflight, this was no humanitarian project. For the observant Thomas Pynchon, the missile's arcing flight path, "Gravity's Rainbow," marked both the arrival and the passing of death. The symbolism is appropriate. The V-2's purpose was to terrify civilian populations by delivering, without warning, a warhead to a target nearly 150 miles from its launch origin. Worse, in January 1944, the first mass-produced missiles rolled off of the assembly line over the broken bodies of thousands of prisoners of the Third Reich at the terrifying underground rocket factory Dora-Mittelbau. By the time of Dora's liberation at the hands of American soldiers in April 1945, nearly 2200 missiles had rained down on London and Antwerp, and perhaps as many as 20,000 slave laborers at the Dora-Mittelbau camp complex were dead.[3]

This dissertation is the story of life and work within the German missile program as it played itself out at the missile base at Peenemünde. I argue that a complex interaction of professional ambition, internal cultural dynamics, military pressure, and political coercion coalesced in the texture of life at the facility. The interaction of these forces made the rapid development of the A-4 possible, but also

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[3] Manfred Bornemann and Martin Broszat, "Das KL Dora/Mittelbau," in *Studien zur Geschichte der Konzentrationslager* (Stuttgart: Deutsche-Verlags Anstalt, 1970), 154-198. This estimate includes the 1500 prisoners killed by the British bombing raids on the neighboring town of Nordhausen on April 3-4, 1945, Dora prisoners deemed "unfit for work" and sent to the gas chambers at Auschwitz and Majdanek, and those who were murdered during the evacuation of the camp.

contributed to an environment in which stunning brutality could be committed against concentration camp prisoners in the name of defending the Nazi state. The engineers and other missile specialists at Peenemünde, only a fraction of whom were committed National Socialists, reacted to these pressures in a variety of ways. In essence, they became either passive facilitators of Nazi brutality, enthusiastically doing their duty in support of the Nazi war effort, or they manifested a more radical tendency, combining rationality and ideology in a way that served the dual goals of producing weapons and persecuting perceived enemies of the state.

Understanding the ways in which the institution of Peenemünde was able to enlist the unequivocal support of its members is also central to a deeper comprehension of how major technological systems develop and reproduce themselves, especially in the intensified atmosphere of war. This study moves beyond the external functions of state financing and resource support to examine how individuals within the program endowed their institution with personal significance. Moreover, in the Nazi context, identification with the goals of the institution also meant that many engineers and technicians were willing to countenance, even participate in, the brutal excesses of the regime. Though Peenemünde experienced the impact of Nazification as much as any place in Germany, the reasons for their complicity were not solely or explicitly ideological. Rather, they are located in the quotidian rhythms of life at the research station on the Baltic coast.

This study aims to take what appeared to those at Peenemünde as commonsense beliefs and practices and show that they were in fact part of the process of what anthropologists might call “enculturation,” the steady, relentless internalization of a particular set of group norms and ideals. At Peenemünde, technical specialists absorbed a body of beliefs about the importance of their work in a nation in the midst of a desperate war for its very survival. This both created and reinforced their own ideas as a collective identity. Thus socialized, they came to see the concerns of other groups as being far less consequential than their own. The result was a narrowed technical and patriotic vision that consented to some of the worst crimes of the Nazi regime.

In this study, I employ a multi-disciplinary approach, utilizing the techniques of the historian while borrowing from anthropology and sociology to show that missile developers at Peenemünde were not solely united by any overt political program, but rather a shared dedication to a technological program that is best characterized not as apolitical, but rather as transpolitical. By transpolitical, I mean cultural and technological dynamics that function across a broad spectrum of political ideologies and that can subtly reinforce an individual's loyalty to any number of political agendas. However, during the Nazi era, missile specialists at Peenemünde also exhibited a durable loyalty to Hitler's regime. In the context of a National Socialist government that pursued rearmament, war, and total war as policy ends, the decisions of weapons engineers, whose very work helped to both realize these goals and defend the system that set them forth in the first place, were nothing if not conclusive statements about their political sentiments toward the Nazi state. In the end, Peenemünde engineers and technicians not only contributed to the physical defense of Nazi Germany, they also helped shore up domestic support for the government that made their work possible.

The issue of consensus and collaboration under Hitler is perhaps the most important and, therefore, most contentious issue in the historiography on Nazi Germany. In the 1980s, the effort to document the "history of everyday life" (*Alltagsgeschichte*) in Nazi Germany led historians to conclude that support for the Nazis sprang from a well of many different sources. However, the valuable literature on this subject indicates that the Nazis were successful in carrying out only those policies that were not widely opposed by the population at large. A minority of Germans took up the Nazi banner and pushed forward its ideology, while those who did not were mostly passive onlookers or fellow travelers. This cleared the ground for the ideological vanguard to push ever more radical policies. The most fanatic Nazi ideas were most successful when German citizens had nothing against them and thus acquiesced to their prosecution. A sort of consensus on certain issues moved people to passive toleration and cooperation. Happiness and self-perception had an important effect on what was possible within the Nazi regime.[4] Other, more recent books, have re-examined consensus for Nazi policy and shown that even passive onlookers were in fact not so passive. Robert Gellately, for example, illustrates the

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[4] Ian Kershaw, *Popular Opinion and Political Dissent in the Third Reich: Bavaria, 1933-1945* (Oxford: Oxford University Press, 1983). See also Detlev Peukert, "Alltag und Barberei: Zur Normalität des Dritten Reiches," in Dan Diner, ed., *Ist der Nationalsozialismus Geschichte? Zur Historisierung und Historikerstreit* (Frankfurt am Main: Fischer, 1987), 51-61. Among a vast array of books that examine the support for the Nazi regime, the classic work is William Sheridan Allen's *The Nazi Seizure of Power: The Experience of a Single German Town, 1922-1945* (New York: Franklin and Watts, 1964). Also useful are Ian Kershaw's reflections on Hitler's popularity in *Hitler 1889-1936: Hubris* (New York: W.W. Norton, 1999) and *The "Hitler Myth": Image and Reality in the Third Reich* (New York: Oxford University Press, 1987). Though not technically a part of the *Alltagsgeschichte* effort, Peter Fritzsche's *Germans into Nazis* (Cambridge, MA: Harvard University Press, 1998) and Detlev Peukert's *The Weimar Republic: The Crisis of Classical Modernity* (New York: Hill and Wang, 1989) offer thought-provoking cases, though they do not seek to explain the popular support for Hitler in the long term. For women's support of the Nazi regime, see Alison Owings, *Frauen: German Women Recall the Third Reich* (New Brunswick, NJ: Rutgers University Press, 1993) and Ute Frevert, *Women in German History: From Bourgeois Emancipation to Sexual Liberation* (New York: Oxford University Press, 1988).

proactive participation of average Germans in the policing of the Nazi state.[5] He also shows how a fluid but lasting consensus for Hitler developed within the first months of Hitler's regime and through a combination of selective rewards and repression, remained firm until the end of the war.[6] Through all of this work, one thing has become clear: The Nazi regime carried out a colossal social, political, and cultural project in Germany that would not have been possible without the activism of a minority of the population coupled with the positive consent of the majority. That they were as "successful" as they were indicates that one way or another, the Nazis were able to produce powerful social bonds between individuals and with the regime.

The success of the V-2 endeavor is a case in point. This study revisits the historical traditions of *Alltagsgeschichte* by examining the texture of life at the Peenemünde missile facility. The local practices in place at Peenemünde resocialized its employees from an aggregate of disparate individuals into a cohesive group that strongly identified with the same sets of social, political, and technical ideals. In becoming a part of the community of missile specialists at Peenemünde (a "Peenemünder"), individual specialists became firmly convinced that what they were doing was essential to the survival of their nation. The work was, in their eyes, a noble project. Despite whatever demographic differences that they might have had – there were, in fact, few – the basic practices at Peenemünde bound them together with a single mission. A distinct set of dynamic social and professional practices ensured their commitment to Peenemünde's goals, which were inextricably linked to the

[5] Robert Gellately, *The Gestapo and German Society: Enforcing Racial Policy, 1933-1945* (New York: Oxford University Press, 1990).
[6] Robert Gellately, *Backing Hitler: Consent and Coercion in Nazi Germany* (New York: Oxford University Press, 2001).

murderous government that sponsored them in the first place. Support for National Socialism, was, to borrow Alf Lüdtke's term, "co-produced" by the cultural practices of everyday life.[7]

Moreover, with a few exceptions, much scholarship on Nazi Germany has asked why virtually no one resisted the murderous policies of the Nazi regime. Alternatively, historians and others have sought to understand how it was that perpetrators and collaborators were able to overcome disillusionment with or revulsion at crimes they were to commit in the name of the regime and press on with their terrible tasks.[8] This work has been instructive, but flawed. Its fault lies in a

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[7] Alf Lüdtke, *Eigen-Sinn: Fabrikalltag, Arbeitererfahrungen und Politik vom Kaiserreich bis in den Faschismus* (Hamburg: Ergebnisse Verlag, 1993), 332. Lüdtke's conclusions in this essay collection are especially thought provoking and particularly informative insofar as this study is concerned. His conception examines worker politics at the intersection of national parties and local conditions on the shop floor, in the home, and on the street. He compellingly argues that factory workers made their daily choices based on individual and local circumstances. In turn, national parties drew their legitimacy from decisions made by these workers as they negotiated their way through their daily lives. Factory employees, contends Lüdtke, were especially susceptible to those parties, like the National Socialists, that made emotional references to culture and nationhood while also extolling the virtues of labor. This would explain the weakness of the KPD and SPD in the face of the advancing National Socialist movement. It is an argument that opens up interesting possibilities for other social groups in Weimar and Nazi Germany.

[8] Hans Mommsen, "Die Realisierung des Utopischen: Die 'Endlösung der Judenfrage' im 'Dritten Reich,'" in *Der Nationalsozialismus und die deutsche Gesellschaft* (Reinbek bei Hamburg: Rowohlt, 1991) asks "Why did so many who participated in the series of events that led directly or indirectly to the extermination of the Jews fail to withdraw their contribution either through passive resistance or any form of resistance at all?" – as if they knew the extermination of the Jews to be wrong (p. 186). Robert Lifton, *The Nazi Doctors: Medical Killing and the Psychology of Genocide* (New York: Basic Books, 1986), argues somewhat speciously that what enabled doctors to carry out their horrific crimes was their construction of a double life of work and home – an argument that Robert Louis Stevenson might support, but is utterly problematic on its face. The work is based on the *assumption* that they viewed what they were doing as wrong and therefore needed to erect defenses to deal with it. More convincingly, but still problematically, Christopher Browning, *Ordinary Men: Reserve Police Battalion 101 and the Final Solution in Poland* (New York: Harper Collins, 1992) holds that it was a nearly irresistible internal pressure that allowed the Hamburg policemen to overcome revulsion for their work, again presupposing the very presence of a feeling of disgust. To be sure, the shooting of Jews was gruesome work, and some did drop out of the killing, but most stayed on to continue the mass murder. Those who dropped out voluntarily rejoined the group for later operations, a rather extraordinary phenomenon. In his defense, Browning does stress the local initiative of individuals in carrying out the Holocaust, but he still underemphasizes the issue of moral and ideological commitment. See also his book *Nazi Policy, Jewish Workers, German Killers* (New York: Cambridge University Press, 2000). Others blame more impersonal structures. Zygmunt Bauman's *Modernity and the Holocaust* (Ithaca: Cornell University Press, 1991) contends that the instrumental rationality of

fundamental assumption that the perpetrators viewed what they were doing as criminal, or that they should have at least understood it as wrong. Crimes perpetrated in the name of the Nazi regime, they would seem to indicate, were committed without conviction. Rather, other forces were at work that enabled them to surmount their natural predilections that these were in fact immoral, illegal acts. The question was immediately framed in terms of why Germans did not stand up and resist, as we might expect them to. To my mind, this framework has been helpful, but not entirely satisfying. Most often, it does not actually address the issue of moral dedication to the tasks in front of them. In this work, historical actors avoid ethical questions and repress their feelings. The work itself is merely a task to be performed, not a possible source of binding energy or motivation. The problems confronting those who forcibly relocated Jews and other perceived enemies of the state, coordinated massive slave labor projects, developed the world's first ballistic missile, or, for that matter, executed the "Final Solution," were colossal. The success of these projects could only be counted on if those carrying them out were dedicated, conscientious, and motivated workers.[9] Further inquiry into the actual work world of those perpetrators

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bureaucracy was perfectly suited to extermination of the Jews because moral considerations play absolutely no part in bureaucratic functions. Indeed, argues Bauman, bureaucratic decisions have no intrinsic moral value. Given the initial push by the ideological elite, Nazi bureaucrats acted automatically to achieve the ends of the force that gave it its impetus. Finally, though problematic, one of the benefits of Daniel Goldhagen's *Hitler's Willing Executioners: Ordinary Germans and the Holocaust* (New York: Alfred A. Knopf, 1996) was to ask whether or not Germans actually faced any dilemma at all in persecuting the Jews.

[9] Historians have largely missed this point because they have tended to see internal struggles at every level of the different bureaucratic structures in the regime and assume that every new order perpetuated internecine strife. Peter Hüttenberger's essay, "Nationalsozialistische Polykratie," *Geschichte und Gesellschaft* 2 (1976), which argued that Nazi politics and institutions were characterized by multiple power centers that competed for influence within the Third Reich, was of fundamental importance in shaping historians' perspective on the regime. Certainly, his argument has merit in the rarified air among Hitler's paladins. However, more recent literature has begun to point out that at the middle and lower levels of the bureaucracies, cooperation, not competition, was far more common than heretofore assumed. See Michael Thad Allen's work on the SS Economic and Administrative Main Office (SS-

and collaborators might reveal quite a different picture than one of repression, denial, or exclusion heretofore offered by many historians.

The work by the Peenemünders to produce missiles for the Nazi regime as well the participation by missile specialists in the practice of slave labor have become the central points of controversy in the discourse about Peenemünde generally. For nearly fifty years after the war, most histories of the German ballistic missile program were written by participants themselves or their supporters. The result was a narrative that both distanced their work from the regime that sponsored it while underplaying, misrepresenting, or downright ignoring their decisions about participation in the use of slave labor.[10] In the late 1980s, in the wake of the Justice Department's investigation of Arthur Rudolph, the Production Director at Peenemünde and the slave labor factory at Mittelwerk, journalists began scrutinizing the Nazi past of the former Peenemünders. This work was valuable for the

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WVHA), *The Business of Genocide: The SS, Slave Labor, and the Concentration Camps* (Chapel Hill, NC: University of North Carolina Press, 2002; Michael Wildt's qualitative study of the RSHA officer corps, *Generation des Unbedingten: Das Führerkorps des Reichssicherheitshauptamt* (Hamburg: Hamburger Edition, 2002); Eric A. Johnson's study of the Krefeld Gestapo, *Nazi Terror: The Gestapo, Jews, and Ordinary Germans* (New York: Basic Books, 1999); and Hans Safrian's work on Eichmann and the officers around him, *Die Eichmann Männer* (Vienna: Europa Verlag, 1993). Allen's useful book, which examines the cultural and ideological context in which SS business operations functioned, contains a chapter dedicated to the effort to manufacture the V-2. In this chapter, he places ideology at the center of activities, missing, in my estimation, the connections between Peenemünde and Dora-Mittelbau, and therefore the other factors motivating work that resulted from this connection.

[10] An excellent example of this type of work is Walter Dornberger's *V-2, Der Schuss ins Weltall: Geschichte einer Grossen Erfindung* (Esslingen: Bechtle Verlag, 1952). It is a self-serving memoir that focuses on many technical aspects of the program and distances the rocket engineers from Himmler and the SS by ignoring the use of slave labor at Peenemünde and Dora. A decade later Dieter K. Huzel, an engineer in Peenemünde and Wernher von Braun's assistant, wrote *Peenemünde to Canaveral* (Englewood Cliffs, CA: Prentice Hall, 1962), another memoir that focused on the technical development of the V-2 at the expense of raising self-reflective questions of the rocket engineers' complicity in Nazi crimes. Peter Wegener's memoir, *The Peenemünde Wind Tunnels: A Memoir* (New Haven: Yale University Press, 1996) is the only work that does not whitewash their actions during the war. Among the many examples of work written by other supporters of the Peenemünders, see Thomas Franklin (pseudonym for Hugh McInnish), *An American in Exile: The Story of Arthur Rudolph* (Huntsville AL: Christopher Kaylor, 1987), Marsha Freeman, *How We Got to the Moon: The Story of the German Space Pioneers* (Washington DC: 21st Century Science Associates, 1994).

documents it turned up, but unfortunately, it was much like that of the earlier work, painting a simplistic, though very different, picture of life in the Third Reich and the missile specialists' place in it.[11] Thus, for nearly half a century, historians were left with a thoroughly incomplete understanding of one of the most significant technological endeavors of the twentieth century.

However, in 1995 Michael Neufeld addressed this oversight with his important book *The Rocket and the Reich*. His work is an account of the technological and organizational history of the German ballistic missile program. According to Neufeld, the V-2 was "the product of a narrow technological vision that obscured the strategic bankruptcy of the project.[12] It was a weapon that had virtually no tactical or strategic value because it was wildly inaccurate and could only deliver a payload of one ton, scarcely more than a single American bomber. Administrators of the project inflamed the expectations of the regime and used the regime's polycratic struggles to establish the missile as Germany's best chance to win the war. Allied bombing raids provided the rationale for continued funding during the war, which was allocated at the expense of other more strategically valuable projects. Moreover, according to Neufeld, the use of slave labor to mass produce the missile was a specifically Nazi, non-technocratic contribution to the program, not the result of

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[11] The most well known of these books is Linda Hunt, *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip* (New York: St. Martin's Press, 1991). Another, less valuable book is Dennis Piskiewicz, *The Nazi Rocketeers: Dreams of Space and Crimes of War* (Westport, Ct: Praeger Press, 1995).

[12] Michael J. Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge, MA: Harvard University Press, 1995), 274. Those seeking an excellent outline of the history of the program should start with this book. In 1984, Heinz-Dieter Hölsken published the scholarly work *Die V-Waffen: Entstehung – Propaganda – Kriegseinsatz* (Stuttgart: Deutsche-Verlags Anstalt, 1984), but his work did not have access to the entire documentary record and fell prey to many of the myths about Peenemünde established after the war.

rational decision making by the engineers developing the program or of any deeply held ideological beliefs they may have had. In all, Neufeld shows that in the German context, such a huge technological leap forward would not have been possible without the megalomaniacal ambitions of National Socialism.

In this dissertation, I argue the complementary converse, that while the grand designs of the Nazi regime were undoubtedly critical, such a task could also not have been accomplished without the willing identification of individual engineers and technicians with many of the same overblown ambitions. The social, cultural, and political fabric at Peenemünde inextricably bound the missile specialists to the goals of their institution and through them, to objectives of the regime itself. Mike Neufeld necessarily focuses on the specialists' accomplishments as purely technological achievements, as ends themselves. This dissertation examines the Peenemünders' accomplishments not as technological statements, but as political and military ones. Such an approach changes the conception of missiles from ends themselves to means to an end, precisely what a weapon of war is. In only five years, a nearly impossible period of time, missile specialists at Peenemünde carried out one of the twentieth century's most impressive technological achievements. Such a stunning feat could indeed not have taken place without the willing and active identification of the Peenemünders with the important work to which they were assigned. Part and parcel of their connection with these goals was a willingness to set aside the priorities of all other groups and to engage in slave labor under some of the most horrific conditions in the Nazi empire. The process by which the Peenemünders came to internalize such imperious ambitions is at the center of this study.

This dissertation is arranged both chronologically and thematically. Chapter one examines the roots of rocket engineering in Weimar Germany. The central feature of rocketry in this period was the collection of amateur rocket societies that were dedicated to the idea of spaceflight. Perhaps the most important experimental facility was located in Reinickendorf, outside of Berlin, and had the impressive moniker *Raketenflugplatz Berlin* (Rocketport Berlin). The members of the *Raketenflugplatz* were mostly unemployed engineers who were fascinated by the idea of space travel, and they commonly cast their work as an assertion of German cultural and national interest. Radically new rocket technology was a statement of strength made by its practitioners on behalf of a nation that suffered so terribly in the wake of World War I. Moreover, the common practices and shared conditions on the shop floor at the *Raketenflugplatz* acted to bind its members together into a closely-knit group that identified intensely with its work. When the German Army began its own in-house missile program and was able to co-opt the services of the amateur rocketeers, the technological, economic, and nationalist interests of the *Raketenflugplatz* specialists began to be fulfilled, and the process by which their identities would be re-shaped as rocket specialists in the service of the state had begun.

As the Army dedicated more and more resources to the work, it became clear that a new research facility was necessary. Chapter two examines the rise of Peenemünde and the framework within which Peenemünde's unique institutional culture would crystallize. Missile specialists were drawn into a close cooperative relationship with authorities within the Nazi regime through a combination of military decisions, professional aspirations, and demands for secrecy. The steadily strengthening Army made its commitment to missile technology clear. Wild rearmament in the 1930s gave the specialists a first-rate research facility on the Baltic coast that was the most closely guarded secret in the nation. The secrecy around this project had important implications for the formation of the engineers' group identity as missile specialists in the service of the Nazi state. It fostered a sense of community, privilege, and loyalty, in addition to an overriding sense of observation by the authorities that set the framework for their future efforts on behalf of the regime that sponsored their work. In this way, the practice of missile engineering at Peenemünde was influenced both positively and negatively by its association with the Nazi state.

Chapter three analyzes the life and work of specialists inside the Peenemünde research station. Those who worked at the facility, which was somewhere between an army base and a utopian social experiment, recalled their years there as some of the best of their lives. Engineers and scientists, most of whom would have been drafted into the Army to serve at the front if not for their work, were positively thrilled about being hired or assigned to Peenemünde. The development work, so profoundly advanced and playing about the edges of science fiction, was supremely exciting. Many of them bonded personally and professionally while making many radical technological leaps forward. The tasks at Peenemünde deeply satisfied many of their personal and professional goals. At the same time, engineers who designed and built the missile base made sure that the specialists were afforded spacious, comfortable housing for them and their families. Community life at Peenemünde was distinctly pleasant. Inhabitants of the small, enclosed settlement established tight bonds with each other by holding many social events and partaking in the many leisure and recreation opportunities on their island base. These activities helped solidify their identification with each other and established the community of "Peenemünders," a group of professionally and personally like-minded people whose shared circumstances fostered close bonds of personal familiarity and professional friendship.

This work, however, was not entirely set in an apolitical, technocratic environment. It was clear to these Peenemünders, who owed their identities and professional lives to the Nazi regime, that their work was being carried out in order to defend the government that made their work possible. They were to develop and produce a powerful weapon for which there was no defense, and they were to do so as quickly as possible. That they were doing so for a regime that embarked on a war that engulfed the continent, openly persecuted Jews, homosexuals, and others, and enslaved foreign civilians, was not a matter of particular concern for them. A number of them even embraced Nazi political and military goals. Those who were not necessarily committed Nazis still accepted the National Socialist rhetoric in which their work was cast. Their comfortable personal lives and profound professional satisfaction, all established within a framework of intense secrecy that tended to stunt the development of contrary positions, led to the nearly automatic adherence to Peenemünde's central mission of developing an unstoppable weapon that could be used to defend the Nazi state. Their concerns were central. Those of other groups paled by comparison.

This dynamic led the Peenemünders to consent to one of the most heinous acts of cruelty during the Nazi years. Chapter four examines the decision by Peenemünde managers to employ slave labor in the mass production of the V-2. Specialists at Peenemünde actively sought out slave labor as a solution to the increasingly pressing labor shortages that were occurring across Germany and welcomed the contributions of the SS in this regard. Chapter four also analyzes the treatment of forced and slave laborers who worked at Peenemünde. An important dynamic established itself at the base, in which unskilled foreign labor suffered poor treatment, extremely arduous work, and impossible living conditions, while skilled labor, because of the its value for the project, enjoyed better treatment, easier work, and more comfortable housing. Those prisoners who were in a position to directly help the Peenemünders and their work received much better treatment than those who were involved in more menial construction and materials transport work. Peenemünde specialists made no efforts to alleviate the condition of those unfortunate laborers who were not lucky enough to possess the skills that would enable them to assemble a functional ballistic missile. This was a pattern that would be reflected, with much more catastrophic results, at the notorious slave labor of Dora-Mittelbau. The Peenemünders' narrowed ethical outlook, a result of their strong identification with each other and the goals of their project, meant that the concerns of others barely weighed in the balance.

The terrible result of this was ready accommodation to increasingly barbarous slave labor in the missile program in 1943 and after. Chapter five examines the actions of Peenemünde specialists who were engaged in mass production in the terrifying slave labor factory of Mittelwerk. The missile program's mid-level managers who carried out their tasks at Mittelwerk proved to be willing collaborators with the SS, which supplied labor for the factory and set the overall conditions for its use, because both groups strongly identified with the military and technical goals of the missile project itself. Former Peenemünde specialists assumed important positions in the factory in which they had to make daily decisions that directly affected the lives and well-being of slave laborers who worked on the shop floor. Their strong identification with the program's objectives, the major professional advances that they made in the move to Mittelwerk, and, it must be noted, a dramatically increased feeling of personal coercion to conduct the work successfully, combined to ensure the civilian specialists' utmost dedication to their production tasks. The same dynamic as at Peenemünde, in which management viewed skilled labor as a valuable commodity and treated it as such while not concerning themselves with the fate of unskilled labor, rapidly took shape at Mittelwerk. The result was a dynamic in which decisions about human value were made based on criteria of function and skill, while humanitarian considerations did not fit into the equation at all.

Chapter six shifts the focus back to the experts at Peenemünde. In the last eighteen months of the war, the missile program was buffeted by major bureaucratic conflict at the highest levels of the regime. The increased influence of the Armaments Ministry and SS, along with the Army's weakening influence, opened up gray areas of influence in which these organizations each sought greater control. However, these conflicts were attenuated by the close cooperation between individuals in these organizations at the level of middle and lower management. The

Peenemünders' expertise made them irreplaceable, while their shared dedication to the program's goals made them willing collaborators with other organizations. This working arrangement was the model for the solution to the administrative conflicts at the top of the program.

Moreover, over the course of 1944 and early 1945, the missile specialists at Peenemünde worked furiously to reverse Germany's fortunes in the war. This was a period of immense technological creativity that was characterized by both a steady advance in missile technology and the development of new weapons that sometimes were no more than desperation projects borne of technological fantasy. In both cases, the scientists, engineers, and technicians at Peenemünde prosecuted their work with phenomenal effort. This chapter confirms Karl-Heinz Ludwig's influential thesis on *Selbstmobilisierung* (self-mobilization), the notion that engineers under the Nazis went far beyond the normal call of duty in their daily work.[13] The Peenemünders never flagged in their technical dedication to missile technology and, therefore, the regime that sponsored them. In this way, they made their own technological contribution to the cumulative radicalization that took place in Nazi Germany in the last months of the war. Their experience at Peenemünde, a place characterized by its utter secrecy, tightly-knit community, fascinating work, and persistent political rhetoric, fully imbued them with the idea that their livelihoods depended entirely

[13] Karl-Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Düsseldorf: Droste Verlag, 1974). Ludwig examined the socio-political conduct of engineers under the Nazis generally. His work remains seminal in the historiography on technology in Nazi Germany. For studies that followed on and reinforced his work, see, for example, Jeffrey Herf, *Reactionary Modernism: Technology, Culture, and Politics in Weimar and the Third Reich* (New York: Cambridge University Press, 1984), and somewhat more recently, Helmuth Trischler, "Self-Mobilization or Resistance? Aeronautical Research and National Socialism," in Monika Renneberg and Mark Walker, eds., *Science, Technology, and National Socialism* (New York: Cambridge University Press, 1994).

upon the continued service to the state, and they were bent on doing everything they could to ensure its survival.

In a recent essay, Norbert Frei has argued that it is necessary to look at periods of "normalcy" under the Nazis and ask what kind of effect they had on the lives of regular Germans. He holds that "One must take into account collective feelings and subjective experiences which in part seemed to be more positive than was to be expected under the objective political circumstance of a dictatorship."[14] This dissertation is an effort to do exactly that. Consensus and collaboration under the Nazis was not achieved by the dynamic established because of an individual's or a group's repression and avoidance. Rather, the positive integration of individuals into a collective that body that believed in the goals of the Nazi project was central to the success of Hitler's regime.[15] Like many Germans, those at Peenemünde shared some of the same goals as many of the most ardent members of the regime. Many of the megalomaniacal ambitions of the Third Reich would not have been as successful as they were any other way.

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[14] Norbert Frei, "Peoples' Community and War: Hitler's Popular Support," in Hans Mommsen, ed., *The Third Reich Between Vision and Reality: New Perspectives on German History, 1918-1945* (New York: Berg, 2001).

[15] Despite its problems, Goldhagen's *Hitler's Willing Executioners* revealed a dearth of historical research on the circumstances surrounding the positive, integrationist aspects of the Nazi regime. Apart from its flaws, it addressed the very important question of what it was that Germans wanted from the regime. A German tradition of "eliminationist anti-Semitism" may not be the answer, but Goldhagen's focus on the question is welcome.

Chapter 1

"Help Build the Spaceship!": Culture and Community in German Rocketry, 1924-1934

Liquid fueled rocket development in the Weimar era was shaped in complex and important ways by a combination of amateur rocketeers and professional military men. The amateur rocket enthusiasts, who worked under preposterously primitive conditions, began to develop a social and cultural life during this time that heavily influenced the way they viewed their work. The nationalist sentiments of their associational life combined with cultural factors specific to their specialized technical world to reinforce both their dedication to rocket development and its potential contributions to the German nation. In 1934, Army-imposed restrictions on their work only buttressed this dedication by adding the promise of improved working conditions while forcibly erecting a cultural barrier between practitioners of rocketry and the outside world. The effect of these restrictions laid the groundwork for a subtle, yet influential professional elitism that would play a major role in the cultural lives of the engineers during the years of the Nazi regime.

Many historians and sociologists have stressed that scientific and technological development cannot be understood only in terms of what scientists and engineers do "on the shop floor." They emphasize the significance, for example, of examining practical and ideological alliances between engineers, and military leaders, politicians, or consumers.[1] This chapter follows their lead by approaching the lives of

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[1] See, for example, Ulrich Albrecht, "Military Technology and National Socialist Ideology," in *Science, Technology, and National Socialism*, Mark Walker and Monika Renneberg, eds., (Cambridge: Cambridge University Press, 1994), Mario Biagioli, *Galileo Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: University of Chicago Press, 1993), Wiebe Bijker and John Law, eds.,

both amateur and Army engineers not with an analysis of their technical accomplishments, but rather with an eye toward an understanding of how their technical feats were reinscribed in the political, social, and cultural world of the engineers themselves. For those developing this technology, the rocket was endowed with the powerful ability to guide the German nation out of the misery imposed by the victors of World War I while fending off the hostile intentions of competitive nations. By casting their results of their work in this light, the engineers implicitly made themselves part and parcel of German renewal. This began a process of moral and cultural self-definition that was augmented and expanded as the engineers went from working independently in small groups to working for the Reichswehr and then for the Nazi regime at Peenemünde.

Historians who have examined this period of rocket development have done so either by emphasizing technological advances or by casting the rocket engineers as apolitical technocrats who were only interested in creating a functional rocket. They often emphasize the work of energetic and creative individuals at the expense of the group dynamic that emerged among Weimar rocketeers. [2] These approaches do not

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Shaping Technology/Building Society: Studies in Sociotechnical Change (Cambridge: MIT Press, 1992), Eric Brose, *The Politics of Technological Change in Prussia: Out of the Shadow of Antiquity, 1809-1848* (Princeton: Princeton University Press, 1993), Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987), and Donald Mackenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge: MIT Press, 1990).

[2] While there are a great many books written by journalists and others who combine sensationalism with a simplistic view of life in the Third Reich or cite the memoirs of the participants uncritically, work by historians has been sparse. For historians' work, see Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1996), who emphasizes the independence and apolitical and opportunistic nature of the rocket engineers. See also Frank Winter, *Prelude to the Space Age, The Rocket Societies: 1924-1940* (Washington, D.C.: Smithsonian Institution Press, 1983), who closely follows the technical development of liquid fueled rocketry. Both histories under-emphasize the role that nationalism played in technological advance, thereby overlooking the geopolitical implications that German

develop the social, cultural, and political dimensions of the movement, which played a crucial role in shaping both the world of the amateur rocket enthusiast. While their work has been invaluable, this chapter breaks with their analytical approaches and addresses three important, yet overlooked issues. The first is the nationalist rhetoric in which many of the leading engineers who worked on rockets cast their work. This rhetoric was important for the ways in which it helped influential conservatives reconcile themselves with technological advance. It also conditioned the engineers to look favorably upon cooperation with the German military. A second, related issue is the subtle politicization of aviation and rocket technology that the leading rocket engineers engaged in. Their discourse tapped into the German fear of foreign dominance that was a legacy of the Treaty of Versailles and offered a way out from under the heel of Germany's oppressors. Finally, this chapter emphasizes the communal factors that formed the framework of the engineers' cultural world. Bonds formed in the course of their work both reinforced the dedication of the engineers to each other and excluded those who could not conform to the norms that the work environment created. All of these issues factored in to the cultural world of rocket engineering in the 1920s and '30s.

I also wish to emphasize that this chapter is by no means an exhaustive history of rocket development in the Weimar era. A great many technicians and engineers engaged with varying success in the pursuit of rocketry. Their story has capably been written elsewhere.[3] I examine only the two most important groups involved in this profession: the large amateur group based in Breslau (with its most advanced cadre of

engineers ascribed to their work. They also ignore the group dynamic that helped create an environment conducive to large technological advances.

[3] See the work of Neufeld and Winter noted above.

engineers in Berlin), and a small but talented collection of engineers working together in private industry. These two groups would go on to constitute the core leadership personnel of the Army rocket program under the Nazi regime.

Finally, an explanatory note on the sources is necessary. There is a paucity of available documents relating to rocket engineering in this period. The amateur rocket groups in Weimar did not keep extensive records of their work. The great dearth of money and raw material available as well as the ad hoc nature of their work combined to limit both the volume of documents they produced and any systematic record keeping of these documents. Moreover, those documents and artifacts that were produced in the 1920s and '30s were almost all lost during World War II. Therefore, any attempt at a thorough investigation of this period must resort to the large number of memoirs written by participants in events of the period. While this approach inevitably holds the potential for problems, as memoirists obviously write with the wisdom of hindsight and often construct a memory of events that is at odds with the reality of them, this strategy is also useful. Unfortunately, many memoirs of the rocketry in Germany do not always place the events they describe in the proper chronological order, nor are the details of certain events accurately recalled. Some, like Walter Dornberger's memoir *V-2*, even gloss over more controversial issues in later periods, such as the use of slave labor later during the war. However, they are invaluable for the insight they offer about the professional and cultural lives of the rocket engineers because the details of these lives are often so mundane that they warrant no *ex post facto* concern over moral or political malfeasance. Moreover, for the purposes of this study, errors of factual detail because of temporal distance are of secondary concern. Rather, the participants' ruminations on the cultural life of rocket development are far more important and, insofar as that cultural life developed over time, the importance of the chronology of technological development recedes into the background. In the end, it is the impressions of participants such as Willy Ley, Walter Dornberger, and Wernher von Braun that take precedence over their own chronological and factual accuracy.

Amateur Rocketry in the Weimar Republic

The large scale development of rocketry in Weimar Germany emerged from two distinct cultural groups. A small, dedicated group of engineers and technicians, augmented by the odd swindler and con-man, proved highly adept at fostering a nascent spaceflight movement among Germans in the middle of the 1920s. In short order, German military officials became intrigued by developments in the field of liquid fueled rocketry. They were eager to both rebuild the power of the German army and undercut the restrictions placed upon their military by the Treaty of Versailles. To this end, they sought new and original forms of weapons technology that would not be covered under the articles of the Treaty and therefore not subject to legal restrictions. These two groups began to forge strong connections with each other in the late 1920s and early 1930s. By the time of the Nazi seizure of power in 1933, they had established meaningful links that developed into a complex web of dependency that both subtly and overtly reinforced the dedication of one to the other. The bonds forged between amateur rocketeers and professional military men constituted the foundation upon which the massive installations at both Peenemünde and Dora-Mittelbau would function so successfully and terribly years later.

During the 1920s, rocketry and space travel were exceedingly popular in Germany.[4] This popularity is central to an understanding of the rocketeers' social and cultural environment.[5] Technological advance played a central role in the advancement of the cultural life of the German nation. What Detlev Peukert has termed *Machbarkeitswahn*, an erroneous belief that human intelligence could master all of the challenges of the modern world, so common in all Western nations at the turn of the century, spurred, among other things, a technological, technocratic impulse that was part of the legacy of the nineteenth century.[6] Society was to be built on ambitious programs of social hygiene, industrial might, and foreign imperialism.

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[4] Asif Siddiqi's emerging work on rocketry in the Soviet Union convincingly argues that amateur rocketry was more popular there than anywhere else. For an introduction to this topic, see his article, "The Rocket's Red Glare: Technology, Conflict, and Terror in the Soviet Union," *Technology and Culture* 44/3 (July 2003), p. 470-501.

[5] To be sure, historians have addressed the intersection of technology and culture in German history, but they have most often done so with a focus on the intellectual elite rather than "ordinary" Germans, who were forced to come to terms with technological advance no less than the German intelligentsia. See Geoff Eley, *Reshaping the German Right: Radical Nationalism and Political Change After Bismarck* (New Haven: Yale University Press, 1980), Jeffrey Herf, *Reactionary Modernism: Technology, Culture, and Politics in Weimar and the Third Reich* (New York: Cambridge University Press, 1984), and Karl Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Dusseldorf: Droste, 1974). *Reactionary Modernism* offers an excellent analysis of the conservative reconciliation with technology, but unfortunately restricts itself to the intellectual elite and misses much of the popular assessment of technology before and after World War I. By and large, historians of German popular culture have ignored the history of technology as it pertains to their field. Two exceptions are Guillaume de Syon, *Zeppelin! Germany and the Airship, 1900-1939* (Baltimore: Johns Hopkins University Press, 2002), and Peter Fritzsche, *A Nation of Flyers: German Aviation and the Popular Imagination* (Cambridge: Harvard University Press, 1992). Clausberg's book focuses on the history of the German imperial Zeppelin fascination, while Fritzsche connects the Imperial, Weimar and Nazi periods and examines the popular cultural movements that the idea of flight engendered. See also Chrisoph Asendorf, *Super Constellation – Flugzeug und Raumrevolution: die Wirkung der Luftfahrt auf Kunst und Kultur der Moderne* (New York: Springer, 1997). Most recently, Michael Neufeld has examined popular rocketry explicitly. See his article, "Weimar Culture and Futuristic Technology: The Rocketry and Spaceflight Fad in Germany, 1923-1933," in *Technology and Culture* 31 (October 1990). Neufeld's article is enlightening, but also problematic. While he notes the popular nationalism prevalent in Weimar, he pays little attention to the politicized rhetoric in which the most well-known group cast its work.

[6] Detlev Peukert, "The Genesis of the Final Solution from the Spirit of Science," in David Crew, ed., *Nazism and German Society, 1933-1945* (New York: Routledge, 1994).

Moreover, the state was to be the vehicle by which these programs would be enacted.[7] Seen in this way, technological advance fed a popular nationalism that was hardly mitigated by the fury of World War I. Especially in post-war Germany, technological achievements upheld a durable sense of common national purpose in an otherwise fractured environment of disenchantment and depression. For some, the rocket was emblematic of the ability of technological advance to function as a spur to national renewal.

Liquid fueled rockets and manned space travel first began to receive serious attention in Germany in 1923, with the publication of Hermann Oberth's groundbreaking book *Die Rakete zu den Planetenräumen* (The Rocket into Interplanetary Space). Oberth, born on June 25, 1894 in Sibiu, Transylvania, was the son of a German physician. After his service in the Austro-Hungarian army during World War I, he studied physics at Cluj in Romania, but after a year, moved on to study in Munich, Göttingen, and Heidelberg, Germany. In 1917, his proposal to the German Armaments Ministry to build a large, liquid fueled rocket was rejected on the grounds that the Armaments Ministry thought the task impossible.[8] When he was twenty-nine years old, he published his seminal book which would go on to become, as one historian has put it, "the cornerstone of the Space Age."[9]

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[7]E.L. Jones, *The European Miracle: Environments, Economies, and Geopolitics in the History of Europe and Asia* (New York: Cambridge University Press, 1987). See also Michael Adas, *Machines as the Measure of Men: Science, Technology and Ideologies of Western Dominance* (Ithaca, NY: Cornell University Press, 1989).

[8] Hermann Oberth, unpublished essay, "My Contributions to Astronautics," XVIII International Astronautics Congress, First History of Astronautics Symposium, "Pre-1939 Memoirs of Astronautics," September 26, 1967, 8, in National Air and Space Museum (NASM) File "Germany, 1920-1923."

[9]Frank Winter, *Rockets Into Space* (Cambridge: Harvard University Press, 1990), 18-19.

Die Rakete zu den Planetenräumen, at eighty-seven pages, was by all accounts a short volume, but it covered nearly every important detail of space flight, including propulsion, guidance, life support, and re-entry. Moreover, it offered a vigorous, if turgid, defense of the concept of manned space flight. Removing the idea of space flight from the realm of science fiction, the book made interplanetary travel a solvable engineering problem that only lay a few years into the future. Though Konstantin Tsiolkovsky arrived at similar conclusions before Oberth and Goddard contributed much to the discussion of the idea of spaceflight, their conclusions were almost totally inaccessible to the lay public.[10] One of Oberth's great contributions in his volume was the accessibility and availability of much of his work. Though by no means a simple book, it was far more available than Tsiolkovsky's writings, none of which appeared in the West between 1903 and 1923, and far bolder than Goddard's cautious work. Thick with complex mathematical equations as it was, it remained accessible enough to the layperson so that it was able to energize its readers with the possibility of space travel.[11]

Oberth's book offered a number novel ideas. First, he argued that the state of technology in the 1920s made it possible for man-made machines to climb "higher than the earth's atmosphere." In addition, these machines could be made capable of carrying human beings in relative comfort. Also, while more work remained to be done, man-made machines could actually achieve escape velocity and breach the Earth's atmosphere. Finally, he argued that within a few decades, these space ships

[10]Tsiolkovsky's *Exploration of Cosmic Space by Means of Reaction Devices* appeared in Russia in 1911, and Goddard's famous paper "A Method of Reaching Extreme Altitudes" was published in 1920. See Winter, *Rockets Into Space*, 10-11, 17-18. Oberth had never even heard of Tsiolkovsky until 1924. Oberth, "My Contributions," 17.
[11]Hermann Oberrth, *Die Rakete zu den Planetenräumen* Reprint (Nuremberg: Uni-Verlag, 1960).

were almost certain to be profitable "under certain conditions" which remained largely unspecified in his book.[12]

Absent from Oberth's book were pronouncements of nationalist goals or statements of political inclination. For the most part, Oberth avoided bold statements of loyalty in favor of strict adherence to what one might characterize as scientific neutrality, and he did so throughout his career. He preferred to focus on the practical and theoretical problems of space travel rather than engage in the polemics that so many of his scientific and technical colleagues found themselves embroiled in during the turbulent years of the Weimar Republic. In the years to come, this "neutrality" would become a false front once the Nazi regime began to invest heavily in the development of science and technology at Peenemünde, but in the early 1920s, without the political and financial backing of the state, Oberth was careful to remain largely apolitical concerning the theoretical possibilities of space travel and its associated technology.

Nevertheless, German conservatives were quick to seize upon Oberth's achievement. The *Deutsche Allgemeine Zeitung* (DAZ), a right wing newspaper closely aligned with German industrial interests, published a glowing review of *Die Rakete zu den Planetenräumen*. First noting its relationship to the work of Robert Goddard, the DAZ went on to report the "happy news" that a German engineer had been devoting a great deal of his time to the problem of space travel "with German thoroughness." While admitting that the technical means of rocket travel had not yet been realized, the DAZ did not question the idea that a rocket would be sent up to a height of one hundred kilometers within a short time. Moreover, the newspaper was

[12] Oberth, *Die Rakete*, 7.

quick to attach great significance to Oberth's German heritage. "For us," the newspaper jubilantly proclaimed, "it is an uplifting feeling that in these years of the deepest distress of Germandom, a German engineer has carried out valuable work toward a solution of this technical problem."[13] In celebrating Oberth's work as well as part and parcel of his nationality (despite his Rumanian citizenship), the DAZ helped to publicize Oberth's radical technological ideas in Weimar's influential conservative circles. It also helped to reconcile his ideas with many conservatives' deep fears of modern technology.[14] By drawing the conclusion that the inspiration for the rocket lay in Oberth's German heritage, the DAZ made it clear that it was the German spirit that inspired technological advance and which could rescue the nation from its "deepest distress." The *Deutsche Allgemeine Zeitung's* search for signs of German renewal in Oberth's work pointed to a nascent link between the interests of German rocket enthusiasts and the nationalist right wing in Weimar.

Nationalist interests aside, Oberth did openly acknowledge the possibility of using a rocket as a weapon that could sow mass destruction. A noteworthy passage in his 1929 book *Wege zur Raumschiffahrt* (Paths to Space Travel), a more rigorous development of the ideas first raised in *Die Rakete zu den Planetenräumen*, Oberth pointed out that the value of rockets was not just in transportation, but in weaponry as well. He raised the possibility of using rockets to engage in chemical warfare by equipping the warheads with poison gas. Oberth also suggested the fanciful idea of setting up a space station and equipping it with mirrors that could redirect the sun's

[13] "Die Raketen zu den Planeten," *Deutsche Allgemeine Zeitung*, December 2, 1923. See also Neufeld, "Weimar Culture," 744.
[14] See Herf, *Reactionary Modernism*, for a full exploration of the conservatives' conflicted feelings about modern technology.

energy, changing local weather patterns and laying waste to entire cities.[15] This admission, though brief, is important. It is an early acknowledgment by a civilian of the rocket's possibilities as a tool of destruction, rather than solely a scientific instrument imbued only with positive, constructive attributes. This is significant because a primary component of the master narrative constructed by rocket engineers in the years after World War II was that they were never interested in building weapons of war and that they were forced into producing missiles that Germany could rain down on its enemies with impunity by a brutal dictatorial regime which brooked no opposition. I shall return to this point at greater length later in this chapter and again later in the dissertation, but it is clear that the early rocket pioneers, while not necessarily devoted militarists, were at least open to the possibility using the fruits of their labor for less than humanitarian purposes.

In any case, Oberth's early work was not immediately embraced by academia or by the lay public. As a doctoral dissertation, *Die Rakete* was rejected in 1922 by Max Wolf at the University of Heidelberg because of its unorthodox subject matter, and the high strung Oberth was fated to suffer the slings and arrows of other members of academia for some time after the book was published a year later. Moreover, once published in 1923, sales of Oberth's book were initially sluggish.[16] However, *Die Rakete* did inspire a number of German authors to compose their own books on the possibilities of space travel. These included Max Valier's *Der Vorstoss in den Weltenraum: eine technische Möglichkeit* (The Thrust into Interplanetary Space: A

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[15] Hermann Oberth, *Wege zur Raumschiffahrt* reprint (Bucharest: Kriterion, 1974), 199-200. Wernher von Braun, "Reminiscences of German Rocketry," *Journal of the British Interplanetary Society* 70 (May/June 1956), 145.

[16] Oberth, "My Contributions," 16. Hans Barth, *Hermann Oberth: Leben, Werk, und Auswirkung auf die spätere Raumfahrtentwicklung* (Feucht: Uni-Verlag, 1985), 75-76, 93.

Technical Possibility – 1924), Walter Hohmann's *Die Erreichbarkeit der Himmelskörper: Untersuchungen über das Raumfahrtproblem* (The Attainability of Celestial Bodies: Investigations into the Problem of Space Travel – 1925), and Hermann Noordung's *Das Problem der Befahrung des Weltraums: Der Raketen-Motor* (The Problem of Space Travel: The Rocket Motor – 1929).[17] The most noteworthy of these disciples was Max Valier.

Valier was born on February 9, 1895 in Bolzen (Bolsano) in South Tyrol. He began his academic career by studying physics at Innsbruck from 1913-1915. From 1915-1918, he served as a pilot in the Austro-Hungarian armed forces on both the Italian and Russian fronts, as well as in Rumania. After the war, he studied astronomy, meteorology, and mathematics in Munich and Vienna. The dynamic Austrian, an author of a number of books and articles on the occult as well as the pseudo-scientific idea of "glacial cosmogony," wrote to Oberth about a possible collaboration to further the ideas first introduced in *Die Rakete*.[18] Oberth complied and sent Valier a number of calculations. Valier's effort, the semi-popular *Der Vorstoss in den Weltenraum*, was by no means an academically rigorous book. For that matter, it contained a number of glaring errors that spoke volumes about Valier's misunderstanding of Oberth's work. However, Valier was an irrepressible and energetic salesman with a gift for speaking and writing, and his book sold briskly,

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[17]Max Valier, *Der Vorstoss in den Weltenraum: eine technische Möglichkeit* (Munich: Oldenbourg, 1924);Walter Hohmann, *Die Errichbarkeit der Himmelskörper: Untersuchungen uber das Raumfahrtproblem* (Munich: Oldenbourg, 1925); Hermann Noordung, *Das Problem der Befahrung des Weltraums: Der Raketen-Motor* (Berlin: Schmidt, 1929).

[18] "Glacial Cosmogony" a theory first devised by Hans Hörbiger, held, among other things, that the planets and moon were coated with ice. Ilse Essers, *Max Valier: Pioneer of Space Travel* (NASA Technical Translation TTF-664) (Washington, DC: 1976) 94-95. Barth, *Hermann Oberth*, 106.

going into a second printing in 1925.[19] Valier's former colleague Hans Hörbiger wrote somewhat disdainfully of Valier's talents that "He needs a topic to make his name a household word all over the world, to spread the impact of his writings and to fill his lecture halls, since he has to make a living for himself and his two families. And he is an excellent speaker who does not need to use any notes. But he also needs a gripping subject – and space flight makes converts of the most cautious adherents, while the mysticism of the WEL [Glacial Cosmogany] requires a public with greater technical background in order to generate some cash flow."[20] Despite Hörbiger's distaste of Valier, whom he felt had abandoned him to pursue the glamorous field of rocketry, *Der Vorstoss* helped increase the sales of Oberth's book. In the end, it was Valier who proved to be the most adept at popularizing Oberth's ideas.

Valier toured Austria and Germany in an effort to promote his and Oberth's work. He made numerous lecture stops at the same time as he tirelessly wrote illustrated articles on spaceflight in magazines and newspapers, many of which were quite well-received.[21] In his articles and speaking engagements, Valier made no effort to disguise his ardent nationalism. Like the conservative editors of the DAZ, he linked the accomplishments of rocketry and spaceflight with the triumph of an innate German spirit. Valier's lecture programs provide an example that captures both the salesmanship and nationalist spirit of Valier's efforts. In a lecture program that he had printed for a tour he made in support of *Der Vorstoss*, Valier wrote that his lecture, "Despite its perfect scientific seriousness, it also sensationally brings to all listeners an undreamt-of enrichment of knowledge, an abundance of instruction, and

[19]Neufeld, "Weimar Culture," 730.
[20] Horbiger to Ley, June 12, 1927, in NASM File "Germany, 1920-1940, Correspondence."
[21]Essers, *Max Valier*, 62, 123.

enlightenment of the mysteries of the universe and their solutions through science and technology. Holding [the lecture] promotes in all parts of Germany the execution of this grand work of German spirit and daring."[22] Florid language aside, Valier's strong, if amorphous, nationalism is clear. For him, the pursuit of space travel, with all of its risks and rewards, was a task perfectly suited for a bold German nation. Such a task captured the individual inventor spirit that German scientists and engineers closely associated with their nationality.

Moreover, in the politically charged environment of Weimar Germany, Valier's discourse on innovations in technology assumed a dangerous and partisan aspect. In the field of aviation, the growth of gliding and commercial flight, the establishment in 1925 of Germany's semi-public airline Luft Hansa, and the trans-oceanic voyages of the massive Zeppelin airships were all inscribed with powerful nationalist meaning. German aviation pointed the way to a new, more robust nation that could meet the demands of ever-growing international competition and renewed contests for empire. Aviation redrew the world map by establishing an unprecedented proximity that had fundamental military and political consequences. Technology, whether Germans liked it or not, would point the way toward a more prosperous future.[23] Valier's work was thoroughly imbued with this language of increased national competition. For example, in the English language periodical *Aviation Mechanics*, Valier wrote of his desire to establish ongoing trans-Atlantic rocket flights. After proclaiming the geopolitical importance of creating the world's

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[22] Lecture Program, "Der Vorstoss in den Weltenraum," c. 1927, found in NASM file "Max Valier."
[23] Fritzsche, *A Nation of Flyers*, 132-184, and Syon, *Zeppelin*. By 1931, Oberth would also place great value on the ability of rocket-equipped planes to shorten the flying time between two distant points. Hermann Oberth, "Der Raketenantrieb bei Flugzeugen," *Flug* 10 (October, 1931).

fastest link between Berlin and New York, Valier wrote, "I want to state that it is not 'speed mania' which impels me to set the travel time [between Berlin and New York] so low; but it is a matter of technical and economic necessities [sic]."[24] In justifying his desires in terms of economic and technological need, Valier acknowledged a prevalent feeling among Germans that aviation technology was an important way for Germany to parry its neighbors' competitive and hostile intentions. His writings situated him among those intellectuals for whom technological progress was a necessary step in both the protection and advancement of the German nation.

By 1927, Valier's tireless efforts led to the formation of the *Verein für Raumschiffahrt* (Society for Space Ship Travel – VfR). Willy Ley, another space enthusiast who wrote about space travel, received a letter from Valier early in that year. In it, Valier recommended to Ley that a club be organized in order to raise money for rocket experiments. He went on to suggest that Ley contact Johannes Winkler in Breslau (now Wroclaw, Poland), an engineer who would know how to go about setting up such a venture. Ley contacted Winkler, who agreed to Valier's scheme, and on July 5, the VfR held its first meeting.[25]

The purpose of the VfR, according to its charter members, including Valier and Winkler, was to develop large spacecraft "which can be ultimately developed by their pilots and sent to the stars."[26] Above all, its membership earnestly desired to experiment, but in reality the VfR spent most of its time raising funds. In addition to membership dues, the VfR made much of its money by organizing recruitment drives to increase membership and by selling cheap souvenirs. Indeed, its leadership was

[24]Max Valier, "Berlin to New York in One Hour," *Aviation Mechanics* 4 (Nov.-Dec. 1930).
[25] Ley, *Rockets*, 136-137; Winter, *Prelude*, 35.
[26] "Verein für Raumschiffahrt, E.V.," *Die Rakete*, 1 (July 1927), 82.

quite adept at recruiting new members. Within a year of its founding, the society counted its members in the hundreds. By late 1929, that number reached over 1000.[27] In 1927, less than a month after its establishment, nearly twenty percent of the VfR's members were engineers.[28] No data exists for membership of engineers beyond 1927, but it can reasonably be assumed that this number increased as many well-known names in rocketry, including Robert Esnault-Pelterie, Hermann Noordnung, and Oberth himself enrolled in the VfR.[29] The society's organ, *Die Rakete*, was edited by Winkler and was the first periodical exclusively devoted to rocketry. Regularly published until December 1929, it was made up of articles on the development of different types of rockets, propulsion systems, life support measures, and various other aspects of space flight. Moreover, the journal served as a forum in which VfR members could exchange views about such subjects and learn of others whose interests coincided with their own. Finally, through *Die Rakete*, VfR members were more able to keep abreast of theoretical and technological developments in space flight. In nearly every sense, *Die Rakete* became a respectable professional journal with some degree of international recognition in a very short time.

However, what truly caught the German public's imagination were the daring and fantastic experiments conducted by Valier and Fritz von Opel, the cavalier heir to the automobile fortune of the same name. Eschewing liquid fueled rockets and Oberth's more methodical course, the two media savvy experimenters conducted

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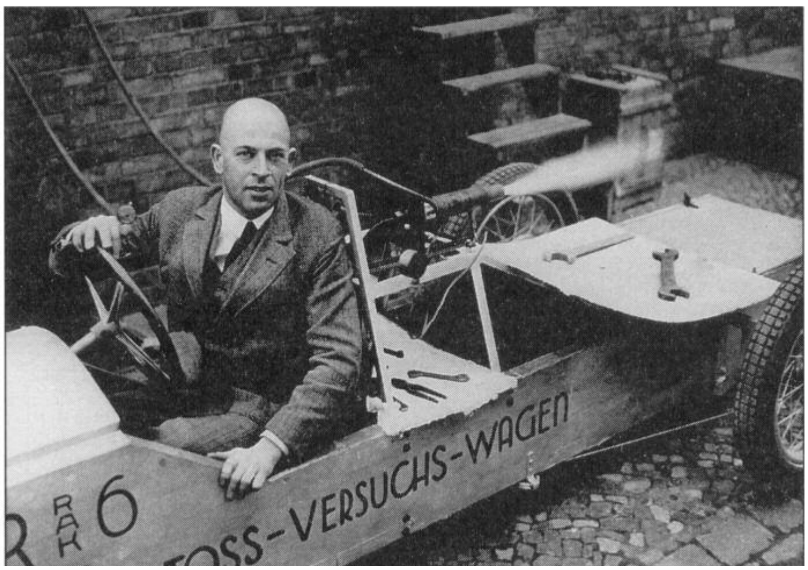
[27]Winter, *Prelude*, 36-37.
[28]"Verein," *Die Rakete* (July 1927), 83.
[29]The VfR's periodical, *Die Rakete*, regularly published the names of its most well-known members. See also Willy Ley, *Rockets, Missiles, and Space Travel* (New York: Viking Press, 1961), 118. Ley's recollections of the early rocket period are sometimes faulty, but they are nonetheless one of the most important sources of information on the VfR and Raketenflugplatz outside of Berlin. Ley, no friend of National Socialism, was one of the only rocket engineers to flee Nazi Germany. He escaped Germany in 1936.

spectacular tests of race cars equipped with black powder rockets in April and May 1928. Their first experiments took place in Rüsselsheim at the Opel headquarters on April 11-12, and the second, far more dramatic test took place on May 23 in front of nearly 2000 spectators on the Avus racetrack in Berlin.[30] Newspapers lent a great deal of coverage both events, and many amateurs and even the military began to take notice.[31]



Max Valier conducting static test on a rocket car.
Courtesy DM

The effusive publicity unleashed by these stunts resulted in a rash of new experiments conducted by Valier, Opel, and others. Tests ran on such rocket-powered objects as train cars, gliders, an ice sled, and even bicycles.[32] News reels, print media, and radio broadcasts helped to popularize these events.[33] The very

[30]Essers, *Max Valier*, 140-156; Neufeld, "Weimar Culture," 733-734.
[31] *Volkische Beobachter* (Munich), Bavarian edition, April 15/16; *Vorwärts* (Berlin), morning edition, April 14; *Berliner Tageblatt*, evening edition, May 23, 1928; *Berliner Morgenpost*, May 24, 1928; *Die Umschau* 32 (June, 1928) (487-488)
[32]Winter, "1928-1929 Forerunners of the Shuttle: The 'Von Opel' Flights," *Spaceflight* 21 (1979); Essers, *Max Valier*, 207, 209-210.
[33]Neufeld, "Weimar Culture," 736. Both the German domestic and international press reported on these tests. See, for example, "Raketen-Flugzeug Steigt," *Berliner Morgenpost*, October 1, 1929; "Raketen-Unfug und kein Ende!", *Flugsport*, January 9, 1929; "Raketenstart für Segelflugzeuge,"

public experiments even helped to reinforce the desire of film director Fritz Lang, of *Metropolis* fame, to make a new film about space travel, which he entitled *Frau im Mond* (The Woman in the Moon).[34] UFA (Universal Film Corporation) contracted Oberth to launch a rocket on the date of the film's premiere, but Oberth was unsuccessful.[35] Other, more scientific, experiments also followed. Some of these were conducted with the financial backing of large industrial firms. In 1929, Hugo Junkers, head of the Junkers Aircraft Company, lent his support to Winkler. Winkler's research revolved around the creation of rocket assisted takeoff devices (RATO, or *Starthilfe*) for large airplanes as well as rocket propulsion for smaller ones. Valier also managed to secure the backing of Paul Heylandt's liquid oxygen manufacturing firm *A.G. für Industriegasverwertung* (Industrial Gas Utilization Company) in Berlin and was attempting to develop a rocket car that used liquid fuel.[36]

It was in these experiments with liquid fueled rocket engines at the Heylandt Works that the flamboyant Valier met his death. Heylandt was a proponent of rocketry and enthusiastically agreed when Valier first approached him about using liquid oxygen for the purposes of rocket propulsion. At the time, liquid oxygen was primarily used for welding and in hospitals because its storage took up less space than gaseous oxygen. However, from the standpoint of rocket propulsion, liquid oxygen burned much more efficiently and powerfully than black powder and had much more

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Luftfahrt 8 (April 22, 1928); New York Herald Tribune, "Rockets Speed Sled in Test Near Munich," January 24, 1929; New York Times, "Valier Tries Rocket Sled," January 24, 1929; "Flying Bikes Fitted with Wings and Rockets," *Popular Mechanics*, June 1932.

[34]Ley, *Rockets,* 105-123. See also Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1995), 8-9

[35]Winter, *Prelude*, 37; Ley, *Rockets*, 124-130. Neufeld, "Weimar Culture," 737.

[36]Neufeld, *Rocket*, 10-11. Walter Riedel, "A Chapter in Rocket History," *Journal of the British Interplanetary Society*, 4 (July 1954), 209.

potential as a propellant. On May 17, 1930, the determined Valier, assisted by Walter Riedel, who would become head of the design division at Peenemünde, and a young Arthur Rudolph, the future production chief at Peenemünde and Mittelwerk, was experimenting on a kerosene/liquid oxygen engine. As Valier made a last close inspection of the idling engine, it exploded suddenly. Rudolph recalls

> I was suddenly knocked over on my back. When I looked up the engine wasn't there anymore. I only saw a big stream of oxygen. I saw Valier reeling back and forth, and I saw Riedel running up to him and catching him under the arms to steady him, and I saw Valier's lips moving and then Riedel let go and ran towards the gate house to call for help. Valier walked a few steps and fell on his face. By that time I had gotten up, and I went to Valier and turned him over. He was bleeding profusely from the mouth. He had been hit in the chest by a piece of shrapnel. There was nothing I could do. Within a minute, he was dead.[37]

The explosion that killed Valier led to a short public stir that ended with a failed attempt in the Reichstag to ban rocket experiments. Heylandt shut down the experiments, but Riedel and Rudolph continued their work on rockets.[38]

Valier's death did nothing to help the popular rocket craze in Germany, which began to falter in 1929. Despite a lavish premiere, *Frau im Mond* was only moderately successful, a victim of a hackneyed plot and the growing popularity of talkies.[39] Oberth's failure to build a usable rocket for the film nearly caused the temperamental theorist to have a nervous breakdown, and he departed briefly to

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[37]Printed in Thomas Franklin, *An American in Exile: The Story of Arthur Rudolph* (Huntsville, AL: Christopher Kaylor, 1987), 18-19.

[38]NASM Oral History Interview (OHI), Arthur Rudolph, 6; Neufeld, *The Rocket*, 11; Essers, *Max Valier*, 247-265; Franklin, *An American*, 19.

[39] Neufeld, "Weimar Culture," 740. Paul M. Jensen, *The Cinema of Fritz Lang* (New York: A.S. Barnes, 1969), 79-92. Ufa newsletters and film magazines in Willy Ley Collection at NASM, Box 2700, folder 164, and Box 2701, folder 200. Ley, *Rockets*, 131. Winter, *Prelude*, 37. Ley was a publicist for *Frau im Mond*.

Yugoslavia. The VfR ceased publishing *Die Rakete* in order to devote more of its meager resources to experimental activities, thereby cutting it off from its members and losing their financial support. Into this bleak situation stepped Rudolf Nebel, yet another irrepressible personality.

The unscrupulous Nebel first made his presence known to rocket enthusiasts in late 1928, when a theoretically adept but technically deficient Oberth was casting about for engineers to help him build the rocket for the premier of *Frau im Mond*. Nebel, more con-man than engineer, only had a minimum of engineering experience, but was an infectiously enthusiastic salesman. The World War I fighter pilot claimed to have started thinking about rockets as weapons in 1916, when he attached powder rockets to his biplane. After the war, he earned an engineering degree and went to work for the Swedish-German firm SKF-Norma, manufacturing ball bearings. [40] Reflecting the growing conservative world view of many engineers in the Weimar era as well as that of many war veterans, Nebel also joined the Stahlhelm, a right wing veterans organization, and lent his political support to the highly conservative German National People's Party (*Deutsche Nationale Volkspartei* – DNVP).[41] After bouncing around through several jobs in Berlin, Nebel was hired by Oberth to help him with the UFA film project without so much as a single interview to determine his qualifications. That project was a fiasco, but the equipment purchased for them by

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[40] Rudolf Nebel, *Raketenflug zum Mond – Von der Idee zur Wirklichkeit* (Dusseldorf: Privately Printed, 1970), 4-6. Much of Nebel's written work is of questionable veracity, though some of his wilder assertions have been proven by other sources.

[41] Rudolf Nebel, *Die Narren von Tegel* (Dusseldorf: Droste Verlag, 1972), 16-17.

UFA was procured afterward by Nebel and he and the leadership of the VfR regrouped in Berlin.[42]

Early in 1930, Nebel spent a great deal of time searching for funding and a secluded area in which the VfR could conduct experiments. With the help of Willy Ley, he discovered funding sources from private donors and from the government. Of special importance was the 5000 marks he received from Army Ordnance after meeting with its head, Karl Becker.[43] The VfR's relationship with Ordnance will be developed shortly. Moreover, Nebel found an empty area in Reinickendorf, a suburb of Berlin, in which the VfR could conduct its experiments. After a short period of negotiations, the VfR was given access to the grounds in September 1930, and Nebel christened the site as the "Raketenflugplatz Berlin" (Rocket Port Berlin).[44] It would go on to become the home of the most influential rocket group of the pre-Nazi period.

The Weimar Republic owned the unused land, which stretched across nearly two square miles. It was totally unsuitable for manufacturing or settlement and the two roads that crossed it were little more than cow paths. Swampy lowlands were sandwiched between rocky, tree covered hills, and the main guardhouse was filled with a long-forgotten supply of lumber, which had thoroughly rotted by the time that the VfR moved in. There were no telephone facilities, and the buildings were overgrown with weeds and brush. Moreover, the work stations and living quarters were tightly cramped. The initial storage area doubled as a conference room,

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[42]Ley, *Rockets*, 124-127; Winter, *Prelude*, 39; Barth, *Hermann Oberth* 139-153. Once it became clear that they would not be able to stage a successful launch before the premiere of the film, Nebel unsuccessfully tried to convince Oberth that they should film a rocket being lowered from a balcony, turn the picture upside down, and tell the public that it was a rocket ascending through the air. NASM Oral History Interview, Hermann Oberth, 32.
[43] Rudolf Nebel, *Narren*, 72-75. Ley, *Rockets*, 136. Neufeld, *The Rocket and the Reich*, 16-22.
[44] Ley, *Rockets*, 136-137; Winter, *Prelude*, 41. Neufeld, *The Rocket and the Reich*, 14.

reception area, and office space.[45] Compared to their future accommodations at Peenemünde, working and living conditions were less than optimal.

Despite these limited accommodations, the Raketenflugplatz leadership, which Nebel had managed to co-opt, was able to have their facility up and running within a relatively short time. The labor force at the Raketenflugplatz was free and plentiful, and Nebel's astonishing ability to procure goods and raw material at no expense meant that the limited financial means of the group could be dedicated elsewhere. The crushing economic circumstances of the Great Depression in Germany assured the enthusiasts of a large, inexpensive pool of skilled labor. Electricians, draftsmen, sheet metal workers, and engineers could live at the Raketenflugplatz and eat for free in exchange for work.[46] One of the buildings on the grounds of the site was converted into a dormitory in which employees slept. They were fed daily by a nearby soup kitchen that Nebel had managed to work out deal with, the particulars of which are unclear. Indeed, Nebel's negotiating skills were par excellence, and the Raketenflugplatz rarely had to pay for anything. Siemens supplemented the food from the soup kitchen with cheap meals. Shell Oil provided free gasoline, and other firms supplied nuts, bolts, paint, sheet metal, liquid oxygen, and even a motorcycle.[47] Years later, von Braun offered a typical example of Nebel's skill at procurement. "Nebel," he wrote, "once talked a Director of Siemens Halske, A.G. out of a goodly quantity of welding wire by vividly picturing the immediacy of space travel. Our own use for such wire was extremely small, but Nebel offered it to

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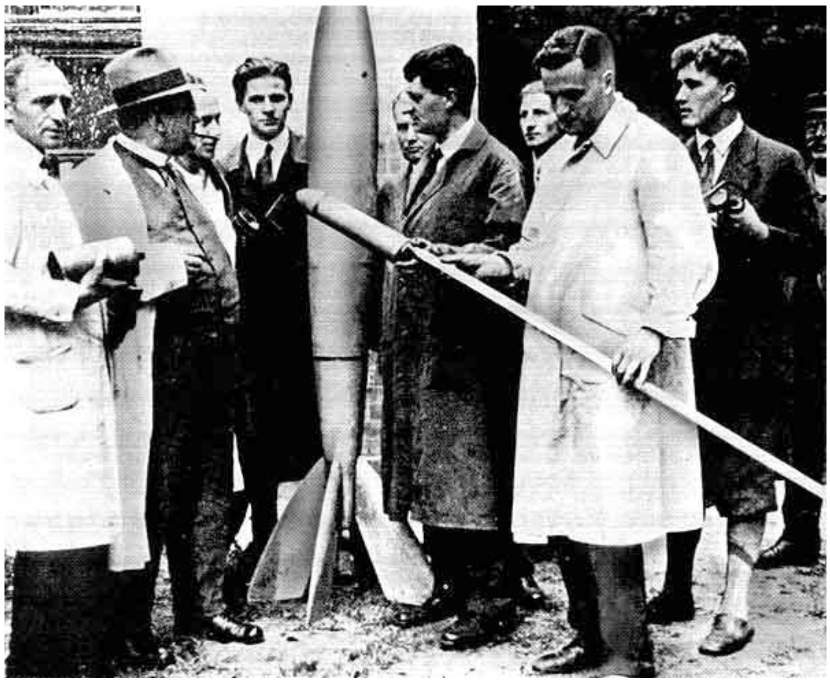
[45] Wernher von Braun, "Reminiscences of German Rocketry," *Journal of the British Interplanetary Society* 70 (May/June 1956), 127. NASM File "Germany, 1920-1940," Ley, *Rockets*, 138.
[46] Von Braun, "Reminscences," 127.
[47] Nebel, *Die Narren*, 86-87. Ley, *Rockets*, 138.

a welding shop in exchange for the labor of a skilled worker, which we badly needed…Machine tools, raw material, and office equipment gradually accumulated as Nebel wove his spells around those who could spare them and who were vulnerable to space travel."[48] In this way, the Raketenflugplatz was able to scratch out a meager, yet fruitful existence.



This photo, taken in 1930, brings together some of the most important figures in Weimar rocketry. At the far left is Rudolph Nebel, founder of the Raketenflugplatz, in the center is Hermann Oberth, and at the far right is eighteen-year-old Wernher von Braun. Klaus Riedel, the design chief at the Raketenflugplatz, is holding a solid fuel rocket. The free-standing rocket in the middle never flew and was used only for its propaganda value.

Courtesy DM

The leadership of the Raketenflugplatz couched the goals of its work in two equally important ways that are linked by their common assertions of German cultural and national interest. One benefit of their results, as the enthusiasts saw it, was in terms of the rocket's non-military, scientific, and economic applications. Engineers

[48] Von Braun, "Reminiscences," 127.

at Reinickendorf touted the rocket's uses for mail delivery, passenger planes, weather research, and of course for space travel. Indeed, their desire to explore space was a primary motivation for constructing the rocket in the first place. However, Raketenflugplatz members were also sensitive to criticism about the reality and purpose of flying into space. One member of the team wrote, "After the most recent successes with rocket technology, the question of whether traveling by space ship and visiting neighboring heavenly bodies is realistic has come up again. For us rocket researchers, there is no doubt that space travel is possible."[49] This same individual, however, attached a deeper meaning to their achievements. "Without doubt," he wrote, "space travel will be an expensive undertaking. But shouldn't it be possible to just once ante up for a cultural act of the first rank a fraction of the sum that one truly and uselessly ground away [*verpulvert*] during the World War?"[50] Journeys into space, therefore, were not merely valueless exercises demonstrating humanity's mastering of the natural world. They were also cultural events inscribed with deep meaning. Indeed the Raketenflugplatz enthusiasts acknowledged a sincere desire for space travel, but in so doing ingrained in the act important cultural and even nationalist significance. Using a phrase that became the de facto slogan of the Raketenflugplatz, one public appeal for funding cried out

> Help build the spaceship! This call goes out to everyone who wants to help with a new great act of German technology. As at the beginning of aviation, interplanetary travel is created first by unselfish promotion on the part of those who see great cultural progress in the problem of space travel … Only if we all unite will we be witnesses to the implementation of

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[49] *Raketenflug*, 2 (February 1932).
[50] Ibid.

> space travel, which has as its final goal the visiting of neighboring heavenly bodies.[51]

Such sentiment reveals a desperation borne of the profound division caused by economic dislocation and depression, rampant unemployment, and chronic political chaos in the late years of the Weimar Republic. Even more, it holds out the offer of a new, grand vision to heal such problems by uniting the nation behind rocket development. Space travel, therefore, would not simply be an important scientific and technological achievement. Rather, it was a profound cultural statement made by the Reinickendorf enthusiasts on behalf of the German nation.

A second way in which the Raketenflugplatz leadership conceived of its work was in a much more aggressively nationalist vein. Despite Nebel's proclivity for obtaining needed items, the Raketenflugplatz group was still chronically short of funds. One strategy they had for addressing this was advertising their work and soliciting donations in these advertisements. The most common tactic for doing so was through handbills. These handbills attempted to arouse sympathy for their work by tapping German resentment of foreign restrictions imposed on the nation in the wake of World War I. Moreover, as in Valier's speeches, they couched their work on the rocket in terms of Germany's resumption of world power status. One handbill that appeared in the early 1930s jingoistically bemoaned the restrictions on Germany brought about by the Treaty of Versailles.

> For decades, German scientists and technicians have worked on the problem of the rocket. Finally, tangible results are within reach. For the continuation and expansion of our findings, we are missing that which we have the least help with – money. Foreign nations have made monstrous efforts to tear the results of our

[51] Handbill, "Helft das Raumschiff bauen!" NASM file "Germany 1930-1940."

> studies away from us. Hindering these efforts must lie in the heart of every German. Everyone should give according to his means so that the fruit of our decades-long labor will not escape us. Through the solution of the rocket problem, Germany, at least in an economic and cultural sense, will strike a blow for the quick reconstitution of its international standing.[52]

Statements of this sort, written most often by Nebel, who was rapidly becoming the mouthpiece of the rocket engineering community in general, portrayed the rocket engineers as victims of an unfair, nefarious peace settlement that undercut Germany's national potential by limiting German technological achievement and plundering their nation of its economic and technological resources. At the same time, these statements endowed the rocket, and indeed, its creators, with the ability to cut the web of international restrictions placed around Germany and to allow the nation to resume its proper place among the world's powers.

Nebel's appeals in these handbills went even further than these pronouncements. His skill as a propagandist, never mind his manipulative streak and penchant for stretching the truth, rivaled that of the Nazi Gauleiter of Berlin, Joseph Goebbels. Indeed, his appeals echoed many of the sentiments that the future Propaganda Minster would use to such deadly effect later in his career. In an early fundraising appeal for the VfR, probably printed in 1929, Nebel decried the tide of money flowing out of German hands and into the West. Following on fellow engineer and Nazi ideologue Gottfried Feder's arguments about "interest slavery," Nebel wrote,

> The German nation [*Volk*] pays 75 gold marks per second, 4500 gold Marks per minute to its enemies!

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[52] Handbill, "Raketenflug Aufruf!" NASM, Herbert Shaeffer Collection, NASM, Smithsonian Institution Photo Number 77-6008.

> This means slavery for all eternity [*in alle Ewigkeit*]. Our primary duty must be to cast off these bonds of slavery. For this, we need a new weapon! Under the motto, "*Help build the Spaceship!*" preparations for this goal were made and the Verein für Raumschiffahrt was founded. Join the Verein für Raumschiffahrt![53]

Absent from Nebel's appeal are any references to using the rocket in order to harmlessly deliver mail across Europe and the Atlantic. Instead, what the rockets would deliver was national salvation from the oppressive bonds of western slavery. No longer would Germany have to suffer from the onerous reparations payments or the crushing economic and intellectual burden of national poverty. Moreover, for Nebel, the small groups of rocket enthusiasts that were slowly coalescing under the aegis of the VfR in Breslau, Berlin, and elsewhere were not simply amateurs playing with children's toys. Rather, they were the soldiers of the future who would lead Germany back to world prominence through their development of the world's most futuristic and advanced technology.

Indeed, Nebel was not above consideration of the rocket's uses as a weapon that was capable of having a dramatic impact on the nature of modern warfare. In a pamphlet he published in 1927, Nebel noted a number of ways in which the rocket would alter military realities in the twentieth century. According to the self-styled engineer, who engaged in preposterous hyberpole on more than one occasion, liquid fueled rockets made possible "A qualitative improvement in armaments as well as [the fighting of] a war that can be conducted with 1000 engineers in the place of an

[53] Undated Nebel Handbill, NS 19/1795, BAL. Feder's early speeches in Munich made a deep impression on Hitler, who recognized in them both their propaganda value as well as a similarity with his own developing economic ideas. See Ian Kershaw, *Hitler, 1889-1936: Hubris* (New York: W.W. Norton, 1998), 123, 138. For Feder's economic thought, see Albrecht Tyrell, "Gottfried Feder and the NSDAP," in Peter Stachura, ed., *The Shaping of the Nazi State* (New York: Barnes and Noble Books, 1978), 49-87.

army of millions."[54] Moreover, and somewhat more realistically, in future warfare, rockets would, among other things, be deployed in an anti-aircraft capacity, bombard enemy positions, serve as the propulsion unit for fighter airplanes, and, ominously, act as the delivery platform for poison gas. Echoing the sentiments of his colleagues in aviation, Nebel wrote that "Long-distance rockets with gyroscopic steering [*Kreiselsteurung*] can strike any point on the Earth's surface that one wishes. It can, for example, travel from Berlin to Paris in five minutes, to London in six minutes, to Moscow in twelve minutes, to New York in thirty minutes, and to any other point on the earth's surface in fifty minutes."[55] Nebel also emphasized that rockets which were manned by pilots would be able to deliver powerful warheads to precise targets such as munitions depots, air fields, industrial areas, fortifications, and city quarters. Finally, Nebel wrote that "Disguising [*Tarnung*] and financing the mail rocket ensures at the same time the permanent readiness for national defense."[56]

Nebel's arguments about the military use of the rocket clearly pointed up their utility in both civilian and military capacities. Historians must be careful about any generalizations they make about this slippery character, but at least in this case, Nebel was quick to make use of the cover that touting the rocket's civilian uses would give to its darker and more destructive potential. Though the rocket did have clear peacetime uses, its military deployment was at least as important, if not more so, for the future of the nation. It would enable Germany not only to ward off foreign threats, but also to stand off and destroy the nation's enemies with impunity. That the

[54] Nebel, "Raketen-Torpedos," *Raketenflug* 14 (1927).
[55] Ibid. In an article in the *Berliner Zeitung am Mittag*, Nebel also touted the rocket's uses in air defense. Rudolf Nebel, "Raketen Schiessen die Grenzen," *Berliner Zeitung am Mittag* 6/10/31.
[56] Ibid.

use of poison gas and the bombardment of civilian targets was proscribed by numerous international treaties was unimportant. If called upon to be employed in such a way, the rocket would serve these ends perfectly. Defense of the nation in an era both of unbridled international competition and unprecedented German military weakness demanded that these possibilities be kept in mind.

Again, these arguments helped reconcile the progressive, modernist elements that seemed inherent to rocket technology with the more conservative discourse and militaristic demands of large and powerful segments of German society. The appeal of this most modern technology dovetailed perfectly with conservative interests when cast not in terms of its peacetime utilization, but rather its wartime capabilities. As usual, however, Nebel dramatically over-stated his case. In 1927, rocket engineers could barely keep a small rocket in the air for more than a few seconds, and the promise of inter-continental ballistic missiles was a pipe dream that required far more resources than the meager material that private enthusiasts could drum up during the Weimar years. Ironically, Nebel would prove to be unable and unwilling to work within the bounds set by the Reichswehr, the one institution that most clearly echoed his sentiments about the military applications of the rocket and that was capable of offering him the kind of financial and technological support necessary to see the project through to its successful conclusion.

In any case, rhetoric of the sort Nebel propounded was nothing new among the engineering community in Weimar. Paul Heylandt, whose work emerged independently of the Raketenflugplatz and the VfR, also made claims of being able to reach distant locations in minutes. In April 1931, he demonstrated his newest rocket car for a gathering of journalists, claiming that his rocket engines could reach anywhere in Europe in twelve minutes.[57] The predominant ideological tradition of German engineers in this period took on a deeply and distinctively conservative outlook. However, popular history writers and historians have, for different reasons, not linked the nationalism of the Raketenflugplatz members with the broader conservative discourse on nationalism and technology then taking place in Weimar. They have largely preferred to view the rocket engineers as apolitical technocrats, unconcerned with political issues and solely interested in rocket development. These arguments fail to stand up because they ignore both the direct exploitation of nationalist rhetoric as well as the more subtle competitive nationalist reasons for developing aviation and space technology in the first place.[58] The rocket engineers in Reinickendorf were products of their age, and they, like many Germans, chafed under the onerous restrictions imposed on them by the Treaty of Versailles.

It was during the Raketenflugplatz years that the young, brilliant engineer Wernher von Braun, one the key figures in rocketry in the twentieth century, made his first foray into the field. Von Braun's family was of moderately wealthy Prussian Junker ancestry. His father, Magnus von Braun, was a high ranking civil servant in the fledgling Weimar government whose purported association with the extreme right wing Kapp putschists forced him out of office. The elder von Braun then went into banking and maintained his close ties with future President von Hindenburg and the

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[57] New York Herald Tribune, "Motor Flight in Stratosphere Shown in Berlin," 4/12/31; New York Times, "Sees Lightning Speed for Liquid Gas Planes," 4/19/31.

[58] For the nationalism of engineers generally, see especially Ludwig, *Technik und Ingenieure* and Herf, *Reactionary Modernism.* For arguments that fail to fully capture the essence of the rocket engineers' nationalism, see Heinz Dieter Hölsken, *Die V-Waffen: Entstehung, Propaganda, Kriegseinsatz* (Stuttgart: Deutsche Verlags Anstalt, 1984), Winter, *Rockets into Space*, and Neufeld, *The Rocket and the Reich*.

old reactionary elites of the former Kaiserreich. In 1932, Franz von Papen made Wernher's father the Minister of Agriculture in the reactionary "Cabinet of Barons" just before Hitler came to power. After Hitler was appointed Chancellor, von Braun did not become part of Hitler's cabinet, but believed, as many conservatives did, that Hitler's movement could be harnessed to their own ends.[59] With this parental background, Wernher von Braun was reflexively nationalistic, but not necessarily sympathetic to the Nazi cause. In any case, the nationalist histrionics of the Raketenflugplatz's advertising campaign posed no problem for the young engineer. Von Braun was fascinated with the lure of space travel and joined the group for this reason. If anything, the idea of Germany riding to national glory with the thrust of the rocket probably only made it easier for him to join.

Like many of the engineers who would come to work under him at Peenemünde, the younger von Braun was a rocketry enthusiast whose interest in the technology began after reading Oberth in 1926 and was piqued by the work of Valier, Opel, and Fritz Lang's *Frau um Mond*.[60] Von Braun was an eighteen year old Wunderkind who was about to begin university studies at the Technical University of Berlin when he came to the Raketenflugplatz for the first time. Walter Dornberger, the Army colonel who would go on to become von Braun's closest ally at Peenemünde, remembers being struck by von Braun's energy and theoretical knowledge at such a young age. Von Braun seemed to clearly understand the

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[59] Neufeld, *The Rocket and the Reich*, 13. Rainer Eisfeld, *Mondsuchtig: Wernher von Braun und die Gebürt der Raumfahrt aus dem Geist Barberei* (Reinbeck bei Hamburg: Rowohlt Taschenbuch Verlag, 1990), 41-42. Magnus von Braun, *Wege durch vier Zeitepochen: Vom ostpreussischen Gutsleben der Väter bis zur Weltraumforschung des Sohnes* (Limburg an der Lahn: Starke, 1964), 234, 263.

[60] Von Braun, "Reminiscences," 125. When he was fifteen, von Braun met Valier, who, ironically, upbraided the young Prussian for conducting experiments without proper safety precautions.

problems inherent to developing a liquid fueled rocket and his ability to systematically dissect these problems far exceeded his age and station at Reinickendorf. For Dornberger, "In this respect, he had been a refreshing change from most of the leading men at the place."[61]

The rocket enthusiasts that von Braun joined in 1930 were a tightly-knit group who plied a dangerous trade. Improvements made on the rockets tested at Reinickendorf were almost always ad hoc, and informal meetings between three to six people could result in major design changes. Except for Nebel himself, it was rare for anyone to take individual credit for design changes. Ley wrote that "We never paid any attention to the question of who had thought of what, knowing that it was a long way from our experiments to definite shapes, and knowing also that our glory was a collective glory."[62] Moreover, the small number of people working at the Raketenflugplatz meant that nearly everyone knew each other relatively well and that supervision of even minute tasks could be consistent. These factors led to a greater degree of personalized attention to detail and of better quality control in the development and assembly of parts. Finally, successful experiments were often followed by long nights of celebratory drinking in a local pub.[63] Nor did political issues escape their ken. At communal dinner in the evenings, on Sundays, or during breaks in the work, the Reinickendorfers often engaged in political discussions. According to Rolf Engel, a Raketenflugplatz engineer and participant in such discussions, political allegiances among his friends were divided evenly between

[61] Walter Dornberger, *V-2* (New York: Viking Press, 1955), 27.
[62] Ley, *Rockets*, 142.
[63] Wernher von Braun, "Behind the Scenes of Rocket Development in Germany, 1928 through 1945," (date unclear, late 1940s), 6-7, Space and Rocket Center Huntsville (SRCH), Wernher von Braun Papers. Neufeld, *The Rocket*, 14-15.

Communism and National Socialism, but such differences never once affected their work. Recalling this period years later, Engel wrote that "The emotional connection to the technical problems of rocketry and space travel were so strong that political loyalties never broke them."[64] In short, the dynamics of the small community of engineers at Reinickendorf effected a profound and personal dedication to the success of the overall endeavor. One visitor to the Raketenflugplatz wrote, "The impression you took away with you was the frenzied devotion of Nebel's men to their work…they belonged exclusively to a world dominated by one single wholehearted idea."[65] The bonds forged between the members of the Raketenflugplatz would go a long way in keeping a number of the most skilled men together during the transition period from privately funded rocket experiments to government sponsored "big science" at Peenemünde.

Technology itself was also a source of binding energy for the engineers. In this regard, the development of the rocket in Reinickendorf deserves mention. The instruments developed at the Raketenflugplatz represent the first real steps toward the large, liquid-fueled rocket. The *Mirak* ("Minimum Rocket") was the primary test vehicle. Its original design was a version of Oberth's rocket built for *Frau im Mond*, but in a short time, it went through a number of design changes that resulted in a rocket that was approximately fifteen feet long and "propelled" by the oblong engine in its nose. Dubbed the "Repulsor," this "nose drive" configuration consciously

[64] Heinz Horeis, *Rolf Engel – Raketenbauer der ersten Stunde* (Munich: Lehrstuhl für Raumfahrttechnik, 1992), 24. Written by Horeis with help from Engel, this semi-autobiographical book recounting Engels's time as a rocket engineer is deeply self-serving and must be treated with great care.

[65] Dimitri Marionoff, with Palma Wayne, *Einstein, An Intimate Study of a Great Man* (New York: Doubleday, 1944), 115. Marionoff was Einstein's son in law who introduced Nebel to the physicist in 1932. In the weeks after this first meeting, Nebel tried unsuccessfully to solicit financial support from Einstein, who rightly regarded Nebel's overtures with suspicion. Nebel, *Narren*, 114, 121-123.

emulated the design of powder rockets. Its major drawback was that it was nearly impossible to achieve stability and control in flight. However, stability was not of central importance to the engineers in Reinickendorf. Their efforts were directed toward creating a rocket that simply worked semi-consistently and could achieve enough thrust for liftoff. At this point, stability and guidance were of secondary importance, a situation that created less than favorable safety conditions.[66]

In their experiments, the rocket engineers took major risks and were forced to trust each other implicitly. Poor engine assembly was a primary danger. Weak welds at the seams of the engine could blow apart under the intense pressure generated by the engine's own combustion. Shoddy assembly of even the smallest components could do the same. Nevertheless, personal, consistent supervision, as well as the perks offered by the Raketenflugplatz during desperate economic times mitigated assembly problems by ensuring that the engineers and technicians had a vested interest in the successful flight of the Mirak. Explosions and failures did occur, but these were the results of faulty design or improper materials, not shoddy workmanship and lack of attention to detail. During testing, there were problems of a slightly different nature, and a strict task list was necessary to ensure that all of the procedures for safety as well as proper ignition were followed. Preceding a static test, for example, the rocket engine was placed into a metal container which was then attached to a balance on the test stand. A pipe on the bottom of the metal container drew cooling water from a large barrel next to the test stand. A ground crew made sure that there was enough water in the barrel and then attached the engine to the test stand. To this assembly, the ground crew then attached a thermite cartridge, which

[66] Nebel, *Narren*, 99-116. Winter, *Prelude*, 41-43. Ley, *Rockets*, 140-154.

functioned as an ignition device, and manually poured the highly flammable liquid oxygen into the engine's tank. At this point, the ignition crew took over as the ground crew headed for safety. One member of the ignition crew stood on the earthen berm surrounding the test stand and shouted orders to an engineer standing inside the shack, which was outside of the berm. This engineer, who could not see the test stand, was expected to follow these orders quickly and exactly. They first lit the thermite cartridge, then fired gasoline through the charge, followed by the liquid oxygen, which, if all went according to plan, resulted in a short, bright, bluish flame that emerged from the exhaust nozzle with a steady roar.[67]

If these steps were not followed perfectly, disaster inevitably followed. The accidental introduction of the liquid oxygen before the gasoline would result in the entire assembly violently blowing apart. Once when this happened, Ley kept a piece of shrapnel that he found embedded into the handle of a shovel as a reminder of the danger of the experiments. Improper attachment of the water cooling pipe could result in the walls of the combustion chamber superheating, melting through, and exploding, a problem that plagued the V-2 designers through 1942. On one of these occasions, Ley recalled that they "ducked quickly and with great disregard for curiosity." The lack of attention paid to stability and guidance also carried great risks. Flying rockets could and did go astray, buzzing the engineers at very low altitude or crashing near their own test site.[68] Clearly, the rudimentary work carried out at the Raketenflugplatz was difficult and dangerous. To surmount these

[67] Ley, *Rockets*, 144-145.
[68] Ibid., 143. Neufeld, *The Rocket*, 73-109.

problems, the engineers were forced to fall back on a combination of professionalism, trust, and more than a little disregard for personal safety.

However, there is more to these experiments than meets the eye. Heuristically, it is helpful to view the rocket flight tests as rituals that reinforced the rocket engineers' loyalty to each other and commitment to the project.[69] A comparison of primitive rituals and modern technical testing illuminates the cultural and psychological significance of this testing.[70] It captures the symbolic meaning of the tests carried out specifically in Reinickendorf and brings into relief the themes that apply both to rituals and technical testing. These themes include the struggle to master a new challenge, fulfillment of personal ambition, the experience of community in a competitive world (this is particularly true in the harsh political and economic circumstances of the Weimar Republic), and the drama of bringing a new object into existence. All of these tropes were central to the experimental experience at Reinickendorf. Seen this way, the process of testing and experimentation not only led to improvements in rocket technology, the also enhanced the active identification of the engineers with each other and with the project, thereby contributing to and reinforcing the cultural dynamism of the Raketenflugplatz. Thrown together in ramshackle buildings and conducting dangerous experiments on untested technology, the enthusiasts kept up their labor while making very little concessions to safety

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[69] No exact data on dates and types of experiments performed at the Raketenfluplatz exists and the historian is forced to rely on Ley's memoir and the papers of G. Edward Pendray, an American who visited Reinickendorf in April 1931. See NASM file "G. Edward Pendray. Nevertheless, Frank Winter ably sorts out much of the confusion. See *Prelude*, 120. The lack of testing documentation was a source of considerable annoyance for Walter Dornberger.

[70] S.F. Moore and Barbara Myerhoff, eds., *Secular Ritual* (Assen: Van Gorkum, 1977). Moore and Myerhoff point out that ritual analysis can be meaningfully used when studying events that are not necessarily sacred or religious. See also Hugh Gusterson, "The Rituals of Science: Comment of Abir-Am," *Social Epistemology* 6/4 (1992).

except to trust in their co-workers' professionalism and commitment to the work and each other, which was strengthened in a number of ways by the testing experience itself. In the process, the unemployed engineers created a sense of community and received the professional satisfaction of developing new technology, never mind the benefit of eating free meals and receiving free accommodations in exchange for their work. The result of this dynamic was a small corps of engineers and technicians that were intensely dedicated to the complex and hazardous job at hand.

However, the work of these engineers was limited by their small number and lack of resources. This, combined with their zeal for actually seeing the rocket in flight, meant that they dedicated the vast bulk of their talent and material to the propulsion system. The engineers set aside guidance and steering problems until they could achieve what they viewed as consistently satisfactory engine performance. With this approach, accidents because of unstable, unguided rockets were unavoidable, and one incident led to serious curtailing of their experiments. At the end of 1931, a repulsor crashed with great noise and fright outside the grounds of the Raketenflugplatz. At least two Repulsors crashed before this one, but the third actually destroyed a barracks belonging to the local police force. No one was injured, but the damage was finally enough for the angry gendarmes to descend quickly on the launch site. After a stretch of negotiations that lasted several days, the police placed a number of restrictions on the tests. The engineers could fuel the test rockets with no more than five kilograms of fuel, and the new engines had to undergo three successful static tests before they were permitted to be launched. Moreover, the police were to be informed before every launch, and the launch tests were only permitted Mondays through Fridays from seven a.m. to three p.m. Finally, the engineers were forbidden from launching rockets on anything even closely resembling a windy day.[71] These regulations effectively capped the size of any rocket they attempted to build. They also seriously restricted the number of actual launch tests that could be run, drastically slowing research in the area in which it was most needed, guidance and control. For the men of the VfR, who dreamed of massive rockets capable of delivering large payloads across the continents, this was a most difficult arrangement.

In a strictly professional sense, this was also not very impressive. Though the Reinickendorfers carefully machined their parts, methodically worked through the testing ritual, and experimented often, much of their work was thoroughly amateurish. The enthusiasts chronically failed to keep important data measurements such as pressure distribution, fuel flow, and exhaust speed, and they virtually never recorded the results of their launch experiments. The result was an ad hoc trial and error approach to a technology that demanded advanced theoretical and scientific testing which was regularized by systematic data keeping. Moreover, resource procurement and dedication was always inconsistent, resulting once again in an inability to systematically work through the deeply complex development issues. Furthermore, even though the engineers and technicians got to practice their skills, they did not make any wages or a salary at the Raketenflugplatz. They only earned meals or a place to sleep for their work. Though the many individuals at the Raketenflugplatz earned valuable experience while there and made some technical progress, in the late 1920s and early 1930s, the most well-known, aggressively experimenting rocket

[71] Ley, *Rockets*, 148-152. Grzescinsky to Nebel, October 17, 1931, in NASM File "Germany, 1930-1934."

outfit in Germany was in truth little more than a flophouse for technically proficient spaceflight aficionados who were led by a morally suspect con-man.

This was not necessarily the case everywhere. At the same time that Nebel was pulling together the VfR at the Raketenflugplatz, other important research on liquid fueled rockets was being conducted elsewhere with much less fanfare and self-promotion. One of the few experimental groups that received limited corporate support was the small group under Max Valier, which was financially supported by the Heylandt Works. On the staff of this group and serving as assistants to Valier were two figures who would go on to become very important in the future development of the V-2, Arthur Rudolph and Walter "Papa" Riedel.

Born in Königswusterhausen, just outside of Berlin, in 1902, Riedel was the son of a locomotive engineer and a housewife. From 1921 to 1928, he worked as a civil engineering technician for two construction firms, Mamag and Wolf, Netter, and Jacobi. In December 1928, Riedel was hired by the Heylandt Works as a research engineer. After Valier's death in 1930, Heylandt re-assigned Riedel to other tasks within the firm. Riedel never lost his job during the Great Depression and lived relatively comfortably through the early 1930s. Despite his lack of economic dislocation, he showed his early faith in the party, first voting for the Nazis in the elections of March 1933, which solidified Hitler's grip on power shortly after he became Chancellor. Riedel would go on to join the party in 1937, when party enrollment was re-opened after a three year hiatus.[72]

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[72] Walter Riedel Dossier, Box 371, RG 319, Records of the Army Staff, National Archives. On the Nazi rise to power, see, among others, William Sheridan Allen, *The Nazi Seizure of Power: The Experience of a Single German Town, 1922-1945* (New York: Franklin -Watts, 1965); Martin Broszat, *Hitler and the Collapse of Weimar Germany* (New York: St. Martin's Press, 1987); Gerhard Schulz,

Riedel's fellow party member and co-worker, Arthur Rudolph, was born November 9, 1906 in Stepfershausen. Like von Braun, Rudolph also took part in the spaceflight fad that swept Germany in the 1920s. He was fascinated by Valier and Opel's stunts on the Avus, read a number of articles on rockets and spaceflight, and saw the film *Frau im Mond*.[73] In 1930, he graduated from the factory technical school in Berlin with a major in mechanical engineering.[74] Serendipitously, Heylandt hired him to work as a draftsman a few weeks after he graduated in the spring of 1930. In this capacity, Rudolph met Valier, with whom he worked as an assistant.[75] After Valier's death, Rudolph continued to work on the problem of the rocket engine against the expressed orders of Paul Heylandt. He successfully redesigned the fuel injection system of the engine model that malfunctioned and led to the accident that killed Valier in 1930.[76]

In 1931, Rudolph joined the Nazi party and the S.A.[77] Though there is no evidence of his participating in the violent street brawls for which the brown-shirted thugs are so infamous, Rudolph did participate in rallies in which he carried a banner

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Aufstieg des Nationalsozialismus: Krise und Revolution in Deutschland (Frankfurt am Main: Propyläen Verlag, 1975). For the internal development of the Nazi Party and its sources of support, see especially Martin Broszat, *The Hitler State: The Foundation and Development of the Internal Structure of the Third Reich* Transl. By John W. Hiden, (New York: Longman, 1981), which, though dated, is still one of the best books on the subject; also Robert Gellately *Backing Hitler: Consent and Coercion in Nazi Germany* (New York: Oxford University Press, 2001).

[73] NASM OHI Interview, Arthur Rudolph, 1.

[74] OSI interrogation of Arthur Rudolph, October 13, 1982, printed in Thomas Franklin, *An American*, 189-190. Since the institution Rudolph attended was a small technical school, not a larger technical university, Rudolph graduated with a certificate in mechanical engineering and might be professionally described as a technician (*Techniker*), rather than one of the academically trained engineers (*Diplom-Ingenieure*) produced by the technical universities. See Konrad Jarausch, *The Unfree Professions: German Lawyers, Teachers, and Engineers, 1900-1950* (New York: Oxford University Press, 1990) and Ludwig, *Technik and Ingenieure*, for a nuanced discussion of the differences.

[75] OSI interrogation of Arthur Rudolph, October 13, 1982 in Franklin, *An American*, 191.

[76] NASM OHI Interview, Arthur Rudolph, 6.

[77] Arthur Rudolph Dossier, Box 636, RG 319, Records of the Army Staff, National Archives.

and sang the Horst Wessel Song.[78] According to postwar interviews, Rudolph joined the Nazis because he feared a Communist revolt. A year earlier, the severe economic crisis of the Great Depression began creating an army of unemployed, and the Communist Party (KPD) capitalized on this with large political gains that were surpassed only by the Nazis. According to Rudolph, one of his coworkers convinced him that only the Nazis were capable of meeting the needs of the unemployed while beating back the communist threat.[79] These assertions may very well have a degree of truth. Berlin, where Rudolph lived and worked, was a center of KPD activity in the 1920s and 1930s. In addition to being confronted with catastrophic unemployment, Rudolph was exposed daily to the rhetoric of both parties, and his aspiring middle class sensibilities forbade him from lending his support to the KPD.[80] Widespread Nazi propaganda efforts to gain the support of technicians and engineers certainly played their part in garnering Rudolph's support as well.[81] In any case, Rudolph's enrollment in the party and S.A. a full two years before the Nazi accession to power indicates that, for whatever reason, he did indeed support specific planks in the party platform and was ideologically predisposed to at least some of the goals of the National Socialist project.

[78] Rudolph OSI interrogation, Franklin, *An American in Exile*, 283.
[79] Arthur Rudolph OSI interrogation, Franklin, *An American*, 192-196. NASM OHI, Arthur Rudolph, 26.
[80] The best English language examination of the KPD is Erich Weitz, *Creating German Communism: From Popular Protest to Socialist State* (Princeton, NJ: Princeton University Press, 1997). See also Klaus Michael Mallmann, "Milieu, Radikalismus und lokale Gesellschaft: Zur Sozialgechichtes des Kommunismus in der Weimarer Republik," *Geschichte und Gesellschaft* 21/1 (1995), who makes an excellent case for the importance of locality in shaping Communist demands and protest.
[81] For the shape and appeal of this propaganda, see Herf, *Reactionary Modernism*, Ludwig, *Technik und Ingenieure*, and Gerd Hortleder, *Das Gesellschaftsbild des Ingenieurs: Zum politischen Verhalten der technischen Intelligenz in Deutschland* (Frankfurt: Suhrkamp, 1970).

Nor was Rudolph above working with the Nazi party or the Army when it suited his interests to do so. In 1932, Heylandt was forced to fire Rudolph because the Depression was ravaging *Industriegasverwertung*. Rudolph and Alfons Pietsch, his foreman from the Heylandt Works who was also fired, were determined to continue their rocket work. In the spring, they went to the local head of the Berlin S.A. for financial backing. The S.A. expressed interest in sponsoring the two rocket specialists, but had no money to offer them and they were forced to look elsewhere. Rudolph and Pietsch then unsuccessfully attempted to secure the backing of the Kaiser Wilhelm Gesellschaft, which was the leading state-sponsored scientific foundation in Germany, and various industrial interests.[82]

Historians must be careful not to read too much into the organizations to which Rudolph applied for funding. There is simply not enough evidence to argue that he appealed to the Nazis for funds because of any firmly held ideological beliefs about the supposedly mutually beneficial relationship between science and National Socialism. To be sure, the Kaiser Wilhelm Gesellschaft was largely made up of scientists among whom the consensus political opinion was strongly nationalist, but the society also regarded open opposition to Weimar as "a transgression of the professional code."[83] Moreover, Henry Ashby Turner has conclusively shown that

[82] NASM OHI, Arthur Rudolph, 15-16. OSI Interrogation of Arthur Rudolph, October 13, 1982, in Franklin, *An American*, 198-199. There is no record of Pietsch's political background.
[83] Alan Beyerchen, *Scientists Under Hitler: Politics and the Physics Community in the Third Reich*, (New Haven: Yale University Press, 1977) 4. With the forced removal of its Jewish members because of the Nazi policy of Gleichschaltung, the KWG became increasingly anti-Semitic as more and more fanatical Nazis began to take over important positions and carry out increasingly cruel and scientifically questionable studies. See, for example, Matthias Weber, "Rassenhygenische und genetische Forschungen an der Deutschen Forschungsanstalt für Psychiatrie/Kaiser-Wilhelm Institut in München vor und nach 1933," 95-111, and Volker Roelcke, "Psychiatrische Wissenschaft im Kontex Nationalsozialisticher Politik und 'Euthansie:' Zur Rolle von Ernst Rüdin und der Deutschen Forschungsanstalt für Psychiatrie/Kaiser Wilhelm Insitut," 112-150, in Doris Kaufmann, ed.,

German industrial barons of the 1920s and 1930s were alarmed at Hitler's rhetoric and that they also saw no advantage to supporting National Socialist ambitions. Only after Hitler became Chancellor did money in support of the Nazis begin to flow from the opportunistic industrial interests. Before the Machtergreifung, German industry was no friend to National Socialism.[84] In addition, had Rudolph been an ideologically committed Nazi and S.A. member, he would have found large capitalist industry to be repugnant and likely not sought its support.[85] Rudolph's post-war assertion that he and Pietsch both sought any financial support they could find is likely true.[86] To the utilitarian Rudolph, the struggle for economic support during the lean years of the Depression trumped ideological prerogatives. Rudolph and Pietsch first sought the support of the S.A. because they felt that it was here that they could exploit Rudolph's membership in the Nazi party most fully. After this initiative failed, the two engineers, without regard for political inclination, merely sought out others whom they felt might be most interested in the further development of rocketry.

Despite their failure to garner the support of the party, big business, and academicians, the two men kept up their efforts. In the spring of 1933, they applied to the Army for financial support, which they received in the form of a contract to

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Geschichte der Kaiser-Wilhelm-Gesellschaft im Nationalsozialismus: Bestandsaufnahme und Perspektiven der Forschung (Göttingen: Wallstein Verlag, 2000).

[84] Henry Ashby Turner, *German Big Business and the Rise of Hitler* (New York: Oxford University Press, 1985). Turner also convincingly demonstrates that Hitler could not afford to be perceived as accepting the support of big business in the form of financial donations even though he courted business interests by emphasizing individual achievement and the productive exploitation of private capital. The dynamism of the early Nazi movement was dependent on the active support of those party members who saw Nazism as a crusade against big business in all forms.

[85] See Turner, passim, and Herf, *Reactionary Modernism*, who has shown that the engineering intelligentsia had a deep distrust of large corporate capitalism.

[86] NASM OHI, Arthur Rudolph, 16.

build a new engine. Pietsch squandered the money and shortly afterwards disappeared, leaving Rudolph to explain to his Army sponsors why they had no money left and only a half-completed rocket engine. Walter Dornberger, who originally offered the Army's support, allowed Rudolph an extra three hundred Reichsmarks to finish the work. Rudolph received no salary or expenses from the Army and was forced to live off of the paltry unemployment insurance offered by the Republic, which amounted to seven reichsmarks, fifty pfennig per week. Nevertheless, he did manage to finish the engine and successfully test it in front of his army benefactors. Impressed by Rudolph's work, Dornberger hired the hungry, impoverished engineer shortly thereafter. One of the stipulations of his employment was that he leave the SA, but he could remain a member of the Nazi party.[87]

The Army Ordnance Bureau and Liquid-Fueled Rocketry

Dornberger's enlistment of Rudolph's talents was part of a larger effort by the Army Ordnance Department to develop missile technology. Lieutenant Colonel Karl Becker was the head of the ballistics and munitions section of Ordnance. Becker, who held a doctorate in engineering from the Technical University of Berlin, first took an interest in rocketry in 1929.[88] This interest was engendered by the popularity of amateur rocketry during the second half of the 1920s as well as the Reichswehr's secret rearmament projects in the later years of the Weimar Republic.

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[87] To be sure that Rudolph kept up his part of the bargain, a nonplussed Dornberger sent his deputy, Leo Zanssen to check on the progress of Rudolph's work every week. NASM OHI, Arthur Rudolph, 16-19, 23, 25. Rudolph file, Berlin Document Center (BDC), RG 339, NA.

[88] Michael Neufeld, "The Reichswehr, the Rocket, and the Versailles Treaty: A Popular Myth Reexamined," *Journal of the British Interplanetary Society* 53 (2000), 163.

Rocket development in Germany must be understood in the context of military rearmament. As Germany began to repair its international standing with the diplomatic successes of the Treaty of Locarno in 1925 and its entrance into the League of Nations in 1926, foreign control over its armaments became much less stringent. Reichswehr Minister Wilhelm Gröner, a retired general, surreptitiously began a rearmament program in the fall of 1928, systematically stockpiling arms and training an expanded (and illegal) army in the Soviet Union. In addition, the increasingly conservative Weimar cabinets throughout the 1920s assured that the Reichswehr would have a steady financial base from which it could expand its strength.[89] Though the fact that the restrictive provisions on Germany's military in the Treaty of Versailles made no mention of rockets was an added bonus to Becker, his efforts to utilize rockets as weapons must also be seen in the context of German rearmament during the late 1920s.

This is clearly indicated in a meeting that took place on December 1930, in which Becker presented his case for the value of the rocket as weapon to a number of important Reichswehr officers in charge of rearmament, including General Alfred von Vollard-Bockelberg, the head of Army Ordnance, and Colonel Erich Karlewski, head of the Ordnance Testing Branch. In his presentation, Becker discussed both the potential uses for a rocket (as a substitute for heavy artillery and a delivery system for poison gas, which was strictly forbidden by the treaty) as well as the present state of the art in rocket technology. Colonel Karlewski was convinced by Becker's

[89] Hans Gatzke, *Stresemann and the Rearmament of Germany* (New York: W.W. Norton, 1969). Wilhelm Deist, "Die Aufrüstung der Wehrmacht," in Militärgeschichtliches Forschungsamt, ed., *Das Deutsche Reich und der Zweite Weltkrieg*, (Stuttgart: Deutsche Verlags-Anstalt, 1979), 379-392. Edward Bennet, *German Rearmament and the West, 1932-1933* (Princeton, NJ: Princeton University Press, 1979), 36-38. Neufeld, "The Reischswehr, the Rocket, and the Versailles Treaty," 164.

discussion. His comments on the military and political potential of the rocket, in addition to offering clues as to the army's operational concept for the weapon, bear a fascinating resemblance to the nationalist concerns of the amateur rocketeers. In supporting Becker, Karlewski stated that "Along with remote guidance, infrared and ultraviolet rays, etc., [The rocket] belongs to the areas from which one day the revolutionary new invention may emerge that Germany has been waiting for in order to achieve rapid liberation. We must stick to our oars in these questions in order to possibly overtake the other powers. If we do not do something in this regard, or do not do it quickly enough, someone else may one day surprise us with the new weapon."[90] The nationalist themes present in the exhortations of amateur rocketeers were also common in military circles. For Karlewski, Germany's weakness lay in the fact that it was subject to foreign oppression and control and unbearably weak vis-à-vis its rivals. Therefore, its efforts to compete with other nations on a level playing field were seriously retarded. Germany's military inferiority and poor world power status could be overcome if this oppression could be lifted. The rocket's potential as a weapon was a primary means in which Germany could extricate itself from the heel of foreign dominance and exploitation and resume its rightful place as one of the chief powers in the world. In addition, the theme of foreign military competition raised by Karlewski would become a familiar trope later in the years of V-2 development at Peenemünde. German military officials were convinced that rocket development in other nations, especially the United States, either equaled or surpassed their own. Because of the weapon's decisive importance, they would argue

[90] "Sitzungsbericht vom 17.12.1930 über die Raktenfrage," M.I. 14/820 (V), 1, 26-27, Imperial War Museum. I am indebted to Michael Neufeld for his generosity in making this document available to me.

in later years that they must dedicate all of their resources to this new and potentially lethal weapon. The hyperventilating enthusiasm of the amateur rocketeers for their technology was matched only by the more sober, but no less positive nationalist assessment of the rocket's potential for the German nation held by the Ordnance officers in 1930.

However, Becker's first step was to commission a study on the state of the art in rocket technology in 1929. The engineer in charge of the study was Captain D'Aubigny von Engelbrunner Hörstig, known simply as von Hörstig. Army captain and diploma engineer Walter Dornberger, who would go on to become the head of the Army's liquid fueled rocket program, was assigned as von Hörstig's aide in this project. The results of their work were discouraging. Except for Rudolph's endeavors at the Heylandt Works and Oberth's failed attempts at a stunt rocket for *Frau im Mond*, virtually no work on liquid fueled rockets had been done. Industry and technical universities had no interest in developing rocket propulsion, and the Raketenflugplatz had not begun to coalesce in any meaningful way when Horstig revealed the results of his study to Becker. Moreover, the VfR had not yet begun any serious experimentation, and even when they did, they did not keep detailed records of their work, a point of increasing friction between the Army and the VfR.[91]

Nevertheless, German amateur rocket groups were initially key to the development of the rocket as a military weapon. The Ordnance office contracted out to private organizations and individuals to see what might come of cooperation with the amateur groups. Becker's association with amateur rocket enthusiasts began in earlier in 1930, when he secretly authorized 5000 marks to support research involved

[91] Winter, *Prelude*, 41-44, 51; Dornberger, *V-2*, 19-20.

with launching Oberth's rocket for *Frau im Mond*. After the failure of that project, during which Nebel openly discussed the Army's donation (much to Becker's chagrin), the Army severed contact until Nebel revived the relationship by touting the Raketenflugplatz's success with liquid fueled rockets over a year later, in 1932.[92]

In April of that year, Becker, intrigued by Nebel's supposed success, wrote to Nebel and asked him to demonstrate their new rocket at the Army's proving ground at Kummersdorf outside of Berlin.[93] The test took place in June, and present at this demonstration were a number of important personalities in Ordnance, including Becker, Dornberger, and Dr. Erich Schumann, a physics professor at the University of Berlin who would go on to become a central figure in the formulation of Nazi science policy. In order to maintain the veil of secrecy around the Army's involvement in rocketry, Nebel, Klaus Riedel, and von Braun were ordered to report with their nose-driven rocket to Kummersdorf at 4:00 a.m. To the chagrin of a number of his colleagues, Nebel did not even go to the trouble of informing the board of directors of the Raketenflugplatz that they would be conducting this demonstration for the Army, one of the signs of the growing dissension and frustration with Nebel among the engineers at Reinickendorf.[94]

The launch demonstration was a spectacular failure. The rocket rose to a height of less than half a mile and crashed only a mile away. Almost immediately,

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[92] Nebel, *Narren*, 72-75. Neufeld, *The Rocket*, ~~5~~ 23.
[93] Nebel, *Narren*, 133-135. Wernher von Braun, "Behind the Scenes," 8, Wernher von Braun Papers, SRCH.
[94] Wernher von Braun, "Behind the Scenes," 8-9. Nebel, *Narren*, 135-137. Hans Ebert and Hermann Rupieper, "Technische Wissenschaft und nationalsozialistische Rüstungspolitik: Die Wehrtechnische Fakultät der TH Berlin, 1933-1945," in Reinhard Rürup, ed., *Wissenschaft und Gesellschaft: Beiträge zur Geschichte der Technischen Universität Berlin, 1879-1979* (New York: Springer, 1979), 469-481. For Schumann's role in the formation of National Socialist science policy, see also Alan Beyerchen, *Scientists Under Hitler: Politics and the Physics Community in the Third Reich* (New Haven : Yale University Press, 1977). Ley, *Rockets*, 155-156.

Ordnance made its dislike for Nebel clear. Its report on the launch stated that in addition to Nebel's clear inability to conduct work in secret, "the conclusion must be reached that, because he makes assertions against his better judgement, closer cooperation with Nebel is out of the question, even though he was able to produce a liquid-fueled rocket with an engine that worked well for a duration of many seconds."[95] Ordnance severed its relationship with Nebel in the middle of 1932 and shortly afterwards changed its focus from farming out rocket work to developing its own liquid-fueled rocket program in-house.[96]

Besides the failed test, there was another important reason that Army Ordnance distrusted Nebel and decided to develop its own liquid-fueled rocket program. Becker, who already thought Nebel a slippery character, despised the endless publicity-seeking and the ad-hoc, un-documented approach of the Raketenflugplatz. According to Dornberger, "We wanted to have done once and for all with theory, unproved claims, and boastful fantasy, and to arrive at conclusions based on a sound scientific foundation."[97] Nebel's penchant for exaggerated salesmanship subverted both the army's attempts at secrecy and any attempts to systematically assess the state of the technology and directions of development. Aside from the desire to keep Germany's rearmament program in general secret, the rocket's capacity for shock and surprise was essential to the its deployment as a weapon. Ordnance wanted to be able to deliver the rocket unannounced, so as to terrify Germany's enemies into submission. If Nebel were to be involved in rocket

[95] Ley, *Rockets*, 155-156. Schneider Report, 6/23/32, IWM, MI 14/801 (V).
[96] Ordnance had been pursuing solid fuel rocket development on its own since 1930. See Neufeld, *The Rocket and the Reich*, 16-17.
[97] Dornberger, *V-2*, 20.

development for the Army, his grandstanding would have made secrecy considerations impossible to maintain, thereby exposing Germany's rearmament and, in the eyes of the Army, lessening the rocket's effectiveness as a weapon.[98] This episode would mark the first time that secrecy began to play an important role in the professional development of the German rocket engineers. Those engineers who were able to adjust to this new dynamic in their work would flourish within the confines of the Army rocket program. Those who could not adjust, like Nebel, were marginalized by the Army and virtually ignored by their colleagues.[99] The practice of secrecy would go on to become a major factor in the reproduction of the engineers' cultural lives at Peenemünde.

Nevertheless, Ordnance's strained relationship with the amateur rocketeers did result in a personnel coup. Through Nebel, Von Braun was introduced to Becker and Dornberger, who were immediately impressed by the young engineer's intelligence and energy.[100] Several months later, the Army hired von Braun by offering him the chance to carry out his doctoral research on rocket development at Kummersdorf. Von Braun actually finished only part of his mechanical engineering program before being made a doctoral candidate under the phlegmatic Schumann at the University of Berlin. His work began in earnest in December 1932 when he began researching for his dissertation, "Constructive, Theoretical, and Experimental Contributions to the Problem of the Liquid Fueled Rocket," while working for the

[98] Walter Dornberger, "Denkschrift," c. 1943, NASM Fort Eustis (FE) Files, FE 496.
[99] For Nebel's marginalization by the Army, see below as well as Michael Neufeld, "The Excluded: Hermann Oberth and Rudolf Nebel in the Third Reich," *Quest* 5/4 (1996).
[100] Dornberger, *V-2*, 26-27.

Army at Kummersdorf.[101] Von Braun was not yet an Army employee, but received a stipend of 300 marks per month to work for the military.[102] Nevertheless, as Neufeld correctly points out, "When von Braun began to work at Kummersdorf, Ordnance's own liquid-fuel rocket program can fairly be said to have begun."[103]

Von Braun's immediate supervisor and contact with Army Ordnance was Walter Dornberger. Nicknamed Sepp by his close friends (including von Braun), Dornberger was born in Giessen on September 6, 1895. In 1926, the Army captain enrolled in the engineering program at the Technical University of Berlin.[104] Dornberger was part of the "study officer" program initiated by Becker, who was deeply concerned about the anti-technological assumptions of the old-line officer corps. This program allowed selected officers to gain valuable engineering training at TU Berlin.[105] Dornberger completed his Diploma-Engineer studies in 1930. However, he was able to continue his academic training and in 1934, earned a doctorate in engineering.[106]

Ordnance set up its rocket research station at its proving ground in Kummersdorf, approximately seventeen miles south of Berlin. A test stand for powder rockets was already in place, but Ordnance quickly built two new work buildings and a new test stand for liquid fueled engines. These facilities were a major

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[101] Dornberger, *V-2*, 27; "Werdegang des Professors von Braun," NASM FE 341. Wernher von Braun, "Konstruktive, theoretische, und experimentelle Beiträge zu dem Problem der Flüssigkeitsrakete," Ph.D. Dissertation, University of Berlin, 1934, reprinted in *Raketentechnik und Raumfahrtforschung*, Sonderheft 1, 1960.
[102] Wernher von Braun-Ordnance Contract, 4/4/33, Wernher von Braun Papers, SRCH.
[103] Neufeld, *The Rocket*, 23. Von Braun's role at Kummersdorf is examined in greater detail in chapter 2.
[104] Walter Dornberger IRR Dossier, Box 371, RG 319, Records of the Army Staff, National Archives. Dornberger's penchant for wearing leather Sepplhosen when off-duty garnered for him the sobriquet. Dieter Huzel, *From Peenemünde to Canaveral* (Englewood Cliffs, NJ: Prentice Hall, 1962), 72.
[105] W. Phillips, "Karl Becker," Obituary, *Zeitschrift des Vereines deutscher Ingenieure* 84 (May 4, 1940), 293-294. Ebert and Rupieper, "Technische Wissenschaft," 469-480.
[106] Dornberger IRR Dossier, NA.

improvement over the third rate setup at Reinickendorf. The new test stand, completed in December 1932, was made up of three concrete walls that were twelve feet high and eighteen feet long. Large metal doors completed the enclosure, which was covered by a retractable roof. Built into one of the concrete walls was an observation room that housed the testing crew as well as instruments used to measure flow rates, pressure, temperature, thrust, and other critical components of the test process. Large tanks built onto the walls automatically pumped liquid oxygen and alcohol directly into the engine, thereby disposing with the dangerous task of manually pouring liquid oxygen, and an automated measuring system calculated fuel consumption during tests.[107] In 1932-'33 Von Braun was limited to using one half of the test stand and his staff was minimal, but nevertheless, the facilities at Kummersdorf were a major improvement over those at the Raketenflugplatz.[108]

In January 1934, von Braun was joined at Kummersdorf by Walter Riedel from the Heylandt Works.[109] The addition of Riedel was part of the Army's effort to consolidate liquid fueled rocket development under their own aegis and suppress the work of the amateur rocket groups. Hitler's appointment as Chancellor in the far right wing coalition government on January 30, 1933 allowed the Nazis to ruthlessly do away with rival parties and organizations.[110] The Army, which managed to maintain nominal independence from the party, took the opportunity to elimate amateur development and public experimentation. Becker had long despised the

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[107] Dornberger, *V-2*, 23-24.
[108] Von Braun, "Behind the Scenes," 63, Wernher von Braun Papers, SRCH. Initially, Von Braun had only one technician under him.
[109] Riedel IRR Dossier, NA.
[110] Ian Kershaw, *The Nazi Dictatorship: Problems and Perspectives of Interpretation* (New York: Routledge, Chapman, and Hall, 1993), 65-81.

amateurs' very public approach to their work and considered the secret development of the rocket to be paramount, but the Weimar constitution made it impossible for Becker to act on these concerns. With the constitutional controls removed by Hitler and the Nazis, Becker seized the chance. By the end of 1934, the Army had either co-opted the work of the amateur groups by hiring their leading experts or forced the collapse of nearly all of the groups themselves. Nebel, who had been thrown out of the VfR (see below), was denounced by the Army to the Gestapo for violating secrecy and also briefly arrested in June during the Night of the Long Knives, the bloody purge of SA leadership. Due to his close connections with Franz Seldte, the leader of the ultra-nationalist Stahlhelm group, the slippery rocket enthusiast was released quickly. Nevertheless, because of the Army's stranglehold on rocket development, Nebel never again rose to prominence in the field.[111]

The End of the VfR and Raketenflugplatz

However, even before the Army's campaign to eliminate the amateur groups, Nebel's folly had already begun the collapse of the VfR and the Raketenflugplatz. In the summer of 1932, shortly after Nebel's disastrous test at Kummersdorf, Franz Mengering, an engineer with friends on the Magdeburg city council, came to the Raketenflugplatz touting the bizarre idea that the Earth actually existed inside a sphere. He wanted to test his idea by launching a rocket and seeing if it would crash against the outer edge of the sphere. Although it is likely that even Nebel rightly

[111] The story of the Army's campaign to suppress the rocket groups is complex and somewhat obscure. Michael Neufeld ably sorts out the details. See Neufeld, "The Excluded,"; *The Rocket and the Reich*, 23-32; and "Rolf Engel vs. the German Army: A Nazi Career in Rocketry and Repression," *History and Technology* 13 (1996), 53-72.

thought the idea incredibly foolish, this was a perfect chance for him to put his opportunistic fundraising skills to use. He succeeded in obtaining 35,000 marks from the city of Magdeburg for his "Magdeburg Pilot Rocket." After securing money, the VfR attempted to build a rocket that was capable of launching a human and have him jump out of it with a parachute once it reached maximum altitude. This launch was to take place in Magdeburg during Pentecost in 1933. Predictably, the attempt to build such a rocket was an embarrassing failure, and the leadership of the Raketenflugplatz began to distance themselves from Nebel's activities.[112]

Moreover, Nebel's questionable business methods were beginning to catch up with him. In February 1930, unbeknownst to the VfR leadership, Nebel, as Treasurer of the organization, filed a bankruptcy petition for the society and allegedly began cooking the financial books.[113] Nebel was apparently using the VfR's money for his own personal gain. In September 1933, Hans-Wolf von Dickhuth-Harrach and Willy Ley, the respective President and Vice President of the VfR, discovered this scheme, accused Nebel of fraud, and expelled him from the society. Citing the close ties between the Raketenflugplatz and the VfR, Von Dickuth-Harrach also severed the ties between two organizations. Von Dickuth-Harrach's explanation for Nebel's expulsion in *Raketentechnik*, the VfR's newsletter, is noteworthy for the direction of the political development of the society. He cast his decision to expel Nebel in terms of the larger "cleansing" of the economy then going on as a result of the National Socialist seizure of power. In arguing that Nebel had been engaging in fraudulent financial activities with VfR money, Von Dickuth Harrach wrote, "This highest ideal

[112] Ley, *Rockets*, 157-160; Nebel, *Narren*, 125-128; Winter, *Prelude*, 44-46.
[113] Ley, *Rockets*, 157.

[a ‘clean economy’ – saubere Wirtschaft],” he wrote, “which was unfortunately almost completely lost in German intellectual circles during the years of Marxism, has become honorable again, thanks to the will of our Führer, Peoples’ Chancellor Adolf Hitler. Hopefully it will soon be considered in the way is was before the war; that is, each German feels in his flesh and blood that he cannot act anything less than honestly and openly.”[114] With this statement, Von Dickhuth-Harrach, who became President of the VfR in 1931, aligned the society with the National Socialist policy of eliminating the supposed corruption and morally depravity of the sinister Weimar Republic. He went on by writing that the worst enemies in this regard were not those who openly supported the Republic’s political and economic initiatives, but rather those who cloaked their own narrow self interest by acting “decently in speech and emphasizing their usefulness to the community.”[115] For the VfR leadership, Nebel’s behavior, with its corruption, deceit, and lack of communal spirit, represented all of the worst characteristics of the Weimar Republic. Nebel’s proclivity for self-promotion was emblematic of an era scandal and self-aggrandizement. He violated the trust of the close community of rocket specialists, both within and outside of the Raketenflugplatz, and for this, he received from his colleaguues the strongest rebuke they could bring – expulsion from their ranks. Moreover, the communal spirit that bonded the engineers became increasingly politicized in the 1930s, falling back on harsh National Socialist rhetoric to explain the causes for this lack of communal feeling. National Socialism offered a solution to these problems by sweeping aside

[114] Hans-Wolfe von Dickuth-Harrach, “Saubere Wirtschaft,” *Raketentechnik*, November 1, 1933, 1, in NASM file “Germany 1920-1940, Correspondence.” Von Braun was elected to the board of the VfR in September 1932, but dropped out of the organization in 1933. *Raketenflug* 7 (December, 1932), von Braun, “Reminiscences,” 130.
[115] Ibid., 2.

the selfishness and fraud inherent in capitalism and reviving the honorable idea of service to the larger community.

Nebel's fall from the leadership of the amateur rocket circles is indicative of larger trends among German rocket engineers during the onset of the Nazi regime. The first is the growing influence of Becker and the Army Ordnance Office. Ordnance favored proceeding from a sober, rational, realistic assessment of the capabilities of rocket technology as they stood at the beginning of the 1930s. They sought out talented individuals, such as von Braun and Rudolph, who could carry on their work anonymously and with strict attention to scientific and technical detail, which would produce systematic, measurable, repeatable results. Nebel, on the other hand, failed them utterly in this regard by literally promising them the moon and delivering to them a farce. His (and others' at the Raketenflugplatz) shortsightedness and failure to consistently measure and record the results obtained through experimentation led to frequent and sometimes major technical failures, wild inconsistencies in experimental findings, and exaggerated assertions about the level of rocket technology at that point in its development. Short of seeing a rocket in flight, Ordnance had no way to know for sure about the exact state of the art. When they saw for themselves how deeply flawed the rocket was and how badly fabricated Nebel's assertions were, they determined to develop the technology themselves and co-opted the valuable and necessary personnel from the amateur groups. Moreover, Nebel's capacity for overstatement and seeking the public spotlight irritated Ordnance leadership, who considered strict secrecy to be one of the most important considerations of their work. This in turn led to a growing mistrust and resentment of

Nebel. In the end, the growing influence of the Army, coupled with the veil of secrecy descending upon rocket research, combined to exclude Nebel from the larger community of rocket engineers.

However, the final blow to the Raketenflugplatz came from something far more prosaic and unexpected than military pressure or Nebel's trickery. In the midst of the Magdeburg debacle, a city official arrived in Reinickendorf with a huge water bill for the Raketenflugplatz. Leaky faucets in some of the buildings that were never used accrued a large water bill over the years of the rocketeers' residence on the site. Since the chronically destitute Raketenflugplatz had no money to pay the bill, the city cancelled its lease to the land. Moreover, the pressure on the group by Army Ordnance to cease its activities proved irresistible. Much of the equipment and what few documents they had traveled to Siemens with some of the engineers who were subsequently hired by the firm. Through von Braun, these men, including such luminaries as Klaus Riedel, Hans Hüter, and Kurt Hainisch, were eventually hired to work at Peenemünde.[116]

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The Weimar years of German rocketry proved to be difficult, yet rewarding for the engineers who sought to develop a liquid fueled rocket. For a profession struggling to gain the same public approbation and political influence as that held by the "free" professions (doctors, teachers, and lawyers), rocketry proved to be a boon in more ways than one. Its popularity, which was fostered by very public and dramatic experiments, led to much greater recognition for many luminaries among

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[116] Ley, *Rockets*, 160-161; Winter, *Prelude*, 48; Riedel, Hainisch, and Hüter questionnaires, folder "Boston," Box 703, RG 165, Assistant Chief of Staff, Enemy POW Interrogation File, 1943-1945,NARA.

engineering. In addition, rocket engineers were able to set up their own professional societies, complete with meetings and a regular journal that enhanced their ideas of professionalism. Even when the work did not pay, as was the case for those at the Raketenflugplatz, it did provide food and shelter as well as a great deal of camaraderie.

The growth of this professionalism was balanced by the wholly amateurish and ad hoc approach taken on the shop floor by the most important group of enthusiasts at the Raketenflugplatz. They had no regular source of supply, other than Nebel's undoubted bargaining skill, no systematic approach to their experiments, and no money to pay their engineers and technicians. Their unabashed enthusiasm could only paper over these problems for so long.

Nevertheless, it was the very popularity of rocketry in the Weimar Republic that brought the enthusiasts' work to the attention of the Army, who, in their quest to re-arm Germany, could provide them with vastly improved facilities and resources. The conditions on this employment were that they eschew the public aspects of their work and focus on quietly improving the scientific and technical groundwork laid in the previous years. Technical development of a deadly weapon, not gaudy and fanciful expositions of the rocket's many potential uses, was the rule of the day. While similar nationalist ideas helped inspire the two groups to work with one another, the Army also put a great deal of emphasis on scientific and technological professionalism and the willingness of the engineers to work in secret. Nearly all of the important rocket enthusiasts in Germany held nationalist beliefs of some sort, but some were unable to set aside their lofty dreams of space travel and focus on the more mundane matters of rocket development that were the key to the success of the rocket endeavor. Others were simply unable to work within the shroud of secrecy that the Army wished to impose on rocket development and believed they could build a rocket on their own or with corporate support. This betrayed an inability to comprehend the vast complexity of the task in front of them, which could only be met with the funding and resources that a large, well-developed industrialized nation could provide. Ultimately, those who could not work within these parameters were shunned not only by the Army, but also by their colleagues in the slowly developing profession of rocket engineering. If they were willing to keep this bargain, they were either hired right away by the Army or would be once plans for the massive research installation at Peenemünde were completed.

It was only with the increased dedication of the regime to developing a ballistic missile that the idea of the professional rocket engineer began to take form. Those who came to work for the Nazis on the missile in the 1930s and '40s fundamentally shaped its maturation. Their professional circle would grow much larger in the years to come even as the cultural and political world of engineers became increasingly complex and the bonds between them and the state grew much stronger.

Chapter 2

State Commitments, State Secrets: Establishing the Peenemünde Community of Rocketeers

In working on rocket development for Army's Ordnance Bureau, the small group of civilian rocket pioneers under Braun at Kummersdorf began the process by which their identities would be re-shaped as rocket specialists in the service of the state. This chapter argues that the rocket specialists, first at Kummersdorf and then at Peenemünde, were relentlessly drawn into even closer cooperation with authorities within the Nazi regime through a combination of military decisions, professional aspirations, and demands for secrecy. First, technical specialists engaged in rocket work experienced a dramatic growth not only in money, resources, and manpower, but also in demand for their very special skills. A corresponding growth in their prestige was the result. The increased military and technological demands mingled with the professional aspirations of the development specialists led by Wernher von Braun. The result was the construction of a first rate technological facility on the Baltic coast that was dedicated solely to their work. Secondly, this chapter argues that the Army's absolute demand for total secrecy in rocket development resulted in a strict network of regulations that formed the framework within which rocket specialists lived both their personal and professional lives, shaping their identities in profound and important ways. Individuals at Peenemünde deeply internalized secrecy practices, and their adherence to the rules was automatic, behavior that improved their chances of success while guaranteeing their loyalty to the regime.

The expansion of the program at Kummersdorf and its eventual resettlement at Peenemünde took place within the frenzied context of the National Socialist rearming of Germany. The regime actively pursued the development and production of technologically advanced weapons, and Ordnance and their rocket developers at Kummersdorf were only too eager to supply them. They capitalized on the demands for rearmament by expanding their budget, enlarging their staff, and improving their facilities. In the end, rocket developers were awarded with one of the largest, most modern, most well-equipped scientific and technological installations in the world.

The secrets within this installation were kept strictly off-limits to anyone not involved in the work. In the context of missile development, maintenance of absolute secrecy was second in importance only to the development work itself. The regulations enacted to guard the secret work were all-encompassing and erected imposing physical and psychological barriers between those subject to secrecy and the outside world. These daily practices that set Peenemünde employees off from the rest of German society became the anvil upon which their identities were reshaped as missile developers in the service of the Nazi state. Secrecy was fundamental to the re-ordering and reproduction of the identities of employees from individual, skilled, technical experts into “Peenemünders,” a group of elite weapons designers working on the very cutting edge of modern technology. This re-definition of individual identity into a group form had important implications, not only for the pace of innovation and development, but also in terms of political compliance within the Nazi regime.

In the end, a combination of several factors enhanced the individual technical specialist's identification with the project in its early years. Unwavering support by the Army was one key. Without this support, which grew steadily in the 1930s, the practice of rocketry would likely have languished in relative obscurity. Also important were the specialists' own aspirations within this nascent community of professionals. Their own desire to work in this highly specialized project grew as the Army made its commitment to their work clear. Civilian specialists and their Army benefactors saw great use, for whatever purpose, in large, liquid-fueled rockets. Finally, the imposition of secrecy around their work and their care in maintaining it began to foster a deep, abiding sense of community, privilege, and loyalty. All of this set out the framework of future efforts on behalf of the regime that sponsored their work.

One note on the goals of this chapter is necessary. What follows does not aim at an exhaustive history of the events leading up to and during construction at Peenemünde. Michael Neufeld's ambitious work covers this in detail.[1] Rather, the first section of this chapter highlights the ways in which the experience of missile development in the early 1930s informed decisions that were made about the conduct of work at Peenemünde. It also illustrates how the goals of authorities in the Army,

[1] Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1995). Neufeld's work is the first English language monograph to examine the existing German documentary record of Peenemünde and corrects the numerous errors made in books written by other historians and space enthusiasts. Heinz Dieter Hölsken, *Die V-Waffen: Entstehung, Propaganda, Kriegseinsatz* (Stuttgart: Deutsche-Verlags Anstalt, 1984), was the first German effort on this front, but Hölsken did not have access to the entire documentary record and his book falls prey to some of the postwar myths about Peenemünde that Neufeld corrects. An early, influential, often erroneous history of the German rocket program that white-washes the records of many German rocket specialists is Fred Ordway and Mitchell Sharpe, *The Rocket Team* (New York: Crowell, 1979). Its authors, both space enthusiasts, draw their arguments almost entirely from postwar interviews with the German participants themselves.

as representatives of the regime, and those of early civilian technical specialists in rocket development became increasingly intertwined in the period before the rocket center at Peenemünde was constructed. The second section, which comprises the bulk of the chapter, examines the daily practices of secrecy at Peenemünde once the facility was opened in 1937. It describes the framework in which individual specialists of varying scientific and technical backgrounds from across Germany developed into a dynamic community with a unitary vision on an isolated island on the Baltic coast. Rather than offer a history of the physical development of Peenemünde, this chapter explores the foundations of the dynamic technical community that formed at the facility and examines the contours within which the basic forces that affected individuals' daily lives took shape.

Kummersdorf Proving Ground, Army Ordnance, and the Roots of "Big" German Missile Research, 1933-1937

The development of the German Army missile program at Kummersdorf and the work that went on at the proving ground contained the seeds of the experience that would emerge at Peenemünde only a few years later. A corps of highly motivated, deeply dedicated developers, backed by the growing financial support of a regime bent on rearming its depleted military, made substantial progress toward the development of the world's first ballistic missile. The work was carried out in utter secrecy, and its increasingly advanced nature dictated the emergence of a specific set of professional norms governing the conduct of work. In a very real sense, the Kummersdorf experience foreshadowed the onset of "big research" at Peenemünde.[2]

[2] On big research, see Margit Szöllösi-Janze and Helmuth Trischler, eds., *Grossforschung in Deutschland* (Frankfurt am Main: Suhrkamp, 1990).

From nearly its first moment in power, the National Socialist regime made the rearming of Germany's weakened military its top priority. As early as February 8, 1933, nine days after Hitler ascended to the Chancellor's post, he reported to his cabinet that "The next five years must be devoted to the restoration of the defense capacity of the German people," and he proclaimed that every state-funded work creation measure must be judged in terms of its value to this goal.[3] For the Nazis, Germany's future depended solely on rebuilding its armed forces that were shattered in World War One and cut to the bone by restrictions in the Treaty of Versailles. All other government expenditures were secondary to this task. The demands of the nation's armed forces were to take precedence over any other institution. Accordingly, the government diverted hundreds of millions of Reichsmarks from other measures to pay for the illegal German rearmament.[4] In April, the government initiated the "Second Armaments Program," which circumvented the standard budgeting process in order to provide money that was not included in the state budget directly to the Army.[5] Hitler's dedication to rebuilding the German Army was the cornerstone of the Army's loyalty to the Reich. Though it would prove to have a troubled relationship with Hitler, the Army leadership found in him a man whose military interests largely coincided with its own. Moreover, Hitler's approach to military spending ignored any practical limitations and rejected international law. Though in the opening years of his rule, he proceeded very carefully with

[3] Quoted in Ian Kershaw, *Hitler, 1889-1936: Hubris* (New York: W.W. Norton, 1998), 444.
[4] Heinz Höhne, *Zeit der Illusionen: Hitler und die Anfänge des 3.Reiches 1933 bis 1936* (Düsseldorf: Econ-Verlag, 1991), 58.
[5] Michael Geyer, *Deutsche Rüstungspolitik, 1860-1980* (Frankfurt am Main: Suhrkamp, 1984), 140.

rearmament, he later proved himself willing to flout international accords and spend profligately.

The Armed Forces pounced on the opportunities for expansion and innovation that the dictator's aggressive armaments policy offered. Acting on their own concerns, they naturally showed little evidence of reflection on the deep, long-term problems that all-out rearmament inflicted on the economy.[6] They were fully aware that they had Hitler's whole-hearted support and continued to press for increasingly advanced and modern weaponry.[7] Ian Kershaw has pointed out that this was not merely based on the desire to increase Germany's military strength. It was also, he contends, one aspect of the armed forces' leadership "working toward the Führer," that is, consciously acting in accordance with what they perceived to be Hitler's own goals.[8] This phenomenon was not limited to the upper echelons of the armed forces leadership. Rather, it extended deeply into the Army's bureaucracy.

This accelerated pace of rearmament under the Nazis as well as the polycratic nature of the regime's administrative structures only served to benefit the aspirations of rocketry enthusiasts by allowing the ambitious head of the Army Ordnance Testing Section, Colonel Karl Becker, who would be promoted to General and assume the post of Ordnance Chief in 1938, and his fast-rising subordinate, Major Walter

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[6] The lack of focus on improving consumer spending inevitably led to major economic difficulties, devastating the Reich's finances and increasing the risk of dramatic inflation. Historians have shown that such fiscal policies in fact retarded German economic growth, even as they gave it a needed injection of energy. See, for example, Dieter Petzina, *Autarkiepolitik im Dritten Reich: Der nationalsozialistische Vierjahresplan* (Stuttgart: Deutsche-Verlags Anstalt, 1968) and Jane Caplan, ed., *Nazism, Fascism, and the Working Class: Essays by Tim Mason* (New York: Cambridge University Press, 1995).
[7] Kershaw, *Hitler, Hubris*, 437-444. Wilhelm Deist, *The Wehrmacht and German Rearmament* (Toronto: University of Toronto Press, 1981), 24-25. Klaus-Jurgen Müller *Das Heer und Hitler: Armee und Nationalsozialistisches Regime, 1933-1940*, 2nd Edition, (Stuttgart: Deutsche-Verlags Anstalt, 1988), 53-61.
[8] Ian Kershaw, *Hitler: Nemesis, 1936-1945* (New York: W.W. Norton, 2000), 9-18.

Dornberger, to carve out an administrative empire that catered to their professional aspirations by putting missile development front and center in the German rearmament effort.[9] The determined missile developers at Kummersdorf benefited greatly from the skillful shepherding of Becker and Dornberger. The massive effort to rearm Germany as quickly as possible and without consideration for internal economics or external treaties helped to create the institutional environment for major technological innovation in the rocket program by providing the necessary facilities, raw materials, and brain power.

Throughout the 1930s, the Army's in-house missile development program made significant strides. The National Socialist assumption of power allowed officials in the Army's Ordnance branch, which headed the official effort at rocket development, to restrict access to the technology by imposing a tight curtain of secrecy around German rocketry. For Becker and Dornberger, secrecy was a consideration of paramount importance. Ordnance effectively closed down nearly all amateur rocket societies and development projects. By 1934, Dornberger had completely cut Rudolph Nebel out of the Army program because of the grandstanding engineer's proclivity to seek out publicity for his work. Ordnance welcomed only

[9] On the chaotic nature of the Nazi administrative hierarchy and the competition that developed within it, see Peter Hüttenberger, "Nationalsozialistische Polykratie," *Geschichte und Gesellschaft* 2 (1976), 417-442, perhaps the single-most influential essay in the historiography of Nazi Germany. See also Martin Broszat, *The Hitler State: The Foundation and Development of the Internal Structure of the Third Reich*, Transl. John W. Hiden (New York: Longman, 1981). Ian Kershaw, *The Nazi Dictatorship: Problems and Perspectives of Interpretation* (London: E. Arnold, 1985), argues that the regime was divided into power blocs made up of the SS, armed forces, and armaments ministry, among others. This interpretation has come under increasing scrutiny by historians who argue that even these blocs, especially the SS, had warring factions. See Michael Thad Allen, *The Business of Genocide: The SS, Slave Labor, and the Concentration Camps* (Chapel Hill: University of North Carolina Press, 2002), Jan-Erik Schulte, *Zwangsarbeit und Vernichtung: das Wirtschaftsimperium der SS: Oswald Pohl und das SS-Wirtschaftsverwaltungs-Hauptamt, 1933-1945* (Paderborn: Schöningh, 2001), and Karin Orth, *Das System der nationalsozialistischen Konzentrationslager: Eine politische Organisationsgeschichte* (Hamburg: Hamburg Edition, 1999).

those specialists who were willing to carry out their research under the strictest secrecy regulations. Some former amateur rocketeers, including Wernher von Braun, found themselves working in the modern and modestly well-equipped firing range at Kummersdorf outside of Berlin.

As von Braun could attest, the conditions at Kummersdorf were far better than at the Raketenflugplatz. Instead of unemployed engineers living in ramshackle quarters and squeezed elbow to elbow in primitive work stations, Kummersdorf offered the prospect of paid employment (employees at Kummersdorf earned between 2400 and 8000 Reichsmarks per year, depending on education and experience) while utilizing some of the best equipment that money could buy.[10] Safety considerations were much easier to maintain and the work was not restricted by angry policemen concerned about collateral damage. All of this combined to help facilitate the creation of professional bonds between the Army and engineers. That many of the engineers at Kummersdorf were deeply nationalist only strengthened the links between the two until stronger institutional bonds could be forged.

At the proving ground, von Braun's small team, with its improved facilities and funding, surpassed the work of the amateur groups rather quickly. The year 1934 proved to be both personally and professionally rewarding for many in rocket development there. In June, Braun defended his dissertation, "Konstruktive, theoretische, und experimentelle Beiträge zur Problem der Flüssigkeitsrakete" ("Constructive, Theoretical, and Experimental Contributions to the Problem of the

[10] For the salaries of civilian engineers at Kummersdorf, see the collection of professional dossiers in RG 165, Records of the Army Chief of Staff, Box 702, File "Boston," National Archives and Records Administratio (NARA).

Liquid Fueled Rocket").[11] The twenty-two year old was awarded the Ph.D. with high honors for his work on rocket development, and his star was rapidly on the rise. By this time, the process by which he would endow this work with great personal significance was well under way. The long-time space enthusiast's research on rocket technology was groundbreaking, and he saw in his work for the Army the fulfillment of many of his professional ambitions.[12] At the end of 1934 on the island of Borkum, Braun's group staged successful test launches of two relatively small rockets, code-named A-2s, but known affectionately by his group as Max and Moritz, after the ne'er do well characters in the cartoon *The Katzenjammer Kids.* Among the participants in the launches were Braun, Arthur Rudolph, and Walter "Papa" Riedel, an important participant in Heylandt's liquid fueled rocket efforts. [13] Riedel, sometimes gruff and stubborn, proved to be extremely important to the early work at Kummersdorf, providing practical design experience while maintaining a close level of supervision and quality control that was so important for the relatively small group at the firing range. Indeed, Braun recalled that "Hardly a rivet or washer in our experimental A-3, A-5, A-9, and particularly the A-4 [missiles] can have escaped his personal scrutiny."[14] When Peenemünde opened in 1937, Riedel would go on to head the Design Bureau for a time.

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[11] Werner von Braun, "Konstruktive, theoretische, und experimentelle Beiträge zur Problem der Flüssigkeitsrakete," Ph.D. Dissertation, University of Berlin, 1934. Reprinted in "Raketentechnik und Raumfahrtforschung," Sonderheft 1, 1960.

[12] Wernher von Braun, "Behind the Scenes of German Rocket Development," Wernher von Braun Papers, Space and Rocket Center, Huntsville, (SRCH).

[13] Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1996), 38. Arthur Rudolph Oral History Interview (OHI), NASM.

[14] Wernher von Braun, "Reminiscences of German Rocketry," *Journal of the British Interplanetary Society*, 70 (May/June 1956), 131-132.

The Kummersdorf group's success with the A-2 test rockets proved to be an important point in the effort to create a larger, state-funded rocketry program. In addition to creating considerable elation among the developers, the December launches at Borkum met with great enthusiasm among Ordnance officials and a further loosening of Army purse strings.[15] When they presented their findings to their Army masters in mid-January 1935, one officer's enthusiasm for the technology got the better of him. He made a premature and short-sighted proposal to quickly mass-produce a scaled-up version of the relatively primitive test rockets for use in artillery style bombardments. In an early indication of his willingness to conceive of his work in terms of its military applications as well as his desire to build even bigger machines, an unenthusiastic Braun had to throw cold water on this idea by arguing that the A-2s were inaccurate, unreliable, and might damage the case for larger weapons in the future.[16] The armed forces accepted this argument, and despite a moderate, but not unreasonable, degree of penny pinching by the Army, the budget for rocketry grew continually throughout the early 1930s, as the senior service made its commitment to the technology increasingly clear. Larger budgets meant that the staff at Kummersdorf grew, the offices expanded, and the testing hardware was enlarged and improved. Braun's earlier spatial limitations at Kummersdorf were eliminated and the complexity of his facilities dramatically expanded. For example, Ordnance built a larger test stand for liquid fueled engines that was surrounded by a blast wall and serviced by a locomotive that could tow large testing equipment and

[15] Wernher von Braun, "I Reached for the Stars," Box 200, Folder 7, Wernher von Braun Papers, SRCH.
[16] Wernher von Braun, Denkschrift, 1/18/35, FE 727/a, NASM.

even complete rockets into firing position.[17] The staff dedicated to rocket development grew to seventy-eight people, and the research budget reached up to 80,000 Reichsmarks.[18] All of this was a far cry from the lean years at the *Raketenflugplatz*, but even so, increasing military demands on rocket technology and growing ambitions of its supporters were beginning to make even the large proving ground at Kummersdorf too small for developing and testing large rockets.

It was during this period that secrecy began to define itself as a major force in the culture of missile development. It played a key role in obtaining necessary resources for development as well as helping to establish the rocket developers as participants in activities that could only be the domain of a privileged few. Despite Becker's efforts and Kummersdorf's improved conditions over those at the *Raketenflugplatz*, resources remained undeniably scarce in the first two years of Nazi rule. Ordnance addressed this problem with a combination of inventive requisition requests (referring, for example, to a pencil sharpener as an "Appliance for milling wooden dowels up to ten millimeters in diameter") and resorting to secrecy. If circumlocution failed, then, "We entrenched ourselves behind the magic word 'secret.' There, the budget bureau was powerless."[19] Dornberger offers a telling example.

> Once, in the summer of 1933, we bought two boxes of Christmas tree sparklers. The idea was to use these sparklers inside the nozzle for igniting the first drops of oxygen and alcohol. A year passed. Then the Bureau

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[17] Neufeld, *The Rocket* 36-54. Dornberger, *V-2*, 33.
[18] Braun, "Reminiscences," 134. Volkhard Bode and Gerhard Kaiser, *Raketenspuren: Peenemünde, 1936-1996* (Berlin: Ch. Links Verlag, 1996), 43. For a history of the Kummersdorf Proving Grounds, see Wolfgang Fleischer, *Die Heeresversuchsstelle Kummersdorf: Maus, Tiger, Panther, Luchs, Raketen und andere Waffen der Wehrmacht bei der Erprobung* (Wölfersheim-Berstadt: Podzun-Pallas Verlag, 1995).
[19] Dornberger, *V-2*, 37.

> of the Budget asked what Christmas sparklers were used for in the middle of summer. We replied tersely, 'For experiments.' But the Bureau of the Budget was not happy with this answer, and eight weeks later asked us what kind of experiments. We answered, 'Secret experiments.' Then they gave up.[20]

Such practices drew a firm and early boundary between initiates, that is, individuals with access to privileged information, and others who were not privy to secrets. In addition to producing needed materials, secrecy also provided the power to refute the demands of those whose prerogatives normally exercised a decisive effect on the daily conduct of work at Kummersdorf. In this case, it allowed Ordnance to dictate access to information viewed by nearly all involved in rocket development as being of decisive importance.[21] It helped establish the boundaries within which a privileged few, who had the proper qualifications, could operate relatively freely and unfettered by normal limitations. Ordnance strove to keep as few people as possible from knowing about their rocket research, but in doing so, also established a dynamic in which those who conducted the research, both producers and recipients of secret information, began to crystallize their ideals of professionalism, privilege, and power.

In any case, another aspect of the demand for improved rocket technology was driven by foreign development competition and Ordnance's desire to maintain its lead in this area. Ordnance officers increasingly argued that though Germany might have taken the lead in rocket development, other countries, especially the United States and Soviet Union, were showing signs of catching up. For the officers in charge of shepherding Germany's rocket program along, the presence of foreign development competition was a serious concern. Troublingly for the Army, they were receiving a

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[20] Ibid., 38.
[21] See chapter 1.

number of reports of progress being made in this field, especially by Robert Goddard in the United States. In January 1936, the German Military Attaché in Washington sent a detailed report of Goddard's work on liquid fueled rockets to Berlin, where Ordnance obtained a copy. The report contained information on the size, altitude capability, and speed of Goddard's instrument, which, though erroneous, gave cause for increased concern among Ordnance officials.[22] In February, the General Staff forwarded a copy of the American Science Newsletter, which contained information about Goddard's ongoing work.[23] Another report indicated to Ordnance the flight of a small rocket from New York City across the Hudson River to New Jersey on February 9, 1936.[24] Unfortunately, there is little evidence relating to German intelligence on Soviet activities in the 1930s. Though none of this work even came close to approximating the scale or success of the German program, it was at least enough to give Ordnance justification for improved funding and expansion of the program. However spotty, this intelligence provided yet more impetus for officials in the armed forces to argue that continued missile development was of decisive importance to the German nation's massive rearmament effort aimed at military superiority over its rivals. In the future, Dornberger would seize on it to promote the highest wartime armaments priority level for rocketry in an attempt to guarantee unlimited development and production resources. In the 1940s, his resort to citing foreign competition as justification for a project that consumed increasing resources would eventually put his development and production engineers under massive strain

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[22] Boetticher, "Raketenversuche in den Vereinigten Staaten," 1/7/36, RG 226, T-78/434, NARA.
[23] "Rocket Sent to 7500 Feet at 700 Miles an Hour, *Science Newsletter*, 1/4/36, RH8/v.1945, Bundesarchiv/Militärarchive Freiburg (BA/MA.)
[24] Auszug aus Technische Nachrichten Nr. 27, RH8/v.1945, BA/MA.

to produce. However, in the middle of the 1930s, Ordnance's concern about foreign development helped encourage them to push for a massive expansion of the program.

The development of the idea for an expanded missile program first gained traction in early 1935, shortly after the successful A-2 experiments. In February, the Luftwaffe's Technical Development Office, under the guidance of Wolfram von Richtofen, began to show an interest in the rocket's potential uses in combat aircraft. In May, Captain Leo Zanssen, who would go on to become the military commander at Peenemünde in 1938, sent a memo to the Air Ministry endorsing the idea of cooperation between the two organizations. Zanssen first noted that the use of rocket engines was perceived "primarily as a military weapon (a liquid fueled long range missile)," making it perfectly clear that Ordnance was not in any way interested in spaceflight. He continued by writing that "A considerable development lead vis-à-vis foreign countries has been reached here, the relinquishment of which would be intolerable because the element of surprise is in the interest of national defense."[25]

Zanssen's memo also underlined the increasing importance that Ordnance attached to secrecy in missile development. The Luftwaffe hoped to conduct a joint development venture with the Junkers aircraft firm, but Ordnance was reluctant to join this effort because of secrecy considerations. Zanssen argued that the rocket engine's use for missile technology would have maximum impact if developed in secret and deployed by surprise.[26] The following June, Ordnance convened a meeting with the Reich Air Ministry (RLM) at Kummersdorf in order to address Ordnance's ongoing concerns and attempt to hammer out the terms of an inter-service agreement.

[25] Zanssen to RLM, "Raketenflugzeug," 5/22/35, FE 732, NASM.
[26] Ibid.

Among those present were Richtofen from the RLM, two representatives of Junkers, Ordnance officer Engelbrunner von Horstig, and von Braun and Rudolph from Ordnance. In the meeting, Braun presented a position paper that, as Neufeld has noted, “Must be regarded as Peenemünde’s birth certificate.”[27] In it, Braun outlined his position on cooperative development, laying particular emphasis the idea of the creation of a single facility dedicated solely to developing rocket engines for missiles and airplanes. His paper called attention to the advantages of cooperation between the Army and Luftwaffe by arguing that “The difference between an engine for a free flying liquid fueled rocket and for a rocket plane does not come into question. Rather, it exists only in spatial arrangements. It is therefore advantageous that in the future, the development of the free flying liquid fueled rocket and the rocket engine for airplanes be carried out together in the same place.”[28] For the young engineer, who also happened to be a flying enthusiast, inter-service cooperation to construct a facility solely for rocket development was the most efficacious path to continued improvement on a technology that he wholeheartedly embraced.

However, Braun also had deeper desires beyond mere cooperation. His paper, in addition to playing to the concerns of Braun’s superiors in Ordnance, revealed his own aspirations for rocket development. “For the implementation of this goal,” he wrote, “it is desired that all new workers entering into this area of activity also remain [*bleiben*] in this ‘experimental rocket center’ [*Raketenversuchsanstalt*]. Section 1 feels that it is particularly important that it is agreed that the workers placed by the RLM for the development of new engines will later be taken over by Ordnance

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[27] Neufeld, *The Rocket and the Reich*, 46.
[28] Wernher von Braun, Stellungnahme von Wa. Prw. 1 zur Entwicklung eines Raketenflugzeugantriebes in Verbindung mit RLM, FE 732, NASM.

offices and/or the 'experimental rocket center.'"[29] Braun was intent on retaining as many specialists in one location as possible. He pushed this point for two reasons. In his time under Army employment, he had become thoroughly imbued with the Ordnance's strong desire to maintain a monopoly on rocket development and what it viewed as proprietary information that emerged from the development process. Though Ordnance officers welcomed the RLM's financial and material contributions, at the administrative level, they nonetheless jealously guarded the secret developmental information and feared that the Air Ministry would make off with this knowledge and key personnel once they had attained what they sought from cooperation with the Army. Braun's position paper spoke to this fear of losing a monopoly on rocket development and sought to ensure this would not occur.

Moreover, Braun's paper also points to his own vision of what professional rocket specialists should be and do. Once brought to the experimental rocket center, they would remain there, forming the nucleus of a like-minded group of technical specialists who would then work toward a common technological goal. Use of the verb "bleiben" indicated that Braun did not simply mean for employees to live at the facility while they were employed there or depart for other projects at the whim of their superiors. Rather, these specialists should remain at the facility in order to focus their energy on continuing development of rocket technology. The new rocket center would serve as the physical locus of a new, cutting edge technical profession. This arrangement would also allow for the reproduction of new specialists by controlling

[29] Braun, Stellungnahme, FE 732, NASM.

the selection and training of newcomers from one central location.[30] Inclusion in the Peenemünde community was to become a hallmark of the increasing professionalization within the highly specialized world of rocket engineering.[31] In his effort to shape this emerging specialization along the professional lines he saw fit, Braun actively sought to determine the physical framework within which this new group of technical experts would carry out their important tasks.

Finally, von Braun noted that while cooperation between the Army and Luftwaffe in the rocket venture made obvious sense, ties with private industry should not be fostered. He insisted that no documents produced by the military be made available to any private firms. In addition to the paramount importance of secrecy, von Braun contended that "There is the danger that profit-making opportunities would arise from development that the state has carried out at tremendous expense."[32] Rocket technology developed by the state, argued von Braun, should simply not be exploited by large industry.

It is tempting to view von Braun's statement on industrial exploitation of state-developed rocketry as a sign that the widespread Nazi anti-capitalist rhetoric held some degree of appeal for him. Certainly, von Braun was imbued with the deeply conservative nationalist sentiment that was rife in the universities and that shot through his profession. However, Michael Neufeld has plausibly argued that the

[30] This process is essential for the growth of the educated professions. See Lennart G. Svensson, "Knowledge as a Professional Resource: Case Studies of Architects and Psychologists at Work," and Charles McClelland, "Escape From Freedom? Reflections on German Professionalization, 1870-1933," in Rolf Torstendahl, ed., *The Formation of Professions: Knowledge, State, Strategy* (London: Sage Productions, 1990). William J. Goode has also noted this phenomenon among the professions. See his article, "Community Within a Community: The Professions," *American Sociological Review*, 22/2 (April 1957), 194-200.
[31] See chapter three.
[32] Wernher von Braun, Stellungnahme von Wa. Prw. 1 zur Entwicklung eines Raketenflugzeugantriebes in Verbindung mit RLM, FE 732, NASM.

young engineer's mistrust of capitalism "drew less on National Socialist ideology than on centuries-old traditions of state ownership in Prussia and Germany."[33] His overriding concern was the maintenance of secrecy considerations and that the missile would lose its effectiveness as a weapon if it were somehow exposed to industry. Though Braun found great personal and professional satisfaction in the Nazi rearmament program and would join the Nazi party in 1937, he did so only after being requested to do so. There are no extant declarations of his political loyalty to the regime, and his actions indicate that rather than being an ideologue who invested heavily in Nazi ideology, he was distinctly an opportunist who saw ample prospects under the regime to advance his own goals and concerns. The science writer Willy Ley wrote of von Braun, "Did we discuss politics? Hardly, our minds were always far out in space. But I remember a few chance remarks which might be condensed into saying that … the German Republic was no good and the Nazis ridiculous."[34] Though the circumstantial evidence makes it tempting to do so, there is simply not enough of it to determine that von Braun was an outspoken proponent of National Socialist ideology. He was at worst an opportunist who used the resources that the regime put at his disposal to further his own cause.[35]

In any case, Ordnance officials subsequently followed Braun's line of argument closely in their dealings with outside entities. They made it clear that they would only include industry in their plans if there were a way to ensure that Junkers

[33] Neufeld, *The Rocket and the Reich*, 46-47.
[34] Quoted in Michael Neufeld, "Wernher von Braun, the SS, and Concentration Camp Labor: Questions of Moral, Political, and Criminal Responsibility," *German Studies Review* 25/1 (2002), 59.
[35] Neufeld, *The Rocket and the Reich*, 47. See also Rainier Eisfeld, *Mondsuchtig: Wernher von Braun und die Geburt der Raumfahrt aus dem Geist der Barberei* (Hamburg: RowohltTaschenbuch Verlag, 1996), 70-74 for a less plausible and heavy-handed argument that von Braun favored a number of National Socialist principles.

would be able to adhere to the strict secrecy considerations that Ordnance thought necessary to implement. Horstig laid out the Army's security measures, stating that "[Ordnance] must insist that absolutely no drawings, documents, and so forth that are based our experiences be in any way made available to industry (not even the Junkerswerk), without special permission obtained from Section 1. The developments and research obtained here must remain in the hands of the developers here."[36] Again, though commercial exploitation may have been on the minds of the Ordnance representatives, their main concern was that their work be carried out in absolute secrecy. The only way to maintain such total seclusion, they contended, was to pursue all development and production work from one central location rather than farm it out to various industrial firms.

Ordnance slightly scaled back its strict secrecy requirements later in 1935 and allowed a limited number of industry representatives access to rocket development. In the summer of that year, the Air Ministry brought Heinkel Aircraft into the rocket program. In September, Army officials agreed to this addition after the tiny number of Junkers and Heinkel employees privy to the project signed a declaration protecting the secrecy of the development. The agreement read, in part, "The devices developed by the Army Ordnance Office for rockets should be used as engines for airplanes. In order to create functional designs, the absolutely secret documents must be made more accessible to the aircraft firms. Since this work must remain totally secret, the firms are obligated to make the documents handed to them accessible only to people given permission to see them by the Air Ministry." Ordnance representatives

[36] Protokoll über die am 27.6.35 in Kummersdorf stattgefundene Besprechung zwischen RLM, Wa Prw. 1 und Vertretern der Junkers-Flugzeugbau A.G., FE 732, NASM.

remained determined to keep the circle of initiates as tightly drawn as possible. They and their counterparts in the Air Ministry limited the number of specialists working on rocket technology to four people at Junkers and six people at Heinkel while ordering that they carry out their experiments in workshops that were off limits to other employees of the firms.[37] The emphasis on total secrecy is clear. Tactical surprise and a strong desire to maintain the Army's monopoly contributed to this dynamic. Army officials only gave their grudging agreement to cooperation with private firms after they made every effort to protect their efforts from disclosure. They only relented after Junkers and Heinkel pledged to maintain such secrecy and to severely limit the number of people exposed to it at the firms. Nevertheless, Ordnance officials clearly preferred that private industry not be involved at all. This ad hoc arrangement would come to an end when the Army and Luftwaffe parted ways in 1938, allowing Ordnance largely ignore private industry and to concentrate nearly all of its developmental capability at Peenemünde and ensuring that secrecy considerations could be maintained as tightly as possible.[38]

Technical successes, the fear of foreign competition, the overweening desire for secrecy, and the rocketeers' own desire to build larger rockets led Becker and his assistants to begin thinking about the need for a newer, larger development facility. The prospect of cooperation with the Air Ministry made this idea even more appealing. However, even before Ordnance began receiving intelligence about rocket development in the United States, the successful flight of the Katzenjammer Kids at the end of 1934 made it clear even then that Kummersdorf was rapidly becoming too

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[37] "Vereinbarung über Zusammenarbeit auf dem Gebiet der Rauchspur zwischen HWA, RLM, Junkers, Heinkel," 9/2/35, FE 746-b, NASM.
[38] For the breakup of the Army-Luftwaffe alliance, see Neufeld, *The Rocket and the Reich*, 54-63.

small for their work, nor was the firing range's location in the Berlin suburbs conducive to secrecy or safety.[39] Their ambition, however, was not simply to build a bigger, more secluded research station. Rather, in an indication of his philosophy behind the assembly of a new facility, Dornberger wrote,

> We wanted to build, to build on a grand scale, and beautifully ... We wanted to investigate and develop on a single site everything that seemed essential to the effective employment of such a new and powerful weapon. We wanted to develop, not only the rocket itself, but also the necessary ground handling and testing equipment, and to study all its implications in the most diverse branches of technology and science. We wanted to start with applied research and end up with a fully developed article ready for production in the factories. In short, we wished to put through on our own account a complete program. We needed a research and development site fully equipped with all the latest resources of science and technology.[40]

The project of rocket and missile development would be no small-scale program. A crucial consideration in the assembly of any new base was that its size and aesthetics match the importance that rocket enthusiasts attributed to the weapon. Building "on a grand scale and beautifully" was essential. Moreover, Dornberger's notion that all of the work, including development, assembly, and production, should be carried out under one roof ("*Alles unter einem Dach*") profoundly shaped the notions of how rocket development should be carried out in Germany. This idea was rooted in the state-centered tradition of Prussian Army culture and National Socialist rhetorical anti-capitalism.[41] Both Becker and Dornberger believed that single

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[39] Dornberger, *V-2*, 38.
[40] Ibid., 38-39.
[41] On the deep roots of the Army's anti-capitalism, see Walter Goerlitz, *History of the German General Staff, 1657-1945* (New York: Frederick A. Praeger Publishers, 1962), 54-57. An excellent analysis of

location that could more easily handle the variety of problems inherent in such a radically new technology was essential for the completion of the work. For Ordnance and civilian leadership, the most advanced weapon required the largest, most advanced research, development, and production facility that could be assembled. Thus, even before the rocket specialists sketched out the A-4 as a concept and any equipment to be used in its development existed, the idea of an elaborate station for the development of ever-larger rockets had taken root. Ordnance was banking not only on the potential of the rocket as a weapon, but also on the skill of the people working in the program. Though it would prove a difficult period of development, the rocketeers would not disappoint.

Cooperation with the Luftwaffe meant even more funding and support for rocket development from both military branches. In December 1935, after several weeks of searching, Luftwaffe and Army officials settled on the area around Peenemünde, a tiny, isolated fishing village on the Baltic coast with a population of 447 residents, as the site for the single rocket facility proposed by Braun the previous year. After viewing an engine demonstration at Kummersdorf in March, General Werner von Fritsch, the Commander-in-Chief of the Army, candidly asked Dornberger, "How much do you want?"[42] As Braun put it in 1956, "In this manner our modest effort, whose yearly budget had never exceeded 80,000 marks, emerged into what Americans call the 'big time.'"[43] To the delight of the developers, millions of marks began flowing in support of the rocket venture.

National Socialism's schizophrenic anti-capitalism is Avraham Barkai, *Nazi Economics: Ideology, Theory, and Policy* (New Haven: Yale University Press, 1990).

[42] Dornberger, *V-2*, 38-39.

[43] Braun, "I Reached for the Stars," WvB Papers, SRCH.

By April 1936, the Luftwaffe approved final construction plans and groundbreaking at Peenemünde began in August. Over 10,000 workers under contract to civilian firms, Organization Todt, and the Reich Labor Service descended on the sleepy island to lay roads and train tracks, erect living quarters, and construct development workshops.[44] The Luftwaffe's construction office administered the building project. The pace of this work and the decisive efforts of the Luftwaffe in support the rocket venture were met with great enthusiasm by the developers, who were more than a little impressed by the air force's willingness to advance their cause. Arthur Rudolph recalled years later that it was "entirely new, fantastic, unbureaucratic, fast moving."[45] "The guys were fantastic," he also proclaimed.[46] Braun cited the important similarities between the rocketeers and the Luftwaffe officers that encouraged mutual identification, writing that they "were young, enterprising, and receptive, and did not suffer from the hidebound mentalities and masses of red tape which handicapped the Army and Navy."[47] "Here was action indeed!" gushed Dornberger.[48] The financial commitment by both services was massive, as the rocketeers' aims benefited from interservice rivalry to finance their work. The Air Ministry gave an initial promise of five million marks, which Becker,

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[44] Volkhard Bode and Gerhard Kaiser, *Raketenspuren: Peenemünde 1936-1996* (Berlin: Ch. Links Verlag, 1996), 24, 27-28. In an indication of its remoteness, electricity had only been introduced to the tiny fishing village in 1928, but most residents still burned oil for light. Braun's mother, who spent much of her time in the nearby town of Anklam, and whose husband hunted around the village, suggested Peenemünde to her son the previous December. Neufeld, *The Rocket and the Reich*, 49.
[45] Arthur Rudolph Oral History Interview (OHI), NASM.
[46] Thomas Franklin, *An American in Exile: The Story of Arthur Rudolph* (Huntsville, AL: Christopher Kaylor, 1987), 48. Thomas Franklin is a pseudonym for Hugh McInnish. His book is based largely on conversations with Rudolph himself. Though it provides some small pieces of interesting evidence, it is one of the most glaring examples of uncritical apologia about rocket research in Germany.
[47] Braun, "I Reached for the Stars," 58.
[48] Dornberger, *V-2*, 41.

not willing to let the Army take a back seat to the junior service's audacity, promised to exceed by another million.[49]

Therefore, the early work carried out by the rocket specialists at Kummersdorf benefited from several factors. The most important of these was the entrance of the Luftwaffe into an agreement with the Army to cooperate in rocket research. Though this pact proved to be short lived, disintegrating in 1938 over technical differences and administrative problems, it was the key to providing enough funding and material to build the new rocket research station at Peenemünde.[50] The geographic limitations at Kummersdorf and the pressure provided by foreign competition also played a significant role.[51] Moreover, during this period, the demands of secrecy began to play an increasingly important role in both policy level decisions and the daily conduct missile research.

All of this, however, played directly into the hands of Becker, Braun, and Dornberger, whose aspirations to build a large facility dedicated solely to rocket development were never far from the top of their concerns. Indeed, the development of a rocket *facility* for research and development took center stage even before Ordnance had any detailed conception of the twin objectives of a ballistic missile and rocket fighter. It was only after the site was chosen and funds dedicated to construction and development that von Braun, Dornberger, and the skillful engine

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[49] Wernher von Braun, "Behind the Scenes of German Rocket Development," 18. Wernher von Braun, "Reminscences of German Rocketry," *Journal of the British Interplanetary Society* 15 (May/June 1956), 135. Neufeld, *The Rocket and the Reich,* 50.

[50] See Neufeld, *The Rocket and the Reich,* 54-63, for an examination of the decline of the Luftwaffe-Army alliance.

[51] Army officials also laid plans for an expansion of Kummersdorf while Peenemunde was being built. They wanted to expand the firing range's settlement area so as to accomodate eighty married employees, 100 workers, and approximately sixty temporary employees and workers. Wambsganz to Pfeiffer, 3/3/38, R3901/21299, Bundesarchiv Lichterfelde (BAL).

technician Walter Riedel, who would for a time head the design group at Peenemünde, hammered out the technical outlines of the A-4 missile, known to posterity as the V-2.[52]

The Rise of Peenemünde

In constructing the base at Peenemünde, Dornberger and Ordnance officials wished to spare virtually no expense. In August 1936, workers began arriving at Peenemünde to begin constructing roads, rail lines, development workshops, an air field, and living quarters for employees. The 447 residents of the tiny fishing village on the northern tip of the island were ordered to move.[53] At the end of 1937, while construction of the development workshops was still ongoing, Dornberger voiced his desire to construct a production plant at the base as well. In November 1938, Army Commander in Chief Walther von Brauchitsch gave the go-ahead to begin expansion of the facility to include the production plant.[54] Factory planners estimated that the workforce required to man this plant would be approximately 5000 people, but Usedom did not have the housing facilities for so many. Their solution was quite literally to build a town for the employees, which came to be known as the "Settlement."[55] In March 1939, Dornberger informed Becker, who been promoted a year earlier to Ordnance Chief, of the scale of the construction, informing his superior

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[52] Walter Dornberger, "The German V-2," *Technology and Culture* IV/4 (Fall 1963), 398-399. The missile was to have a 25 ton thrust engine, a range of 250 kilometers, be able to carry a one ton warhead, and be able to fit through a standard railroad tunnel. Dornberger, *V-2*, 47-48, Neufeld, *The Rocket and the Reich*, 51-52.
[53] Volkard Bode, Gerhard Kaiser, *Raketenspuren: Peenemünde, 1936-1996* (Berlin: Ch. Links Verlag, 1996) 27-28.
[54] Arthur Rudolph OHI, NASM. Wichtige Daten bei der Durchführung des Vorhabens Peenemünde, 7/5/41, FE 342, NASM.
[55] Neufeld, *The Rocket and the Reich*, p. 114. Schubert Vortrag, 6/7/39, BA/MA RH8/v.1206.

that they planned, among other things, twenty kilometers of streets, twenty-five kilometers of train tracks, a new harbor, six kilometers of four-foot high dykes along the coast, 600 dwellings for employees, barracks for four thousand construction workers, mess halls, a new administration building, and an apprenticeship workshop in the production plant itself.[56] The chief factory planner, Godomar Schubert, estimated put the cost of construction at 180 million Reichsmarks.[57]

Part of this massive financial layout came because Dornberger and Schubert desired to build a modern, "model" industrial facility. All of the buildings, their technical equipment, and their accommodations for the employees were to be top quality. Moreover, they planned to equip the settlement with walking paths, park benches, gardens, and a sport field.[58] This extravagance and expense met with resistance from Armaments Minister Fritz Todt, who was making strenuous, if only partially effective, efforts to curb the massive consumption of raw materials at construction projects across Germany, especially for projects that showed no signs of immediate completion or success.[59] This effort continued into 1941, when he ordered, among other things, that buildings must be planned simply and sparingly, while aesthetic considerations were to play no role whatsoever in construction.[60] Even so, in an indication of the chaotic administrative situation in the Third Reich, Dornberger and Schubert consciously ignored his orders and brushed aside Todt's

[56] Neufeld, *The Rocket and Reich*, 113. Dornberger to Becker, 3/31/39, FE 342, NASM.
[57] Schubert to Speer, 10/12/39, RH8/v.1206, BA/MA.
[58] Entstehungsgeschichte der Fertigungsstelle Peenemünde, 2/10/39, RH8/v.1206, BA/MA.
[59] In April, Todt ordered a halt to all construction on projects that could not be completed by October. Entstehungsgeschichte, 4/6/40, FE 342.
[60] Fritz Todt, Richtlinien für behelfsmässige Kriegsbauweise, 7/2/41, FE 831, NASM.

representative at Peenemünde, a Minister Schönleben.[61] They reasoned that the if employees at Peenemünde had the best living and working accommodations possible, they would perform better on the job. Poor working conditions, Dornberger argued, only led to unproductive laborers. According to Schubert, Dornberger reasoned simply that "The employees' happiness at work will suffer if the working conditions are too primitive."[62] In return, an angry Todt wrote to General Friederich Fromm, Commander in Chief of the Home Army, to complain about Dornberger's efforts. "I am convinced," he wrote, "that the actual useful work toward the goal can be done quickly without increasing the laborers very much if we remember that we are living in a war and if the guidelines for makeshift construction are employed. In Peenemünde, they have created a paradise. The accommodations, the social provisions (Sozialeinrichtungen), clubs and apartments, the factory halls, the warehouses, all exhibit the highest degree of expense that one can possibly imagine."[63] Nevertheless, in the end, Dornberger and Schubert managed to enact their own plans for Peenemünde. Just as Todt began to receive the powers he needed from Hitler to conduct a major overhaul of the war economy, he was killed in a plane crash while leaving East Prussia in February 1942.[64] Albert Speer replaced Todt, and the missile program would enjoy a great deal of support from the ambitious architect for most of the remainder of the war.[65]

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[61] Schubert wrote that "Under no circumstances can I accept Dr. Schönleben's views. Dr. Schönleben believes that what is possible at the front must also be possible at home." Entstehungsgeschichte, 10/1-3/41, FE 831, NASM.

[62] Entstehungsgeschichte, 10/1-3/41, FE 831, NASM.

[63] Todt to Fromm, 7/30/41, FE 342.

[64] Franz Seidler, *Fritz Todt: Baumeister des dritten Reiches* (Munich: Herbig, 1986), 367-369.

[65] On his early unequivocal support of the V-2 program, see Albert Speer, *Inside the Third Reich* (New York: MacMillan, 1970), 469 470. For a full account of Todt's battles with Army authorities over

Thus, throughout the 1930s and into the 1940s, civilian rocket specialists working for the Army found themselves drawn ever closer to the regime that made their work possible. The armed forces welcomed their talents, elevated their status, financed their research, and fed their creative energies by guaranteeing them the most technically advanced research facility in the world and dedicating millions of Reichsmarks to a project that a number of them had labored on in relative obscurity for years. This massive state commitment to rocket technology also had a dramatic effect on the quality and pace of research. Ever-growing budgets and high level intervention overrode any lingering ambivalence about rocket technology on the part of the military and virtually guaranteed increased technical innovation. In addition, there was very little technological ambiguity in the goals sketched out by Dornberger, von Braun, and Riedel, even if there were questions as to how to achieve these aims. In evoking a collective focus, this technical clarity helped prevent the internecine strife between developers that was stunting Soviet missile development in the same period.[66] Finally, military administrators gave a certain degree of latitude to the rocket developers to pursue multiple lines of development. All of this meant an increased level of official support, professional independence, and personal satisfaction, even if it was carried out under the aegis of a secret military development project.

Peenemünde, see Michael Neufeld, "Hitler, the V-2, and the Battle for Priority," *The Journal of Military History* 57 (July 1993), 511-538.

[66] In the 1930s, Soviet missile development was riven by internal personal and technical disagreements, which exploded into often life-threatening political disputes. Scholarly research has only recently begun to uncover these conflicts. See Asif Siddiqi's important article, "The Rockets' Red Glare: Technology, Conflict, and Terror in the Soviet Union," *Technology and Culture*, 44/3 (July 2003), 470-501.

Die Geheimnisträger: Bearing Secrets at Peenemünde

It was this very secrecy around the project that came to have a decisive effect on how rocket developers at Peenemünde saw themselves and their work. An essential condition in the construction of the community of rocket developers at Peenemünde was the effort at keeping their work secret. Secrecy was the central fact of life at Peenemünde. It had a profound effect on how rocket employees at the facility perceived themselves and their work. Indeed, the practice of secrecy was the very basis upon which the institution of Peenemünde re-made their identities as rocket engineers in the service of the Nazi state. The remainder of this chapter examines the complex structure of secrecy at the facility and its diverse practices, from the investigations of potential civilian employees of the base to the regular daily activities that secrecy demanded. The practice of secrecy not only temporarily prevented the Allies from discovering the activities at the facility, but they were also central to the formation of a community there. Secrecy erected the framework within which the Peenemünde specialists came to understand their place and roles with German society. In the end, all-encompassing secrecy regulations created a sense of group identity and loyalty among a large, sometimes disparate aggregate of individuals. This in turn helped foster a feeling among engineers and technicians that they were a technological elite. The regulations were the guideposts by which individual specialists who labored to develop and produce the rocket came to form the closed, exclusive group of "Peenemünders." Moreover, the regulations also thrust upon these people an overarching surveillance that coercively reinforced their loyalty to the program and to the regime. In both a positive and negative sense, the insistent and all-encompassing practices of secrecy remolded the rocketeers' identities, increasingly defining them as a community of elite weapons designers in the service of the Nazi state.

Conceptually, it is useful to view the research base at Peenemünde as a secret society. Indeed, the facility followed the form and function of many such groups. Georg Simmel has developed a somewhat stylized, though useful typology of the internal dynamics of secret societies, and many of the characteristics he outlines compare well to conditions at the rocket center. To more easily understand how Simmel's model applies to Peenemünde, a brief exposition of his points is helpful here. I will examine the following conditions in greater detail later in this chapter, but an outline of these factors here will help clarify them. The first of Simmel's points of emphasis is on the importance of reciprocal confidence among a secret society's members. The complex work of rocket development, from machining individual experimental parts to conducting launch experiments, demanded that employees at the base place firm personal and professional trust in each other. Secondly, Simmel notes that written communication in such groups is governed by intricate norms. At Peenemünde, all written correspondence contained stamps indicating secrecy grades, coded departmental letterhead, and euphemisms indicating specific technologies contained in the communication. Third, according to Simmel, secrecy is not simply of tool for the secret society, but rather the purpose of the group. Ordnance gave secrecy the highest priority at Peenemünde, and nearly everyone at the base made decisions with an eye toward its maintenance. The community of Peenemünders was also physically, professionally, and even linguistically segregated from the rest of

Germany. This was done precisely to fulfill the goal of maintaining secrecy. Fourth, Simmel shows that the division of labor through a strict hierarchy is absolute in secret societies. At Peenemünde, employees worked within a rigidly hierarchical and structured system that they organized according to function and task. Finally, For Simmel, secrecy permits among members of secret groups a measure of freedom that is not present in the outside society.[67] Peenemünde was, in ways to be described in later chapters, a place that offered specific advantages to living and working anywhere else in Nazi Germany. In these ways, the rocket facility at Peenemünde offers a striking example of a modern, technologically advanced, secret society.

Within this society, the practice of secrecy was the cornerstone of the process by which Ordnance and civilian administrators were able to bring together a large group of people with disparate political and social views, foster identification with the goals of the military installation, and encourage them to work cooperatively on the rocket project. Anthropologists who have studied secret societies have shown that secrecy is a powerful means of making and breaking bonds. The practices of secrecy create loyalty and community among those subjected to them, while isolating those individuals who do not have access to the secrets being protected. Sissela Bok's point on this subject is revealing. She argues that members of secret societies are united by "Secrecy itself: secrecy of purpose, belief, methods, often membership. In this way … the secret societies promise the brotherhood and community feeling that many lack in their daily life. [They] give insiders [a] stark sense of separation

[67] Georg Simmel, *The Sociology of Georg Simmel*, Transl. by Kurt Wolff (New York: Free Press, 1950), 360.

from outsiders."[68] Part of the attraction of secret societies is that members not only gain meaning in their own lives, but they also are able to participate in something beyond their own individual existence which they view as having an overwhelming importance for a larger cause. Secrecy, therefore, is often an adaptive, community-building process that can play a vital role in social life, enabling groups that hold communal secrets to achieve a particular set of objectives and decisively transforming the networks of relationships occupied by those who are subject to its practices.[69]

When the "East Works" of the Peenemünde Experimental Center opened in May 1937, the daily practice of secrecy at the facility was of fundamental importance, not only to the research there, but also to the constitution of the employees' identities as members of an elite group that was working toward an important goal. Moreover, they inculcated a sense of group loyalty as well as forced upon the employees a sense of surveillance that was out of all touch with the reality of such scrutiny. To understand how this occurred on Usedom, it is necessary to closely examine these practices as well as their cultural impact on everyday life at Peenemünde. In what ways did the Peenemünders practice secrecy? How did adherence to the rules of secrecy affect the Peenemünder's self-identification? What were the negative effects of secrecy regulations on activities on Usedom? An entire cultural complex of secrecy played a central role in the formation of identity on the island. Understanding the ways in which secrecy shaped identity is a key to understanding both technical development political loyalty.

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[68] Sissela Bok, *Secrets: On the Ethics of Concealment and Revelation* (New York: Vintage, 1989), 46.
[69] See also Stanton K. Tefft, *Secrecy: A Cross-Cultural Perspective* (New York: Human Sciences Press, 1980), 13-17.

On the ground at Peenemünde, Ordnance created a huge, secret world that was isolated from the rest of Nazi-era Germany. From the standpoint of the demand for secrecy, the area around the tiny village was ideal. The physical separation of the facility was one important way in which employees were cut off from the outside world. Usedom was (and remains) a remote, heavily forested island located on the Baltic Sea approximately 100 miles due north of Berlin. It is separated from the coast by the Stettin Lagoon to the south, the Peene River to the west, and the Swina Channel to the east. The island was not directly connected to any major roadways and was accessible only across three bridges which were closely monitored by military authorities. The Luftwaffe development facility, or "Peenemünde West," occupied the northwest tip of Usedom's peninsula.[70] The research center, many test stands, and a number of employee accommodations were located on the somewhat more isolated northern peninsula of the island. Especially during the war years and after the Luftwaffe-Army alliance went into decline, the Army establishment at Peenemünde East was separated from the Luftwaffe facility "by a tight fence and stringent regulations."[71] Usedom's northern peninsula allowed test engineers to launch their experimental rockets on an eastward trajectory over the Baltic, thereby helping to maintain the secret nature of their work and ensuring that it did not crash over populated areas. The Army could also erect measurement stations along the coast to track the rockets test launches. The largest settlements on Usedom were the

[70] Specialists at Peenemünde West conducted research and testing on various rocket plane and rocket assisted take-off (RATO, or *Starthilfe*) technology for heavily loaded bombers in addition to the later V-1 cruise missile. Developers at Peenemünde East, or the "East Works," focused purely on ballistic, and later anti-aircraft, missile technology. Very little work by professional historians has focused exclusively on Peenemünde West. For a decent first-hand account of events at the Luftwaffe facility, see Botho Stüwe, *Peenemünde West: Die Erprobungsstelle der Luftwaffe für geheime Fernlenkwaffen und deren Entwicklungsgeschichte* (Esslingen: Bechtle Verlag, 1995).
[71] Peter Wegener, *The Peenemünde Wind Tunnels* (New Haven: Yale University Press, 1996), 16.

tourist destinations, such as Zinnowitz and Zempin, which were scattered along the coast southeast of Peenemünde. Before construction engineers arrived to transform the quiet peninsula, the closest train station was in Trassenheide, connected by a seven mile foot path.[72] The heavily forested island offered an abundance of natural camouflage, and construction planners attempted to remove as few trees as possible in order to conceal activities there. Despite the thousands of people on the island, massive construction projects, and thunderous engine tests, one engineer recalled that "Peenemünde never lost its character as an isolated wilderness."[73] This isolation would prove a boon to the ongoing work on Usedom, but it also sealed off employees of the rocket center from the rest of Germany, markedly limiting their contact with the outside world. Such separation would make the facility an oasis in the turbulent pre-war years and a refuge in the violent war years, but it also instilled in the Peenemünders the notion that the violence and war wrought by the Nazi regime would remain at arm's length. When the destruction of the war burst upon them in the middle of 1943, it revealed the depth of their complacency and its terror shook them deeply.[74]

Physical isolation was only one way in which the Peenemünders maintained the secrecy of their project. The construction of the massive facility necessitated a huge expansion in the number of specialists who worked on the missile. However, secrecy considerations forced Ordnance personnel to face the dilemma of luring skilled workers to Peenemünde without actually informing them of the kind of work

[72] Peter August Rolfs, *Die Insel Usedom: Ein Heimatbuch und Reiseführer* (Swinemünde: 1933; Reprint, Husum, 1991), 9.
[73] Dieter K. Huzel, *From Peenemünde to Canaveral* (Englewood Cliffs, NJ: Prentice-Hall, 1962), 50.
[74] I examine the British bombing raid in August 1943 and its effects in chapter 4.

they would do if they were hired. Prospective employees could not get wind of the ultra-secret work until they actually set foot on the base, and activities at Peenemünde could not be concealed without first properly educating the employees about the myriad of rules regarding secrecy. The logistical problem of maintaining secrecy while interviewing and hiring new workers, thereby dramatically widening the circle of those "in the know," without informing them directly of the work going on at Peenemünde, was overcome by resorting to an ungainly, time-consuming process that itself turned to secrecy for successful completion. After obtaining the permission of the Army authorities, management at the base posted advertisements for skilled positions in major urban newspapers without actually making clear the location of the work, the employer, or the nature of the job to be done. The advertisements stated that interested individuals should send their applications to an anonymous address in Berlin.[75] Once applications began arriving, they were screened for the requisite skills and those applicants who passed this screening received background questionnaires in the mail a few weeks later. Once managers re-obtained the questionnaires, they interviewed suitable applicants off-site. The best applicants were selected both on the basis of character and technical knowledge. At this stage, the applicants still had no idea where the work was to be carried out, nor did political inclinations figure at all in decisions about whom to hire. Before he arrived at the facility, one engineer stated that he had no idea what went on there and that Peenemünde was for him "a Chinese word."[76] Managers of the responsible labor and military offices discussed those

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[75] Arthur Rudolph OHI, NASM.

[76] Georg von Tiesenhausen, Interview with sociologist Donald E. Tarter, University of Alabama Huntsville (UAH), hereafter cited as "Huntsville Interviews, UAH." Tartar conducted over thirteen hours of video taped interviews with former Peenemünders residing in Huntsville, a series he entitled

applications that they considered the most promising, by now copied in quadruplicate, so that they could avoid any conflict over conscription. Meanwhile, Ordnance officials enlisted both Army Counter Intelligence (the *Abwehr*) and the Gestapo to examine the selected applicants for possible links to supposedly dangerous domestic or foreign elements. After these investigations, the local police branches checked the applicants' background for any criminal behavior. Only after passing this rigorous application, background, and screening process were applicants promised a job and told of the location and nature of the work.[77]

However, practical considerations often overrode this formal hiring process when the skills of particular individuals were required quickly. Personal connections and recommendations proved to be exceedingly important, though secrecy considerations still dictated that caution be taken with information given to outsiders. For example, in 1935, a friend of Braun's who worked at Kummersdorf introduced the development chief to engineer Bernard Tessmann, who would go on to become an important figure in production planning at Peenemünde. On the basis of Tessmann's qualifications and on the recommendation of his friend, Braun asked Tessmann to come to Kummersdorf, explaining only that there was "interesting work there and it [was] a good place for young engineers just starting out." He told Tessmann nothing about what kind of work was being done there, only that it was an entirely new field

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"Our Future in Space: Messages from the Beginning." The results of this work, a comparative essay published as "Peenemünde and Los Alamos: Two Studies," *History of Technology* 14 (1992), attempt to compare the work environments at the German missile base and American atomic bomb facility. The work falls prey to the widespread postwar myths about Peenemünde and utterly lacks any sophisticated understanding of life in the Third Reich.

[77] Richtlinien für die Werbung von Facharbeitern, RH8/v.1429, BA/MA. Dornberger, Abwehrauskunft über Dipl. Ing. Otto Muck, FE 366, NASM.

of research and development.[78] Braun also hired several of his former colleagues, Nebel obviously excepted, from the *Raketenflugplatz* days.[79] Many of the leading administrative heads were also hired through their personal connections with individuals already in place at Peenemünde. Though a number of important people at Peenemünde were party members, there is no documentary evidence that political considerations played a part in whether or not they were hired.[80]

A good example of this is the case of Ernst Steinhoff. Born on February 11, 1908 in Treysa, near Kassel, Steinhoff received his Diploma Engineer degree in 1933 from the Technical University in Darmstadt. During his studies, he became an avid gliding enthusiast, and after graduation, entered into employment at the German Research Institute for Glider Flight (*Deutsche Forschungsanstalt für Segelflug*), which was under the direct administrative control of the RLM. In 1940, Steinhoff completed his Doctorate in engineering at TH Darmstadt.[81] According to Dornberger, Braun met his fellow gliding enthusiast at the school in 1939.[82] They were likely introduced by Dr. Hermann Steuding, an instructor there who was brought into the missile project in order to help develop the guidance theory needed for development. On the strength of Steuding's recommendation, Steinhoff, who joined the Nazi party in 1937 and was a dedicated National Socialist, began working at Peenemünde in July 1939 as head of the guidance section.

Nevertheless, in his work, Steinhoff rarely invoked the Nazi ideals that were so close to his heart. Dornberger, whose memoirs must be treated with care,

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78 Bernard Tessmann OHI, NASM.
79 Braun, "I Reached for the Stars," WvB Papers, Box 200, Folder 7, SRCH.
80 For a thorough discussion of the impact of Nazism at Peenemünde, see chapter three.
81 Steinhoff Dossier, RG 319, IRR, Box 400, NARA.
82 Dornberger, *V-2*, 15.

remembers Steinhoff being overawed by the prospect of working in rocketry, but only because he found the technology so interesting.[83] Employees in Steinhoff's guidance section describe him as being defined not by his enthusiasm for National Socialism, but rather by his zeal for the technical work of missile development. He had a reputation for being a demanding boss, but also for making sure that the people who worked hard for him received their due. Though he did not make many fundamental contributions to the basic design of the V-2, he was an excellent administrator and brought with him numerous contacts with experts in the technical professions, both in and out of the party, many of whom eventually found themselves working at Peenemünde.[84]

Though there is little doubt that Steinhoff was an ardent National Socialist, he was not hired because of his party membership, which meant little to the quotidian technical activities within the community at Peenemünde. Steinhoff received his position at the facility through his contacts with specialists within the facility and maintained his important position because of the surfeit of managerial talent he commanded. Though it is possible that Steinhoff may have benefited in more subtle ways from his membership in the Nazi party, his support for party principles was not the reason for his important position in missile research. Professional qualifications mattered most in the day-to-day activities at Peenemünde.

For all of the employees who arrived in the area of Usedom, there existed layered security system that projected state power, kept prying eyes out, and tightly regulated behavior inside the facility. Until 1943, well-armed Army security units

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[83] Dornberger, *V-2*, 15-16.
[84] Steinhoff Basic Personnel Record, RG 165, Box 703, folder "Boston," NARA. Steinhoff Dossier, IRR, Box 400, NARA. Dornberger, *V-2*, 15. Neufeld, *The Rocket and the Reich*, 101.

controlled the bridges leading to the island and checked the various travel papers of people who wished to gain entrance to Usedom. Their presence was especially prominent in Wolgast, the main crossing point from the mainland to Usedom.[85] The tiny number of people who lived on Usedom but who did not work at the base did have controlled access to the island. The area of Usedom from Karlshagen southeastward along the coast was not strictly controlled and individuals could move about freely, but only those who had the proper paperwork that gained them access to the island could experience this level of freedom. This area, therefore, acted as a buffer zone between the more sensitive grounds of the rocket facility and the outside world. However, individuals were not allowed to venture on to the northern peninsula of Usedom (from Karlshagen northward), site of the development workshops, test stands, production factory, and many accommodations. Only employees and guests of the facility could travel into this area. The entire peninsula was an area reserved for official use (*Sperrgebiet*), and Ordnance did not allow anyone access to it who did not have the proper paperwork.[86]

These are two of the different styles of aluminum badge needed by Peenemünde employees to enter the base. Courtesy HTIZP

[85] Kurt Bornträger Testimony, *Hitler's geheime Waffenschmiede Peenemünde*, Dir. Jakob Kurzenhalt, Polar Film and Media, GmbH, 2001. In May 1943, when Peenemünde administrators began introducing concentration camp labor into production, SS Chief Heinrich Himmler instructed that the first SS guard posts be set up at the base gate at Karlshagen. This was one indication of the SS's growing role in the rocket program, to be discussed in chapter four. Neufeld, *The Rocket and the Reich*, 199.
[86] Gustl Friedl Testimony, *Hitler's geheime Waffenschmiede*. Friedl was for a time Braun's secretary.

To have access to the base itself and to the secret information within it, employees had to have yet another object that granted them entrance into this world. This came in the form of an aluminum badge that each individual wore on his or her clothing. Ordnance divided the base at Peenemünde into numerous security zones. These plackets both allowed employees entrance to the base and indicated where in the facility each individual was allowed access. They were of different colors and shapes so as to be readily recognizable by base security. Along with these plackets, each individual had to carry identification papers with them at all times and present them upon request. This occurred regularly on the factory train that ran from Zinnowitz to the development works, on which armed guards checked the identification of all individuals. Guards often re-checked plackets and identification papers at the train stops.[87] The use of these plackets made secrecy itself a sign of privilege. They entitled the individual bearer to physical access to the technological facility, making entrance to the base the reward of a select few.[88] Finally, the division of the base into zones of varying security control strengthened the internal hierarchy of the community at Peenemünde, a key ingredient to the success of their endeavor (and examined in greater detail below). Only the highest ranking military officers in the program, such as Dornberger and base commander Leo Zanssen and their staffs, as well as the civilian executives, such as Braun and Arthur Rudolph, had access to any area within the facility.[89]

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[87] Huzel, *From Peenemünde to Canaveral*, 31.
[88] Anthropologist Richard Schaeffer discusses this phenomenon at length in his essay "The Management of Secrecy: The Ku Klux Klan's Successful Secret," in Stanton K. Tefft, ed., *Secrecy: A Cross-Cultural Perspective* (New York: Human Sciences Press, 1980), 161-174.
[89] Plaketten für Zugangsberechtigung zu den Sicherheitszonen von Peenemünde, 1938-1944, HTIZP.


The guard gate outside of the development workshops at Peenemünde. Security posts dotted the grounds of the base.

Courtesy DM

Moreover, after passing through the physical barriers erected to guard to the facility, employees had to grapple with an internal complex of layered security measures that were designed to emphasize the demand for absolute secrecy. Foremost among these were oaths and declarations of secrecy. Sociologist Georg Simmel has pointed out that all secret societies seek to promote and reinforce among its members the secrecy that forms the basis of the group. Oaths and threats of punishment, he demonstrates, are the central features in the effort to reproduce secrecy among initiates.[90] This was entirely the case at Peenemünde. In order to gain access to the base at Peenemünde and the secrets lying within it, individuals had to first sign declarations of secrecy and swear oaths to remain quiet about what they learned while they were on the grounds of the facility. Specifically, newly arrived employees swore that they would not break secrecy regulations and that they would

[90] Georg Simmel, *The Sociology of Georg Simmel*, Transl. by Kurt H. Wolff, (Glencoe, CA: The Free Press, 1950), 349.

not remove documents, letters, drawings, and so forth from their work areas.[91] All military men who were ordered to Peenemünde had to swear an oath that pledged that they would keep their knowledge of the base absolutely secret.[92] Finally, all personnel, military or civilian, visitors or employees, had to sign declarations of secrecy if they were present at any tests of missile technology.[93] These declarations formed the backbone of the efforts to keep the activities at the base secret. The text of one signed secrecy agreement read, "I have been informed and instructed by Herr Heinisch of the Army Research Station Peenemünde that I must keep silent to everyone about all knowledge of work and facilities at the Army Research Station Peenemünde and the Greifswalder Oie as well as about what I have seen personally or learned in conferences. It is communicated to me further that this oath of silence is a requirement as well as a prohibition issued from the Reich Government for the Guarantee of National Defense [Reichsregierung zur Sicherung der Landesverteidigung] in the sense of section 92b of the Reich Penal Code [RSTGB]. I have also been made aware that a transgression against this oath of silence [*Schweigepflicht*] is punishable according to the Law Against Bribery and Betrayal of State Secrets of 5/3/1917, the version of 2/12/1920, as well as the stipulations of section 88 of the Reich Penal Code. I have been made aware of both stipulations."[94]

[91] Dienstanweisung Werk Ost, 7/1/37, FE 348, NASM.
[92] Guido de Maesseneer, *Peenemünde: The Extraordinary Story of Hitler's Secret Weapons V-1 and V-2* (Vancouver: AJ Publishing, 2001), 193. Maeseneer's book is the most recent work published by uncritical admirers of the former Peenemünde employees and glosses over a number of the more troubling questions about their activities. However, it is valuable in that most of it is based on conversations with the Peenemünders themselves and reveals much about the non-controversial aspects of daily life at the base.
[93] I will examine the cultural dynamics of missile testing in chapter three.

All such declarations made by Peenemünde employees remained in the possession of the base commander, who sent copies of them to the administration of the development facility.[95]

These oaths and threats of punishment for breaking them thrust state power squarely into the world of employees at Peenemünde. They sharply delineated the Peenemünders' universe of knowledge from the outside world, not only making the activities at the facility the prerogative of a privileged few, but also making clear the disciplinary measures in store for those who transgressed against their vows. Anthropologists have shown that oaths of secrecy "transform obligations."[96] They argue that the new world that individuals enter after taking such oaths decisively influences their activities in the larger society in which they live. These two universes are not mutually exclusive, however. They are capable of existing side by side and of even reinforcing each other. Those who made the oaths to receive knowledge also gained a sense of privilege that separated them from society at large. As I will show in the next chapter, these privileges did not simply come in the form of entrance to a restricted world. They also provided the access to a number of deeply satisfying personal and professional rewards.

In any case, once employees made their declarations, they found that reminders of the absolute importance of secrecy and the imperative that the work be kept as confidential as possible, even within their secret world, were commonplace.

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[94] Verpflichtserklärung, October 1938, RH8/v.1215, BA/MA. The Greifswalder Oie was a small island just located next to Usedom on which a number of early important launch tests took place. I will examine these experiments in more detail in chapter three.
[95] Dienstanweisungen Werk Ost, 7/1/37, FE 348, NASM. The basic outlines of these regulations remained in place throughout the war years.
[96] Bok, *Secrets*, 21. Michael S. Laguerre, "Bizango: A Voodoo Secret Society in Haiti," in Stanton Tefft, ed., *Secrecy: A Cross Cultural Perspective* (New York: Human Sciences Press, 1980), 147-158.

Both formal and informal regulations that guided their behavior were thoroughgoing, and the individuals subjected to them adhered to these rules almost automatically. For example, base administrators put up posters around the facility which read "What you see, what you hear, when you leave, leave it here."[97] Another poster warned to employees to "Be careful what you say – the enemy is listening!"[98] Such admonitions were central to the formation and maintenance of the secret society on Peenemünde. Simmel notes that all such societies continuously seek to promote the fact of secrecy.[99] Posters such as these were a part of the ongoing and systematic instruction of neophytes in the task of keeping silent.

A poster warning Peenemünders to "Be careful what you say – the enemy is listening!"
Courtesy HTIZP

Employees found their discursive worlds regulated by rules of secrecy in other ways as well. Service regulations strictly limited telephone conversations. Employees could only engage in telephone use after receiving permission from the

[97] Huzel, *From Peenemünde to Canaveral*, 31.
[98] Museum artifact, HTIZP.
[99] Simmel, *The Sociology of Georg Simmel*, 349.

division head. In acute circumstances, employees could use the telephone network only if timely clarification of an issue was not possible by resorting to the division head. All conversations were to be kept as short as possible (admittedly, this was to save money and lessen the strain on the island's telephone system more than anything else).[100] On a more informal level, nearly every employee found it safer and more security conscious to refer in their spoken and written interactions to the missile that they were developing with simple euphemisms. At first, Ordnance officials referred to the missile as a "smoke trail instrument" (*Rauchspurgerät*). Over time, however, the simpler euphemism "instrument" (*Gerät*) came into far more common parlance at Peenemünde. The subject line on a great deal of correspondence, circulars, and memoranda was simply "Instrument A-4." The "A" in these designations stood for "Aggregat," or "Assembly." Clearly, then, formal secrecy regulations with regard to the spoken word made steady headway into the Peenemünders' world.   The result in some cases was the adoption of more informal measures that not only maintained secrecy, but also re-shaped the linguistic world of those who were subject these formal and informal stipulations.

The jargon and coding of technology used both orally and in written correspondence became a part of everyday life at Peenemünde. Administrators at the base inaugurated the use of coded terms to formalize measures that most employees had already rapidly adopted for referring to parts and technologies. For example, an undated list of code words that was passed out to each division head at the base made uniform the formal and informal terms to be used in all written correspondence. The on-board radio receiver (*Funkkommandoempfänger*) was informally known as

[100] Dienstanweisungen Werk Ost, 7/1/37, FE 348, NASM.

"Honnef" and formally designated FT-Kdo-21b. The on-board telemetry transmitter (*Messwertsender*) received the code-name "Messina," or Ms-1-92a. Even fire extinguishers received the oblique designation "Intra," and the launch platform came to be both formally and informally known as the "table" (*Tisch*), though thankfully, no such formal alpha-numeric designation for these items came into existence.[101] In any case, such terms not only obscured the objects' meaning and use, they also represented a linguistic barrier to membership in Peenemünde's increasingly exclusive club of technological elite. Without the proper initiation and training, technical specialists who otherwise had at least a moderately good theoretical knowledge of such types of technology would be hopelessly lost in the welter of coded terms used not only in written correspondence, but also in oral communication.

These linguistic gymnastics are also the hallmark of another emerging dynamic at Peenemünde: the ever-increasing professionalization of rocket engineering. Sociologists have increasingly come to see professional problems as posed and solved in a particularly constructed conceptual framework. The concepts created within this framework are only capable of being employed by those who are properly trained to do so. According to sociologists, professional, problem-solving groups use jargon to represent these concepts. The discourse created by this resort to jargon provides a space of mutual understanding that is not commonly shared by others. Sociologist Margatti Sarfatti Larson has shown that this is a common trait in the professional certification of knowledge and the incumbent separation of individual professional groups from other segments of society. Employing a bit of jargon herself, she argues that, "Individual professionals and professional groups have

[101] Tarnbezeichnungsliste für Gerät A4, FE 330, NASM.

different capacities to appropriate authoritative and authorizing discourse. This differential capacity constitutes a singular and characteristic dimension of social inequality."[102] In other words, individuals within professional groups travel over a common linguistic ground that both affirms their expertise and announces their social and experiential partition from the larger society in which they live. At Peenemünde, the rocket specialists were no different. Even if some technical specialists outside of their community understood the fundamental characteristics of some of the equipment they used, the outsider was unable not only to comprehend the use to which it was being put, but also was completely incapable of penetrating the language used to refer to the technology in the first place. Only those specialists who had been initiated into the secret world at Peenemünde and given access to its forbidden knowledge were capable of reproducing the jargon by putting it to use. Secrecy, therefore, enhanced the idea of a nascent profession in development at the facility. Though no one at Peenemünde referred to themselves as professional rocket engineers, they did experience a growing sense of professional elitism that was fostered by the utterly secret conceptual world that fundamentally shaped the way they viewed their work and the terms they used to discuss it.

The linguistic world of the Peenemünders was not the only part of the Peenemünder's lives that was altered by the curtain of secrecy in place at the facility. The rules pertaining to secrecy stretched much farther than simply placing limits on the types of conversations that employees were able to have with one another or on camouflaging the terms they deployed within these conversations. Peenemünde

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[102] Margatti Sarfatti Larson, "In the Matter of Experts and Professionals, or How Impossible is it to Leave Nothing Unsaid," in Rolf Torstendahl and Michael Burrage, eds., *The Formation of Professions: Knowledge, State, Strategy* (London: Sage Publications, 1990), 25-26.

administrators placed even more stringent regulations on the handling of documents. Simmel has noted that the written word is generally opposed to secrecy because it is more permanent than speech and "wholly unprotected against anybody's taking note of it."[103] Indeed, technical drawings, minutes of meetings, developmental correspondence, and administrative procedures all represented information that was more fungible, permanent, and often more specific than the spoken word. Ordnance was well aware that these characteristics made documents the subject of increased interest and invited unwanted intrusion by prying eyes not only among foreign enemies, but also among the Peenemünders themselves. Administrators at Peenemünde took great strides to limit the amount of information any single middle or lower level employee knew about activities at the facility. Clearly, the more secrets an individual knew, the more damage would result were he or she to fall into enemy hands.

One of the most important methods that Peenemünde management had for dealing with such concerns was to make every employee at the base absolutely cognizant not only of the need for security with documents, but also of the practices used to maintain it. The primary means of carrying this out was the copy of service regulations handed out to each office in the workshops and kept by the division heads. This fifteen page set of basic rules constituted another object of overriding importance in ensuring that the Peenemünders knew and understood the rules of secrecy. Ordnance first introduced these regulations at Peenemünde in July 1937. All employees were informed of them when they arrived at the facility, and administrators expected the Peenemünders to be intimately familiar with them. To

[103] Simmel, *The Sociology of Georg Simmel*, 352.

ensure that all employees knew and understood the regulations, management made them sign an attestation every six months, on January 10 and July 10, that they read the statutes and were aware of the rules.[104] This extraordinary source outlines the organizational structure of the experimental center, the responsibilities of the division heads, the rules governing care and treatment of documents, employee responsibilities, and service trips. Though the heads of the administrative divisions amended them a number of times between 1937 and 1945, the broad general outlines of the conditions set forth in them changed very little, even if the more narrow details did alter over time. They offer a precise and thorough look into the daily practice of secrecy on the ground at the Army research center.

The service regulations with regard to documents at Peenemünde carefully controlled access to all documents and were exhaustive in their comprehensiveness. One test engineer remarked that "Office procedures and handling of classified correspondence were as cumbersome and strict as could possibly be."[105] A registrar catalogued all incoming and outgoing letters into letter books according to their secrecy rankings. Administrators at Peenemünde generally employed three levels of secrecy for documents: top secret (*Geheime Kommandosache*), secret (*Geheim*) and open. Occasionally, a document bearing the designation *Geheime Reichssache* or *Chefsache* (essentially, super top secret) emerge in correspondence at Peenemünde, and only the highest administrators at Peenemünde had access to these documents.

In any case, the document registrar distributed the re-sealed incoming mail by currier to the division that it pertained to. When it arrived in a particular division,

[104] Dienstanweisung für Werk Ost, 7/1/38, FE 348, NASM.
[105] Huzel, *From Peenemünde to Canaveral*, 60.

only department supervisors and top administrative personnel were allowed access to documents rated top secret. Secret and open documents were treated somewhat less stringently, but still with tight control. Only specifically and individually cleared employees could view these letters, and they had to do so under the supervision of their department supervisor. Workshop employees could only make copies of secret or top secret documents with the permission and in the presence of the supervisor. Service regulations stipulated that files containing technical and developmental information, no matter what secrecy grade, were to be kept in the department supervisor's office and locked in a safe. The documents were then distributed from there, but regulations expressly forbade employees from removing them from their workshops. Documents containing information pertaining to the daily basic administration of the base were exempt from this rule. Only the department supervisor and his deputy were authorized to hold a key to the safe. If because of retirement, transfer, or even vacation, the department supervisor or his deputy were to be away from the workshops for an extended period of time, Peenemünde East administrators had the responsibility of making sure that he did not take any documents with him. Moreover, all of the personal papers of all employees in the workshops were the property of the base commander. If an employee departed from Peenemünde, the base commander and administrators of the development facility examined his personal papers in an effort to decide whether or not they had contained any secret information and, consequently, whether they were eligible for release.[106]

Correspondence composed in the workshops was required to contain a list of the secret contents on the first page. Department supervisors sealed all outgoing

[106] Dienstanweisungen, 7/1/37, FE 348, NASM.

letters in letter books and messengers delivered them by currier to the Commander's office. Individual employees were strictly forbidden from taking drawings, letters, and other documents out of his workshop. In the Commander's office, his staff examined all correspondence marked top secret, and if the letters passed muster, they were re-sealed and sent off. Again, regulations permitted only specially designated curriers to carry outgoing messages.[107]

If the written word is inherently open in character, technical drawings created at Peenemünde posed an even greater security problem. While typewritten documents contained information on the function and design of parts and assemblies, they did not illustrate the layout of such objects or how they fit together with each other. The technical drawings were the key to assembling a functional missile and therefore received the most stringent security precautions. The Drawing Administration division (Zeichnungsverwaltung) of the technical office served as a repository and clearinghouse for technical drawings, all of which were rated top secret. Many of them received stamps with notices indicating the penalty for misusing the drawings. For example, the numerous technical drawings for testing the A-3 missile, predecessor to the A-4, in late 1937 were stamped, "State Secret! This is a secret object in accordance with Section 88 of the Reich Penal Code (Version of 24 April, 1934). Misuse is punishable in accordance with the conditions of this law, provided that no other conditions of punishment come into question."[108] Further regulations explicitly forbade employees from producing secret sketches for use in their workshops. If a sketch laid out the requirements for an instrument that needed

[107] Dienstanweisungen, 7/1/37, FE 348, NASM.
[108] See, for example, technical drawings enclosed in von Braun to Dornberger, 9/20/37, FE 367, NASM.

to be put into production, then it was forwarded to the design office, where illustrators produced the official design drawing. Employees were to destroy these hand-drawn sketches as soon as they were made into official technical drawings. From there, officials in the Drawing Administration either forwarded the design to Peenemünde's in-house developers, given only against a return receipt, or to a subsidiary private firm.[109] While the development and production shops inside the facility only required a special pass to receive these documents, drawings to be sent to subsidiary firms were packed in folders by the Drawing Administration personnel, bound with tape, and sent to the secrecy registrar's office for further packing and shipment.[110] As I shall indicate in chapter three, this process did not function quite so smoothly when the regime demanded the onset of mass production, and it was found that many production drawings were incomplete or missing altogether, which led to major problems. In any case, by keeping the vital technical drawings in one location and limiting employees' access to them, Peenemünde administrators were able to maintain a close watch on these documents, closely tracking to whom and when they were passed.

Complementing this host of regulations aimed at ensuring the secrecy of activities at Peenemünde were the occasional supplementary orders issued by the rocket program's administrators during the war years. Though Ordnance relaxed its secrecy regulations somewhat in the fall 1939, allowing greater contact between Peenemünde and the universities, it insisted that those with knowledge of the program

[109] Dienstanweisung, 7/1/37, FE 348, NASM.
[110] Aktenvermerk über Überprüfung der Zeichnungsverwaltung in Peenemünde durch Oberstleutnant Krehnke am 29. u. 30.4.42, 5/1/42, RH8/v.1215, BA/MA.

follow strict guidelines so as to maintain as much secrecy as possible.[111] These orders became especially necessary with the massive expansion of the program that was inaugurated when the changeover to mass production brought hundreds, if not thousands, of people into the secret of Peenemünde. For the most part, these orders only reflected the concerns first raised in the service regulations, but they occasionally added new considerations based on the increased production of paperwork, greater number of service trips, and increased level of awareness of the missile project. For example, in late 1943, Walter Dornberger published a set of orders aimed at reinforcing the regulations and addressing other individual problems. He ordered, for example, that drawings, records, and correspondence about the program were to be handled only for official purposes, that use of records for private purposes was expressly forbidden, and that even the temporary keeping of official correspondence was prohibited.[112] In addition, in July 1943, Heinz Kunze, Deputy Director of the A-4 Special Committee, the Armaments Ministry group detailed to coordinate raw materials delivery, development, production, and quality control of the missile, ordered a strict compartmentalization of information in all correspondence with firms outside of Germany proper. He directed that foreign companies under German control not even be informed of the existence of the A-4 program. All letters to them were to be categorized as top secret and references to A-4 development and production were to be made in only the most oblique terms.[113] Though orders such as this one only impacted the Peenemünders marginally, they are

[111] I examine the relationship of the Peenemünders to the universities in the next chapter.
[112] Dornberger circular "Geheimhaltung," date unclear, likely late 1943, RH8/v.1254, BA/MA.
[113] Kunze to Leader of A-4 Special Committee Sub-Committee Leaders, "Geheimhaltung," RH8/v.1254, BA/MA.

illustrative of the massive effort put forth to maintain a thoroughgoing sense of secrecy around the program, even as production created a situation in which more people inevitably became aware of the work. Even as the missile program experienced massive growth in the middle of the war years, the maintenance of secrecy around the work remained of paramount importance.

At Peenemünde, this complex and thoroughgoing effort to keep activities as secret as possible created a massive social and geographical patchwork of restricted areas, objects, and topics. These structured limitations became a part of the daily practical lives of people who lived and worked at the facility. As individuals navigated through their daily routines, they came to take these regulations for granted and integrated them without any reflection into their everyday practices. On the factory train on the way to work, at the security checkpoints, and in the workshops, the observance of the rules of secrecy became a part of their common practical consciousness. For example, Otto Hirschler, a specialist in the guidance section, recalled that he had to camouflage his conversation with a co-worker on the factory on the way to work. He remembered his co-worker glancing nervously around the train and refusing to talk until they got to the lab.[114] Production manager Arthur Rudolph stated flatly that "It was *selbstverständlich*, it was understood, that you didn't [talk about the work]. You worked and didn't talk about it."[115] When engineer Herbert Lucht witnessed a rocket launch just after his arrival at Peenemünde in 1940, his colleague told him that "That is the most secret thing here in Peenemünde, and

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[114] Otto Hirschler Testimony, Huntsville Interviews, UAH.
[115] Thomas Franklin, *An American in Exile: The Story of Arthur Rudolph* (Huntsville, AL: Christopher Kaylor, 1987), 51.

you can't say a word about it to your friends, at home, or at parties."[116] Wernher Brähne, a technical illustrator at Peenemünde, noted that the death sentence for breaking the secrecy regulations as well as the many informers operating at the facility (to be examined below) did not remotely aggravate or upset the employees.[117] Such attitudes not only spoke to the strength of the regulations, but also are an indication of the degree in which they penetrated the practical consciousness of employees at the base. Adherence to these, in anthropological terms, "rituals" of secrecy at Peenemünde was nearly automatic.

This habitual adherence to the rules of secrecy also segregated the Peenemünders from other segments of society. If regulations officially curtailed discussions inside the rocket center, individuals found that they were required to be even more strict outside the facility. Employees could not discuss their efforts with anyone not involved with their work, even with others within the facility. Moreover, they could not publish their work or present it publicly, effectively cutting themselves off from the rest of the professional community of engineers and scientists in Germany.

Without question, these efforts at secrecy occasionally ran up against larger professional norms. However, secrecy concerns held priority over contact with specialists outside the community at Peenemünde, and employees accepted this as a matter of course. For example, in May 1943, the German Academy for Aeronautical Research (*Deutsche Akademie für Luftfahrtforschung*) contacted Braun to ask him to

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[116] Herbert Lucht statement, *Peenemünde: Schatten eines Mythos*, Matthias Schmidt, Dir. (MJB Film- und Fernsehproduktion, 2001).
[117] Werner Brähne, unpublished manuscript, "Die Mittelwerk GmbH. Eine Chronik über Firma und Werk," unpag., Gericht Rep. 299, Bd. 582, HStaD-ZA Kalkum.

speak about liquid oxygen fueled rocket engines at a gathering of propulsion specialists on August 5. Officials at the academy pointed out that Reich Marshall Hermann Göring, the head of the Luftwaffe and President of the Academy for Aeronautical Research, directed that "the most secret things can and should be discussed at the conference." Moreover, organizers stated, the results of the conference were secret, "and nothing about it will be mentioned to third parties."[118] Braun received this invitation on May 14, but a week later, Dornberger sent a curt response indicating that Braun could not participate in this conference, a staple of many professions. Despite the promises of secrecy, Dornberger remarked, "O.K.H. refers to an order of the Führer that the ongoing development in Peenemünde should be considered top secret, even super top secret [*Geheime Chefsache*]. Development may only be discussed when completion of the work is absolutely necessary. Since the Führer's order cannot be abrogated, Dr. von Braun cannot give a lecture on this topic."[119] The requirements of secrecy proved to be more influential than the call of professionalism at Peenemünde. However, this did not prove to be a source of limitation for most of the specialists at the facility. In fact, secrecy became an integral part of the professional conduct among the Peenemünders. Historians have shown that German professionalism, especially in the technical professions, was defined as much by service to the state as by interaction with one's colleagues and membership in professional organizations.[120] Secrecy, imposed from above by the

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[118] Deutsche Akademie der Luftfahrtforschung to von Braun, 5/12/43, RH8/v.1960, BA/MA.
[119] Dornberger to Deutsche Akademie für Luftfahrtforschung, 5/20/43, RH8/v.1960. Von Braun received his copy of this letter five days later.
[120] See, for example, Konrad Jarausch, *The Unfree Professions: German Lawyers, Teachers, and Engineers, 1900-1950* (New York: Oxford University Press, 1990), 3-24, 115-196, and Karl-Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Düsseldorf: Droste Verlag, 1974), 103-159.

state, was a given in this program, and those working at Peenemünde accepted it as a part of their professional duties. Moreover, secrecy itself imparted a sense of distinction on those who worked on the rocket. It compensated those who were forced by the regulations to limit their other professional opportunities by rewarding them with membership in a privileged elite and allowing them access to all of the benefits of life at Peenemünde. Ordnance's refusal to allow Braun to participate in the conference at the Aeronautical Academy so that his state sponsored work could continue in relative secrecy was a small price to pay for the major satisfaction that the young engineer drew from his work, which rested in part on its ultra-secret nature.

Practices of secrecy lent a certain value to the activities at Peenemünde, a phenomenon not unrelated to the segregation that went hand in hand with the work carried out there. Simmel has shown that the employment of secrecy inherently creates the perception of value and importance among those subject to its norms. For him, property, whether intellectual or physical, gains value both when its owner understands that others must do without it and when those denied it attribute special significance to it. He writes that "Inner property of the most heterogeneous kinds, thus, attains a characteristic value accent through the form of secrecy."[121] The system in place that divided both the island and the rocket facility into areas of greater or lesser prohibition and exclusion helped to place an intrinsic value on the information and individuals who moved around in these geographic spaces. Initiates, that is, employees, were welcomed. Non-initiates were not. The quotidian practices of those within this world also contributed to this dynamic. Before he became a full-fledged member of the Peenemünde community, test engineer Dieter Huzel recalled

[121] Simmel, *The Sociology of Georg Simmel*, 332.

that "I admired from a distance those whom I believed had already achieved this higher order of existence – from the obscure language, the secrecy that seemed to shroud their actions, and from the occasional 'private notebook' tactics that some of them used."[122] The insistent practices of secrecy that Huzel points to, the coded, jargon-filled language, the curtain behind which they worked, and the very objects that were off limits, segregated the Peenemünde rocket specialists and helped to foster the sense that they were a community of elites, one that, as I shall indicate in chapter three, worked at the very cutting edge of technological development.

In addition, secrecy regulations both created and reinforced the hierarchy of authority at Peenemünde. Technological leaders controlled information by limiting access to a relatively small number of people. These individuals had to learn the proper uses of the secret information through a long process of group recruitment and training that was guided by their superiors. The authority of those in charge at Peenemünde, therefore, proceeded in part from their larger knowledge of the technological activities on the island and their power of granting or denying access to secrets. Indeed, part of Braun's leadership capability lay in his nearly omniscient knowledge of technical development that grew in part from his unfettered access to every secret in the facility. This knowledge cemented the strict administrative hierarchy at the base, a hierarchy that, according to Simmel, is central to the effective functioning of all secret societies.[123] The authority of the leading administrators at Peenemünde to promulgate such regulations did not simply proceed from the positions accorded them by Ordnance. It also originated in their knowledge of

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[122] Huzel, *From Peenemünde to Canaveral*, 77.
[123] Simmel, *The Sociology of Georg Simmel*, 346-357.

developments at the base and was strengthened by the regulations published by the administrators themselves.

Clearly, these practices formed the bedrock of all of the activities at Peenemünde. For new employees, the hiring process, background check, swearing of oaths, and signature of the service regulations were important moments that made clear to them the rules that bound them together in secrecy.[124] If examined through an anthropological lens, these practices can be seen as initiation rituals that served to integrate individual newcomers into a larger, secret, and privileged group. In undergoing these rituals, neophytes were made aware of other members who worked at the installation, the formal and informal norms governing their professional existence, and of the stratification within the facility itself. Without these rites, which had the power to "rearrange and to transform allegiances, boundaries, and identities," secrecy could not be maintained.[125] For veteran Peenemünders, they re-emphasized the fundamental importance of secrecy to their purposes and aided in tying them together as cohesive group.

Secrecy, Coercion, and Consent at Peenemünde

The presence of all of these security regulations also meant the presence of enforcement mechanisms. Both a real and imagined sense of coercion helped ensure adherence to the rules of the institution. In the first place, Army officials handled the

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[124] Their working and living conditions, to be examined in the next chapter, also were important sources of binding energy.
[125] Bok, *Secrets*, 50.

majority of counter-intelligence matters at the base throughout the war years.[126] However, the Gestapo also commonly resorted to informants in Peenemünde to keep abreast of developments inside the facility. These informants were under the command of Gestapo officials operating out of the office in Stettin, southeast of Peenemünde.[127] The earliest available record of Gestapo operations in Peenemünde is dated November 1939. The massive expansion of construction on Usedom because of the planned assembly plant and accompanying worker accommodations made necessary the addition of nearly another 1500 laborers. In a striking contrast to the accommodations for the technical employees, the influx of these workers strained the facilities set up for their accommodations to the breaking point. The barracks built for them did not have enough beds, nor were many of them heated against the Baltic winter. Mess halls built for 1000 men had to feed 3000, forcing hungry workers to queue up for over two hours. Many were lucky if the food was not all gone when they reached the front of the line. All of this led to a deepening discontent among the workers and worse, an ongoing and significant number of work refusals.[128]

Later that same month, the Army's counter intelligence office in Swinemünde requested that the Gestapo further investigate the situation.[129] Almost six months later, officials from the office of the Reich Trusteeship for Labor (*Reichstreuhänder der Arbeit*) in Pomerania, a government organization charged with acting as a liaison between labor and management in large construction projects, noted the continuing problem and recommended that the Gestapo set up a penal camp on Usedom to deal

[126] Niederschrift über die Besprechung am 7.8.44, 8/8/44, RH8/v.1941, BA/MA.
[127] Stolze Bericht, "Bonner Bundepräsident Lübke," BStU, AV 7/85, Bd. 32.
[128] Untitled Gestapo report, author unknown, 11/21/39, AV7/85, Bd. 26, BStU.
[129] Unsigned telegram, Gestapo office Stettin to Rühlmann, 11/23/39, AV7/85, Bd. 26, BStU.

with the unhappy workers.[130] Construction Directors Erwin Mahs and Heinrich Lübke (who would become President of the Federal Republic of Germany in the late 1950s) at Baugruppe Schlempp, the Armaments Ministry organization that took over construction in May 1940, agreed to these measures, leaving the Gestapo in charge of organizing the supervision of the camp.[131] By September 1940, the Gestapo office in Stettin received authority to monitor activities on Usedom. The official order granting this power indicated that they could rely on Mahs and Lübke for any help the Gestapo needed because "Both have proven themselves to be trustworthy."[132] Over the next several months and years, the Gestapo operated informants in Peenemünde who had access to both construction groups as well as the research station's employees.[133] In addition, as noted above, Army officials sought the Gestapo's help in running background checks to ensure that prospective employees were not involved in any activities that the regime might deem untoward. Thus, the Gestapo did not have to surreptitiously infiltrate Usedom or engage in a bureaucratic battle with Army or construction authorities at Peenemünde in order to gain access to the base. Army counter-intelligence sought out the Gestapo's help so that Ordnance's research and production plans could proceed apace, and construction directors actively supported their efforts in order to keep the facility's frantic building activity moving forward. The result was the active cooperation between Army counter-intelligence, Armaments Ministry representatives, and the dreaded secret police not

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130 Reichstreuhänder der Arbeit to Gestapo Stettin (signature illegible), 6/14/40, AV7/85, Bd. 26, BStU.
131 Zusatzbericht zum Bericht vom 14.6.1940, 6/19/40, AV7/85, Bd. 26, BStU.
132 Gestapo Order 5538/39, 9/24/40, AV7/85, Bd. 26, BStU.
133 Stolze Bericht, "Bonner Bundespräsident Lübke," AV7/85, Bd. 32, BStU.

only to combat labor intransigence, but also to ensure that secrecy was fully maintained on the island.

The presence of both Army counter-intelligence officers and Gestapo informants on Usedom did a great deal to enforce the rules of secrecy. Huzel noted that "The supervision of [office procedures and handling of secret documents] and the punishment of security violators as a matter of fact provided an excellent opportunity for ambitious security officers."[134] Interestingly, however, the internalization of the institutional regulations created a situation in which the employees themselves monitored their own behavior and attempted at all cost to avoid breaking the rules. This commitment was reinforced by the presence of Army counter-intelligence and the Gestapo and the sense of ubiquitous surveillance that the Peenemünders operated under.

In *Discipline and Punish*, Michel Foucault shows that surveillance is a powerful way of imposing social discipline. The root of this discipline, he argues, the very visibility of those subject to surveillance: "Disciplinary power … imposes on those whom it subjects a principle of compulsory visibility. In discipline, it is the subjects who have to be seen. Their visibility assures the hold of the power that is exercised over them. It is the fact of being constantly seen, of being able always to be seen, that maintains the individual in his subjection."[135] Visibility, then, helps to ensure social control. In contrast, the authorities in charge of security on Usedom were often invisible. The invisibility and unprovable nature of surveillance from moment to moment was the secret to its success. Invisibility made the notion of

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[134] Huzel, *From Peenemünde to Canaveral*, 60.
[135] Michel Foucault, *Discipline and Punish: The Birth of the Prison*, Transl. by Alan Sheridan (New York: Vintage Books, 1979), 187.

surveillance omnipresent. The Peenemünders understood that they could be observed, but did not know when, if it all, the gaze of the authorities fell on them. In the words of one engineer, "One never knew when one was being watched."[136] Discipline, therefore, could be imposed even in the absence of state authority. It was internalized by individuals in Peenemünde, who constantly felt subjected to it, whether or not it existed in reality. In Foucaultian terms, this ensured "the automatic functioning of power" by creating a situation in which the Peenemünders were caught up "in a power situation in which they themselves are the bearers."[137] The threat of force was never absent, and there is strong circumstantial evidence, though spotty and undocumented, that coercive force may have been brought to bear on occasion against civilians at Peenemünde when at least one, and perhaps as many as twenty, civilian employees were hanged inbetween 1939 and 1945 for transgressions against secrecy regulations.[138] Nevertheless, in the end, it was the fear of observation and force, not its actual presence, that established a dynamic in which employees tightened the limits of allowable behavior and mitigated against any acts that might be considered inappropriate by state authorities.

An important factor in sustaining this dynamic was the background investigation that preceded an individual's employment at Peenemünde. The Gestapo investigation transformed the employees from relatively anonymous people moving

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[136] "Bericht eines nicht genannten 'Peenemünder,' veröffentlicht in der Wochenzeitung 'Christ und Welt' im Juni 1950," Gericht Rep. 299, Bd. 158, HStaD-ZA Kalkum.

[137] Foucault, *Discipline and Punish*, 201.

[138] Manfred Kanetzky personal correspondence with author, 4/27/04. Kanetzky is the archivist at the *Historisches-Technisches Informationszentrum Peenemünde* and has learned through conversations with former Peenemünders that at least one civilian was hanged, though documentary evidence that could prove this has not been found. He notes that others have cited up to twenty hangings. In each case, it is not clear if the Gestapo, Army, or civilian authorities charged the individuals and carried out the death sentences.

about in a large social milieu into individuals whose identity was closely known by the state and, therefore, subject to greater state control. In a totalitarian political system that possessed no scruples about invading the private lives of its citizens in the first place (and indeed obliterated the very notion of privacy), the sense of being under constant surveillance was sharpened even further. Peenemünde employees were, in principle, under more scrutiny by the state than citizens who were not involved in such top secret research. The Nazi regime stripped away the privacy rights of its citizens as a matter of course. The Gestapo background investigations of potential employees at Peenemünde then shined a light on the people whose individual rights were subsumed before the power of the state, enhancing the sense of being exposed at all times and encouraging individuals to closely regulate their own behavior.[139]

Wernher von Braun was also a central figure in this process of self-policing. He regularly wrote letters and circulars to mid-level management and department heads reminding them of stipulations regarding rules of secrecy and upbraiding them on the uncommon occasion when they did break the rules. Braun vigorously guarded the secrets at Peenemünde and was unafraid to confront others about breaches in security. As late as December 1944, when Germany stood on the brink of utter collapse and the war was irretrievably lost, Walther Riedel (known in the correspondence as Riedel III, no relation to Walter H.J. Riedel), the head of the

[139] Ironically, it is likely that the Gestapo did not have the manpower to properly carry out its enforcement duties. Elisabeth Kohlhaas estimates that in 1937, there was a maximum of 7000 officials in the entire Gestapo. Even in August 1941, there were no more than 7600 in all of prewar Germany. See her article "Die Mitarbeiter der regionalen Staatspolizeistellen: Quantitiative und qualitative Befunde zur Personalausstattung der Gestapo," in Gerhard Paul and Klaus-Michael Mallmann, *Die Gestapo – Mythos und Realität* (Darmstadt: Wissenschaftliche Buch Gesellschaft, 1995), 220-235.

Peenemünde Design Bureau, met with members of the Four Year Plan Institute for Transportation (*Vierjahrsplaninstitut für Kraftfahrzeuge*) at Berlin Technical University concerning work on V-2 transportation development. In the midst of this top-secret meeting, a secretary from the university attempted to work in the same room. After several minutes and repeated requests that she leave the room because of the secrecy of the discussion, an argument ensued with her superiors. In the end, the angry woman departed in a huff. When Braun received news of the institute's inability to effectively control access to secret information, he wrote an acerbic letter to a Dr. Schmidt, the head of the group, in which he voiced his concerns about secrecy. His reaction to the episode indicates his own sense of propriety as well as his overriding concern with keeping information about the V-2 to as few people as possible. "The improper tone and the general behavior of Frau Wolfe," he testily asserted, "exhibits a major lack of discipline. [We] are indignant over the above incident and the affront therein by one of your representatives. In the future, we will choose the meeting place for all further meetings with the VfK."[140] At first glance, one is tempted to read a certain self-importance into this letter, but its subject line, "Secrecy," (*Geheimhaltung*) indicates Braun's real concern. The control of secret information about the V-2 project simply could not be allowed to wane, even if Germany's fortunes in the war were. Even as his enthusiasm for the project began to diminish and the limits of the V-2's effectiveness became clearer by the day, Braun proved himself to be more than willing to call onto the carpet those who breeched the tight ring of secrecy around missile development, and his demand that the Peenemünders choose the location for future meetings with the VfK is indicative of

[140] Braun to Schmidt, "Geheimhaltung," 12/2/44, RH8/v.1265, BA/MA.

his faith in the base employees' ability to tightly control access to secret information. This supposed weakness of the VfK, combined with Frau Wolfe's "Improper tone and general behavior," was an affront to the high professional standards that were so important to the work of the Peenemünders. Braun's own adherence to the secrecy regulations was fully automatic, a part of his identity as a rocket developer. His internalization of Peenemünde's institutional regulations regarding secrecy was emblematic of many Peenemünders, and resulted in a habitual, often pro-active commitment to these rules.

Secrecy, therefore, functioned to segregate employees of the facility from society while ensuring the loyalty of those who were privy to secrets. On one hand, the practice of secrecy was an adaptive process that built communal feeling and enabled individuals to achieve particular objectives. By restricting physical access, making documents the domain of a privileged few, and necessitating the use of jargon and code words, the practice of secrecy provided Peenemünders with a sense of their own elitism which compensated for the restrictions it placed on their professional world. Indeed, secrecy even enhanced the rocket specialists' notions of professionalism as it became part and parcel of their everyday experience.

On the other hand, however, secrecy was also a maladaptive process in that its insistent daily practices acted to squelch dissent or criticism by providing both a real and imagined coercion around the work. Even if we are to take as truthful the postwar assertions of many engineers who argued that they had no control of the larger policy decisions when it came to determinations about labor deployment and treatment of the prisoners, surveillance became a mechanism for curtailing what might be construed in the Nazi context as politically deviant, inclining the Peenemünders to engage in very little, if any, dissent. Thus, the overriding dearth of large scale discord at Peenemünde was not simply a result of the specific technical vision of the project that guided employees down the same path. Though this was certainly an important factor, an equally durable and meaningful means of evoking their collective focus was the internalization and automatic adherence to the rules of secrecy that guided the employees' behavior. Though individual employees disagreed, sometimes strenuously, their disputes were limited to the more narrowly defined technical arena and never exploded into larger questions about the purposes of their work, the nature of the regime that sponsored it, or even the eventual use of slave labor to inaugurate mass production. This was a function of the secret society created at Peenemünde. Entrance to this society involved a thoroughgoing process of initiation and re-socialization along the lines laid out by its members, and the Army and Gestapo ensured disciplinary compliance by providing a powerful, if, in reality, inconsistent, enforcement mechanism. This by no mean excuses the actions of engineers and technicians at Peenemünde. Employees there made individual decisions based on their own conceptions of right and wrong, but these choices were made in the context of an overarching dynamic of secrecy that acted to strengthen their identification with the project at hand while stifling public dissent. The result was a community of like-minded experts who automatically adhered to the dictates of the regime that made their work possible.

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In conclusion, two major factors laid the groundwork for the establishment of the strong and viable community of scientific and technical expertise at Peenemünde. The first was the regime's tremendous financial commitment to the project of rocket development. Ordnance authorities recognized that in order to successfully develop a large, liquid-fueled, ballistic missile, the paltry resources of the private amateur groups and the small experimental set-up at Kummersdorf were simply inadequate to the challenge. A brand new, large, ultra-modern facility, financed by massive state investment, could be the only way to solve the myriad of technical difficulties associated with development. For the small group of individuals who were involved in the program during Weimar's lean years and even in the first years of work at Kummersdorf, the Army and Luftwaffe commitment to expansion of the program and establishment of a new, entirely modern facility dedicated solely to their work was most gratifying. Though it was cloaked in secrecy, their work became all the more satisfying because of the improved pay, expanded resources, and increased prestige that working on such a massive, well-financed project inevitably brought with it. The Nazi regime's revanchist, nationalist, militaristic foreign policy was in line with much of the propaganda about the rocket that they were imbued with during the *Raketenflugplatz* years, and Hitler's unbridled rearmament spending guaranteed the continuation of their work.

The foundation of this emerging community of professionals at Peenemünde was laid on a bedrock of secrecy. Pervasive regulations guarding the work at the base governed almost all aspects of behavior on the island of Usedom, segregating employees from the rest of German society and reshaping their discursive worlds. In the course of their daily activities, the Peenemünders internalized secrecy rules and automatically behaved according to their stipulations. Moreover, secrecy was so fundamental to their daily functions that it became central to the formation of professional identity at Peenemünde. However, the daily practice of secrecy had negative consequences as well. Individuals who internalized these regulations were also less apt to question the larger initiatives of the regime that sponsored the work. Admittedly, support for the re-armament project did not automatically translate into support for many of the regime's harsher measures, including crackdowns against supposed internal enemies of the nation, war, total war, and slave labor. However, the coercive effects of secrecy regulations meant that as the regime enacted these policies, individuals at Peenemünde were less likely to register their dissent. Indeed, as I will point out in the next chapters, the very lack of dissent among those involved in missile development and production is one of the most striking features of the program.

Financial commitments and secrecy considerations profoundly shaped the process by which individual technical and scientific specialists from different disciplines across Germany developed into a dynamic community with a singular vision on a tiny island off of Germany's Baltic coast. They created the framework in which individuals conducted their daily lives. It is this daily behavior, shaped by state sponsorship and carried out in utter secrecy, that explains the roots of consent for the Nazi regime at Peenemünde and the stunning technical achievement of the long range ballistic missile. The tightly knit community that employees wove together was based on strong professional, communal, and personal bonds, not dedication to National Socialist principles or bureaucratic inertia. Nevertheless, the resulting strong identification with each other would ensure the smooth functioning of both technological practices and state power within the Peenemünde technical community.

Chapter 3

“It was a Fantastic Life!”: Living and Working in a Secret Rocket Facility

Despite some of the restrictions that secrecy imposed on life at Peenemünde and the near total physical isolation of Usedom from the rest of Germany, employees of the rocket facility found their lives on the island to be personally rewarding and professionally stimulating. This in turn ensured the technical specialists’ absolute dedication to the goals of Peenemünde as an institution. In large part, this was a function of the lavish accoutrements that the Army provided for them, the abundant opportunities for leisure and recreational activities (especially before the middle of 1943), and the exciting, well-paying work that was carried out in a congenial, professional environment. Their satisfaction with their lives on Usedom encouraged employees to put an even more personal stake in the endeavor that brought them such good fortune. For them, the goals of the Peenemünde Army Research Station were intrinsically linked to both their personal and professional satisfaction. Success in the A-4 project not only meant enhanced professional prestige, but also continued enjoyment of a comfortable life that provided liberal social outlets and was free, at least until August 1943, from the deprivations of war. Though not explicitly ideological in nature, life and work at Peenemünde were central to the social reproduction of support for the Nazi regime because of the subtle ways in which individuals at the facility came to identify their own goals and happiness with the mission of the institution, which was ostensibly to defend the Nazi regime from further harm. The process by which this support came about at Peenemünde is at the core of this chapter.

Max Weber has shown that individuals in society often relate to each other based on sentiment.[1] More recent studies have expanded on this point, arguing that sentiment is largely derived from group processes. Individual identities largely depend upon the groups within which people exist.[2] Much of what people know, they learn from their social environment. They believe certain things to be true simply because the people around them repeatedly assert that they are. Once people have these beliefs and discover that others within their given social networks share them, they take them as simple truths that have no need for further explanation or evaluation.[3]

A decisive component in constructing the Peenemünde specialists' ideals and enhancing their dedication to their facility's institutional goals was the emergence of a new professional rocket engineering community on Usedom. The *Raketenflugplatz* bore the seeds of this emergence, which germinated during the Kummersdorf years. However, the profession of rocket engineering, at best nascent in earlier years, assumed a mature identity at Peenemünde between 1937 and 1943. In assuming this identity, it established a community of like-minded people who shared the same sentiment and identified with the same goals. Sociologist William J. Goode has

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[1] This point is most clearly enunciated in D.B. Clark, "The Concept of Community: A Re-examination," *Sociological Review* (New Series), 21 (1973) 397-416.

[2] Michael A. Hogg and Dominic Abrams, *Social Identifications: A Social Psychology of Intergroup Relations and Group Processes* (London: Routledge, 1988). R. Scott Tindale, Catherine Munier, Michelle Wasserman, and Christine M. Smith, "Group Processes and the Holocaust," in Leonard S. Newman, Ralph Erber, eds., *Understanding Genocide: The Social Psychology of the Holocaust* (New York: Oxford University Press, 2002), p. 143-161.

[3] Serge Moscovici, "The Phenomenon of Social Representations," in Robert M. Farr and Serge Moscovici, eds., *Social Representations* (New York: Cambridge University Press, 1984), 3-69.

shown that the establishment of a "community of profession" is a central goal of all professional life. Once formed, this community decisively shaped the behavior of its individual members. In a community of profession, members are bound by a sense of identity and share many values in common. According to Goode, a commonly invoked ideal of this community is the unique service that it can perform for the larger society. The professional community also exacts from its members high standards of education and performance. This in turn is fundamental to a profession's claim to elite status.[4] All of these factors were in play at the Army's missile research and production facility on Usedom.

At Peenemunde, the engineers' sense of significance, professional achievement, career development, and prestige, was largely a function of this community of profession. They had a very high degree of solidarity and sense of self-significance, which grew out of their participation in this community. Their mores and values emerged as a result of their individual interactions with the larger group dynamic. What is more, individual members of the Peenemünde engineering profession were relatively isolated from outside sources of influence and socialization, finding their rewards and sanctions largely within their own community. At bottom, this further created the sense among Peenemünde employees that they felt themselves to part of an elite technical profession that performed a unique and profoundly important service for their nation. Their individual behavior was almost entirely informed by their consciously and unconsciously felt membership within the community that espoused this very belief.

[4] William J. Goode, "Community Within a Community: The Professions," *American Sociological Review* 22/2 (April 1957), 194-200.

Communal feeling and group identification emerged in a number of ways. One of the most important was the individuals' membership in Peenemünde's secret society. Another was in the unparalleled conditions in which employees conducted their personal and professional lives. Life on Usedom offered benefits that were unique in Germany, and work on the super-secret missile base was the source of a great deal of interest, excitement, and pride. Most employees were not only loathe to give up the advantages of such a stimulating life, they were also deeply dedicated to maintaining and reproducing it. The best way to do so was to embrace the goals of the project. Moreover, senior military administrators appealed to the specialists' patriotism and nationalism in much the same way that the *Raketenflugplatz* appealed for funding in the years before the Nazi regime. They cast their work in terms if its overriding importance for national survival, especially during the war. This not only enhanced a professional ethic that drew on the long-held idea of public service as a virtue, it also gave cause for the employees to redouble their efforts to defend the regime that made their relatively comfortable lives possible. However, it had the negative effect of creating an atmosphere that was colored by the desire to exact revenge on Germany's enemies, thereby encouraging the engineers' tacit, if not direct, support for Nazi initiatives. In the end, this group dynamic in place at Peenemünde ensured rapid technological development and encouraged political support for Hitler's government.

The "Paradise" of Peenemünde

Despite Army Ordnance's protracted battle with higher regime authorities, especially Armaments Minister Fritz Todt, over the costs, amount of labor and raw materials needed to construct the base, the Army's and Luftwaffe's largesse resulted to both a first-rate technical facility as well as attractive and comfortable living accommodations for the employees who worked there. Dornberger's desire "to build on a grand scale and beautifully" was largely fulfilled. The results of his efforts combined with the beauty of the island to dazzle the employees. The entire facility, from the tip of Usedom's northern peninsula to the tiny village of Karlshagen stretched for nearly eight miles. From a naturalists' perspective, the site was idyllic. A pristine beach ran along the east coast of the island, parallel to almost the entire base. The pine forest that covered most of the island provided an excellent habitat for deer and other wildlife.[5] For one engineer, Peenemünde "was the most beautiful area, wooded area, you know, with lots of pine trees and leaf trees like oak trees and elm trees … a beautiful spot … We had beautiful birds in this area, all kinds of ducks."[6] Peter Wegener felt a warm nostalgia when he arrived at Peenemünde, recalling that "Most of my early summers were spent at one of the many resorts on Usedom. For a child from Berlin, the Baltic seashore – with its pure white sand, its dunes, and its hunting grounds for shells and amber – was the closest ocean holiday spot ... The

[5] Dornberger, *V-2* (New York: Viking Press, 1955), 40.
[6] Tessmann, OHI, National Air and Space Museum (NASM).

scenery, the smell, and the waters of Peenemunde were truly familiar."[7] The island's natural beauty, however, was not the only attribute that impressed employees.

As Todt stridently indicated in 1941, the building accommodations for employees were par excellence. Construction engineers strove to avoid monotony in designing and arranging the buildings and added many of their own unique flourishes to the design of the facility. For example, to enter the employee settlement, workers and their families passed through the so-called "Brandenburg Gate," a large stone building through which a car could traverse and that contained bachelor apartments on either wing.[8] Past the Brandenburg Gate to the East lay the actual housing settlement itself. It was based on the idea of the 'Garden City,' a concept celebrated by right wing architects who wished to spiritually unite German families with their native soil. Trees and a number of personal garden plots dotted the settlement, which was made up of two-story row houses and individual, detached family homes. Planners designed the living quarters in staggered rows to vary the settlement's appearance and used a number of decorative architectural touches on the ends of the row houses to improve their appearance even further.[9] Bakeries, cafes, a butcher shop, a grocery, and even a beauty salon and a bookstore opened in the settlement. Architects also built a school, a large sports field, and tennis courts. Reinhold Krüger, a technical apprentice at Peenemünde, was deeply impressed, recalling, "Above all, I was taken in by the new buildings in the clean, perfect town. For me,

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[7] Peter Wegener, *The Peenemünde Wind Tunnels: A Memoir* (New Haven: Yale University Press, 1996), 17.
[8] Photograph 47 575, Brandenburger Tor der Siedlung Karlshagen, Peenemünde, Luft-und Raumfahrtarchiv des Deutsches Museum.
[9] See Deutsches Museum photograph "Siedlung im Heeresgutsbezirk Peenemünde, Bild-Nr. *23881, on order from the Deutsches Museum. Many of these row houses are still in use today.

this was the epitome of German exactitude and cleanliness."[10] The entire settlement area itself lay just west of the beach, and was separated from it only by a stand of pine trees. "It was beautiful," recalled project engineer Werner Dahm. "Our house was right at the woods, and for my lunch time I could walk to the beach."[11] Many scientists, engineers, technicians and military officers were only too happy to move into the settlement upon arriving in Peenemünde with their families.

A view down Hindenburgstrasse in the employee "Settlement" at Peenemünde.
Courtesy DM

Dahm's glowing assessment might have just as easily described "Peenemünde East," the site of the development workshops. This group of buildings was located approximately one mile north of the settlement and was connected to it by a modern electric railway, complete with bright red cars modeled after the famous Berlin S-Bahn. It was made up of technical workshops, a dormitory for single employees, and a large administration building. Designers also built two ornate clubs for officers and civilian workers.[12] Rocket engine test stands dotted the coast of the peninsula to the

[10] Reinhold Krüger statement, quoted in Volkhard Bode and Gerhard Kaiser, *Raketenspuren: Peenemünde 1936-1996* (Berlin: Ch. Links Verlag, 1996), 38.
[11] Werner Dahm OHI, NASM.
[12] Closer to the Settlement, designers converted a modern hotel located on the beach into a third club, called the "Kameradshchaftsheim." This club and another one known as the "Kasino" were the two

north of the workshops, ending at Test Stand VII, the large and complex launch site at the tip of the island, from which all test models were launched.[13] All of the structures, for reasons of camouflage, were nestled among the many trees left intact after construction. According to Wegener, "Administration buildings, laboratories, housing units, and test stands were widely separated according to a well-planned layout, and a bucolic atmosphere prevailed. The architecture was attractive, combining a resemblance to the older municipal buildings of the northern provinces of Germany with a touch of the twentieth century Bauhaus school."[14]

Sandwiched between the employees' settlement and the development workshops was the massive rocket assembly and storage hall, dubbed F-1 by the Peenemünders. At 600,000 square feet, it was one of the largest free-standing, industrial structures in Germany.[15] It only had windows on its front face, but the roof's sawtooth construction, designed to minimize air raid damage, also let in a great deal of light. Engineers and technicians in the assembly hall built the test rockets vertically, rather than horizontally.[16] F-1 was designed to hold rockets much larger than just the V-2. Rather, planners structured it to hold the A-10, a two-stage missile with a 100 ton thrust engine that remained on the drawing board throughout the war.[17] Obviously, they did not want to build a facility that was immediately obsolete, but

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most popular on the island. The Kameradschaftsheim also doubled as women's dormitory. See Deutsches Museum photo 38798 "Kasino in Peenemünde," on order from the museum.

[13] Lageplan der Erprobungsstelle Peenemünde, photo number 16776, DM.

[14] Wegener, *The Peenemünde Wind Tunnels*, 17.

[15] Arthur Rudolph OHI, NASM. On the dawning realization of the size and complexity of such a structure, Rudolph, the building's chief planner, recalled, "I now felt as if I had been standing in the snow and making that little snowball and it began to roll and I could catch that ball any time I wanted to, but suddenly this snowball was an avalanche. A tremendous avalanche. And I got really scared."

[16] Bode and Kaiser, *Raketenspuren*, 36. Although administrators laid extensive plans for mass production in F-1, production was transferred to central Germany before they could be enacted.

[17] Rudolph OHI, NASM. The A-10 was conceived as the world's first intercontinental ballistic missile.

this was also a reflection of their confidence that money would keep coming in and the political support to allowing them to expand their work would be ever-present. In any case, this was the largest and, when combined with its electrical power and employment demands, the most expensive structure on the island. It completed a research, development, and production complex for new weapons that, in terms of its size, complexity, and social considerations, was without equal in the world.

"It Was Absolutely Wonderful": The Social and Cultural World of the Peenemünder

Living in this "paradise" on the Baltic coast proved in many ways to be a deeply rewarding experience, especially in the context of World War II Germany. Peenemünde officials took great care to ensure that all of the concerns of those working at the facility could be easily attended to, enabling employees of the base to establish a dynamic, vibrant, and exciting culture on the island that belied the worsening war situation throughout their country. Both in and out of the workplace, the ties between individual Peenemünders grew increasingly strong, and a dynamic emerged in which personal and professional bonds mutually reinforced one another. This in turn allowed them to forge their unique group identity as "Peenemünders," a homogenous community of like-minded individuals that emphasized both their professional elitism and their thorough identification with each other. The rapid success of the Peenemünders' work on the missile was the result. In addition, the comfort and relative ease of their lives, despite the great pressure on them for results, only fortified their dedication to the missile program's goals and spurred them to ever increasing efforts on the regime's behalf. Indeed, the lively and spirited community that grew up on Usedom owed its existence to the National Socialist regime that served as their benefactor. Even so, years later, many former Peenemünders would recall that during the war, when Nazi Germany was visiting unprecedented destruction on Europe, the years 1939 to 1945 were the best of their lives.

The island of Usedom had much to offer its new residents. Ruth Kraft, a data recorder in the Aerodynamics Institute, stated that "For those of us who came from central Germany or Saxony, the Baltic Sea was a wonderful experience."[18] Gerda Erdmann, whose husband was a lathe operator in the development workshops, stated years after the war that "Everything was wonderful. It's terrible that it's all broken down now."[19] In the first place, Usedom offered a variety of accommodations for the Peenemünders. Many single men lived in dormitories either at the development works or in the Settlement, but others found rooms in the unused guesthouses in the popular beach town Zinnowitz and elsewhere. Wegener wrote that he met a number of interesting people in his dormitory, and many became his good friends.[20] Most engineers who had families were able to live in the well-equipped settlement. Werner Rossinski and his wife lived with their child in one of the row houses here, but when they had a second child in 1940, they were able to move into a house that was only three minutes by foot from the beach. He recalled warmly how in the summer, his family would eat breakfast and then go for a walk on the beach.[21] Rossinski's sentiment is typical of nearly all of the Peenemünders. The accommodations available to them on Usedom were pleasant, functional, and had the advantage of

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[18] Ruth Kraft Testimony, *Originaltonaussagen von Mitarbeiter der ehemaligen Heeresversuchsanstalt Peenemünde-Ost zum Thema Alltag in Peenemünde*, Historisches-Technisches Informationszentrum Peenemünde (HTIZP).
[19] Gerda Erdmann Testimony, *Originaltonaussagen*, HTIZP.
[20] Wegener, *The Peenemünde Wind Tunnels*, p. 19.
[21] Werner Rossinski Testimony, *Originaltonaussagen*, HTIZP.

being located in some of the most prime beachfront property in all of Germany. Rudolf Hermann, the head of the aerodynamics group, happily recalled that "Our house was only 200 meters from the beach. Stepping out of the house, already you hear the noise of the sea."[22]

Moreover, the employees of the missile facility had many outlets for their social and cultural needs. Outdoor recreational activities abounded in the summer, and the Peenemünders took full advantage of them. The quiet Peene River and the Stettin lagoon allowed for excellent sailing. Many of the more skilled and adventurous sailors at Peenemünde, von Braun among them, even enjoyed sailing to the Greifswalder Oie. This was a small island in the Baltic just north of Usedom, which, in addition to a number of important test launch facilities, had a small inn, where, "despite all of the war rationing, one could always eat well."[23] Sunbathing and sports competitions during time off of work were other popular pastimes. For example, early every Wednesday morning in the summer, many co-workers and friends gathered for "morning sport" on the beach. They played handball, soccer, swam, or simply went for walks before gathering for breakfast, cleaning up, and catching the train for work. At the sporting field in the settlement, employees also arranged competitions and games between the various branches and organizations at the base. Many Peenemünders, including Dornberger and Zanssen, also enjoyed taking their families to the interior of the island to pick the wild blueberries that grew

[22] "Memoirs of Rudolf Hermann," unpublished, p. 19, University of Alabama, Huntsville (UAH). This source is rather more like an oral history than a memoir. It is a transcript of an interview Hermann gave to Sandy Sherman in 1988 in Huntsville, Alabama.
[23] *Wernher von Braun Anekdotisch*, gathered by Bob Ward, (Esslingen: Bechtle Verlag, 1972), p. 41.

there.[24] The base's high ranking officials, von Braun included, also enjoyed riding in the woods the island on horses kept from the stables reserved for these men.[25]

Peenemünders on the beach near Zinnowitz, July 1943.
Courtesy HTIZP

In the winter, the theater and films (there were four cinemas on Usedom) were the primary source of entertainment. Huzel's favorite was the cinema in Karlshagen, just south of the settlement, which showed old films, "invariably of good quality," and that never had anything to do with the war.[26] A local *Festzeitschrift* kept people up date about the social and cultural events happening on the base. *Feierabends* and *Kameradschaftsabends* were consistently the most popular events of the year. These were parties in the clubs that were often sponsored by the various administrative divisions of the base. Participants told jokes, put on skits, played music, sang songs,

[24] Herbert Lucht Testimony, *Originaltonaussagen,* HTIZP.
[25] Martin Middlebrook, *The Peenemünde Raid: 17-18 August, 1943*(London: Cassell and Co., 1982), 20. Middlebrook's book is essentially a minute by minute account, drawn largely from oral history interviews he conducted, of the destructive RAF bombing raid on Peenemünde in August 1943.
[26] Huzel, *From Peenemünde to Canaveral,* 130.

ate, and drank together, often poking fun at themselves and each other.[27] In addition, employees themselves often put on concerts and plays, which were well attended by their colleagues. Rudolph Hermann, for example, was a member of perhaps history's most technically brilliant chamber music quartet, with von Braun, who played the cello, measurement specialist Gerhard Reisig, who played the viola, and aerodynamicist Heinrich Ramm, who played first violin. They often performed together in public.[28]

"Kantine Fischer," the site of many *Kameradschaftsabends.*
Courtesy DM

The Peenemünders also established strong and durable social bonds while on Usedom. Many workers celebrated holidays and birthdays together, often exchanging hand-made gifts.[29] Friends and co-workers commonly gathered for in the famous resorts in Zinnowitz. Huzel remembers these gatherings fondly.

[27] See, for example, "Festfolge zum Kameradschaftsabend der Abteilungen TA/L, TA/Proj., TA/Che und TA/TB am Sonnabend, dem 15. März 1941, 16 Uhr in Schwabes Hotel Zinnowitz," HTIZP. The festivities included an opening speech by von Braun, a reading of Otto Schairer's poem "Deutschland dir mein Vaterland" and a performance of the song "Die echte deutsche Gründlichkeit."
[28] Hermann Memoirs, p. 19, UAH. Hermann played second violin.
[29] Herbert Lucht Testimony, *Originaltonaussagen*, HTIZP.

> This town had been a swank seaside resort, and a number of restaurants were still operating… The waiters wore white tie and tails; there were white tablecloths; and the food was pretty good for those times…As wine was unavailable, it was acceptable for the customer to bring his own – which we usually managed to do. After dinner the waiter would spend twice the time with the ration coupons that he did with the bill. These were moments of pleasure stolen out of tragedy, and our humor was always high as we finally made our way back to House 1 [the bachelors' dormitory].[30]

Family life was pleasant as well. The demands of work and the war did not preclude many from starting or expanding their families at Peenemünde. Most families had their own small, but pleasant houses, and parents found no lack of people willing to supervise their children when they both worked. Hermann's family gathered with the families of friends and co-workers on the weekends to "play games together at the beach."[31] Moreover, though the majority of people at Peenemünde were men, there were plenty of women on the island who served as secretaries, clerks, typists, and measurement takers. Most of the women were single and lived in the "Kameradschaftsheim," the hotel that was converted into a club and dormitory. Needless to say, this opened up many romantic opportunities for the young and single Peenemünders. Kiddy Luckman, a young female data recorder in the measurement group, often traveled with her friends to Zinnowitz in search of young men.[32] Some, like development foreman Horst Wiessner, even met their future spouses on such occasions.[33]

[30] Huzel, *From Peenemünde to Canaveral*, 130.
[31] Hermann Memoirs, p. 19, UAH.
[32] Kiddy Luckman Testimony, *Originaltonaussagen*, HTIZP.
[33] Horst Wiessner Testimony, *Originaltonaussagen*, HTIZP.

Life on Usedom, then, was quite comfortable for the Peenemünders, even in the context of total war. Nearly everyone recognized this truth. For example, rationing demands made food scarce across the nation, but because of Peenemünde's location on the Baltic Sea, residents there were easily able to supplement their rations with fish and eel. Partially for this reason, Dieter Huzel was convinced the Peenemünders did not have it as bad as other Germans throughout the country.[34] Except for wine, alcohol was also plentiful. Chemists at Peenemünde were able to distill ethyl alcohol into pure alcohol that they made a sort of moonshine out of and added different flavors to.[35] Georg Tiesenhausen commented wryly (and, it might be said, disturbingly, in a gastronomic sense), "We had parties. Parties with rocket fuel."[36] Konrad Dannenberg held that the availability of such items in Peenemünde meant that they were not badly off there. He noted that, "It was probably much worse all over the rest of Germany."[37] Nearly all Peenemünders were quite conscious that their lives were vastly better than the majority of their countrymen, and they embraced this fact. As one former employee recalled about his time at Peenemünde, "It was a fantastic life!"[38] In the context of Nazi Germany, this secret life, largely free from the deprivations of the war and reinforced by an abundance of recreation and a tightly knit social community, became an oasis in the steadily mounting drumbeat of distress and destruction across the rest of Germany.

All of these benefits and events constituted moments of fundamental importance in the growth of the community of Peenemünders. In an anthropological

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[34] Huzel, *From Peenemünde to Canaveral*, 80.
[35] Konrad Dannenberg OHI, NASM.
[36] Georg Tiesenhausen OHI, NASM.
[37] Konard Dannenberg OHI, NASM.
[38] Werner Rossinski testimony, *Originaltonaussagen*, HTIZP.

sense, they helped make up the foundations of the complex social community on Usedom. These events should be seen as both formal and informal rituals that in their execution, strengthened individual ties to the group. In a revealing comment about the strength of these bonds, technician Gerhard Rühr noted

> This comradeship was present in Peenemünde and was not confined to professional or social groups. Whether one traveled by train or was in a club or in an air raid shelter or at a lathe, we all felt like one big family. Perhaps this spirit of togetherness was due to the fact that we had all, from the youngest apprentice to the general in command, come to this lonely island from all parts of Germany to witness the building of the A-4 rocket… You might even meet von Braun at the dentist's.[39]

In this secret society, recreational activities, friendly, informal gatherings, and formalized social evenings such as the *Kameradschaftsabends* helped reaffirm the unity of this unique group. These were central steps of the process in which the institution of Peenemünde remolded the old, heterogeneous identities of its individual members into the closed, elite, and privileged community of Peenemünders. The reciprocal bonds that they established in these rituals gave a strong boost to the their activities in the workplace and spawned a highly developed sense of solidarity and loyalty among those specialists who came to live and work at Peenemünde.

"We Here are Super-Engineers!": Work, Community, and Identity at Peenemünde

Besides the relatively comfortable life on Usedom, another source of centripetal force that effected technological development and political loyalty was the work itself. Employment at one of the world's most advanced research, development,

[39] Quoted in Middlebrook, *The Peenemünde Raid,* 27-28.

and production facilities on one of the world's most advanced forms of weaponry proved highly rewarding. It provided many engineers, scientists, technicians and craftsmen with some of the most challenging, exciting, cutting edge work that they had ever known. In carrying out their tasks at Peenemünde, the employees' sense of significance, professional achievement, career development, and peer prestige all grew enormously. Moreover, though they never employed the term themselves, the Peenemünders came to define precisely what it meant to be a rocket specialist. The fledgling profession of rocket engineering underwent a profound maturation in the years between 1937 and 1945, and the professional model established at Peenemünde would be duplicated after the war in rocket research stations in the United States and Soviet Union. Nevertheless, it was in Hitler's Germany that many Peenemünders found the most rewarding period of their lives.

Between 1937 and 1943, the development of missile technology in Germany made its most remarkable and important advances. This was particularly true in three areas. Perhaps the most difficult of these was in guidance and control, which had to date received the least developmental scrutiny. Under the leadership of Dr. Ernst Steinhoff, a combination of in-house researchers and university professors under contract to Peenemünde achieved a number of significant and critical steps forward. In the area of liquid fueled propulsion, the gifted but irascible Dr. Walter Thiel successfully, but not without difficulty, spearheaded the design of the required twenty-five ton thrust engine and pushed the engine's fuel efficiency to its theoretical limits. Rudolph Herrmann's aerodynamicists, against a chorus of artillery specialists who argued that it could not be done, crafted the world's first fin-stabilized (or "arrow stable") supersonic body.[40] Without question, these impressive advancements were possible in part because of the major funding and support given to the work at Peenemünde.[41] Helmuth Trischler and Margit Szöllösi-Janze have used the term "Grossforschung" (Big Research) to describe the rise and dynamics of large-scale, heavily funded research projects that enlist the cooperation of university, industrial, and state resources in Germany in the twentieth century. They are careful to note, however, that "Big research is not simply 'big' in the quantitative sense." Rather, the organization and use of resources in "Big Research" projects is also fundamentally important to the work at hand.[42] This was certainly the case at Peenemünde, where the complicated technical problems of guidance, thrust, and supersonic aerodynamics could not have been solved without the proper dedication and delegation of authority and resources.

However, the availability of money and material only tells part of the story of the V-2's rapid and successful development. Of equal importance to the physical resources dedicated by the regime was the environment in which the intellectual resources, that is, the missile developers themselves, functioned, as well as the ways in which Army authorities motivated their work. These talented specialists at the facility worked incredibly hard on behalf of a regime that obliterated enlightened notions of human rights, waged an aggressive war against Europe, and placed

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[40] Donald Mackenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1990), 44-60. Gerhard Reisig, "Von den Peenemünde 'Aggregaten' zur Amerikanische 'Mondrakete,'" *Astronautik*, 4 (1987), 5-9, 44-47, 73-79. Neufeld, *The Rocket and the Reich*, 73-109.

[41] On some elements of Peenemünde's expansion, see the previous chapter. For a more detailed discussion, see Neufeld, *The Rocket and the Reich*, 41-143, and Neufeld, "Hitler, the V-2 and the Battle for Priority, 1939-1943," *The Journal of Military History* 57 (July 1993), 511-538.

[42] Margit Szöllösi-Janze and Helmuth Trischler, eds., *Grossforschung in Deutschland* (Frankfurt am Main: Suhrkamp, 1990), 13.

increasingly harsh demands upon its own population. What convinced them that this was the right thing to do?

Many postwar memoirs and histories of Peenemünde attempt to argue that the specialists on the base retreated into a sort of "inner migration" and became narrowly focused on their work.[43] According to this line of reasoning, no other considerations played a part in their daily lives. To the extent that they conceptualized their work at all, they thought of it in terms of its ability to send humans to space. This argument has become a central part of the myth of Peenemünde that was built up by the former Peenemünders and their supporters in the years after the war.

The essential fault with this interpretation is that it ignores much of the larger intellectual milieu in which the Peenemünders traveled. Closer to reality is that the military purposes of their work were clear and were embraced by nearly everyone. The terms in which their work was cast by regime authorities meant that employees at Peenemünde were confronted almost daily with the military, nationalist, and ideological implications of their work. In what ways did this confrontation occur? Did it have an important effect on the patterns of life and work at the base? Did it shape how the Peenemünders viewed themselves or their work? Rather than argue, as many defenders of the Peenemünde community have in the past, that their technological work was inherently apolitical, it is more useful to examine how their technological work was reconciled with the politico-military aims of the regime.

[43] See, for example Wernher von Braun, "Behind the Scenes of German Rocket Development," Wernher von Braun Papers, Space and Rocket Center, Huntsville (SRCH). "Inner migration" is a term first coined by Alan D. Beyerchen in his important, but now dated book, *Scientists Under Hitler: Politics and the Physics Community in the Third Reich* (New Haven, CT: Yale University Press, 1977).

In the first place, more innocent considerations, such as space travel, were secondary or even unimportant for many Peenemünders. Indeed, wind tunnel specialist Peter Wegener wrote that "During my time at the Baltic, I never heard a single remark about spaceflight ... No one ever mentioned in my presence that the A-4 would be a stepping stone toward a moon flight. In my several meetings with von Braun, he never suggested this possibility, even in small social gatherings."[44] Wegener's remark is, admittedly, not common. Certainly, it is reasonable to expect that some people at Peenemünde did speak quietly of spaceflight. However, Wegener's admission offers an important corrective to the master post-war narrative, which would have observers believe that whispered conversations about moon rockets and plans for sustaining people in space occurred on a daily basis. Rather, the rule of the day was in fact much less humanitarian: to create an operational ballistic missile in the shortest time possible in order to defend the regime and the nation that made their work possible. All other considerations disintegrated in the face of this one task. According to their military leaders, the Peenemünders' work would allow them to play a central role in Germany's very struggle for survival. The military authorities at Peenemünde made this clear in no uncertain terms. For them, Germany was a victim in this conflict, fighting a misunderstood war against the Bolshevik menace to the East that would have subjugated and enslaved Europe if Germany had not acted. The Peenemünde engineers were in the vanguard of the defense of their nation. Indeed, their work was of paramount importance for the security not only of Germany, but for all of Europe.

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[44] Wegener, *The Peenemünde Wind Tunnels*, 41-42.

This essential belief is borne out most clearly in an address that Dornberger gave in the middle of June 1943 to nearly 6500 German employees and soldiers assigned to technical work at the missile base shortly before they were to begin full-time operations. His speech took place in the massive main assembly hall of the production plant, and only Germans were permitted to attend. All foreign workers were expressly excluded from the gathering.[45] The address contained a heady, self-serving mixture of militaristic nationalism, technological triumphalism, Nazi ideology, and paternal advice that reveals not only how deeply Dornberger espoused many of the more aggressive features of National Socialism, but also the light in which working at Peenemünde was cast by authorities who sponsored the project. It is worth examining at length both because of its ideological tone as well as the fact that it illuminates the context in which the Army sought to place the work at Peenemünde. It also makes clear that success at Peenemünde was founded on a mixture of factors that, a robust dose of ideology aside, were not necessarily unique to the German experience at the facility.

The General began his long address by offering his assessment of why Germany was involved in the war. In a manner typical of Nazi propagandists across the country, he explained away German belligerence by painting the country as the victim of Soviet plans to cast all of Europe under the Communist yoke. The Soviet Union, he held, arose on the strength of an industrial sector that exploited and degraded its workers as mere "beasts of burden" [*Arbeitstieren*]. The workers of Europe, he implied, were next. Painting his nation as the bulwark against Communist aggression in Europe, he argued that "It is henceforth the task of the German

[45] Stichworte für den Betriebsappell, FE 833, NASM.

armaments industry, which is organized for Total War, as well as the coordinated Europeans [sic – *gleichgeschalteten Europaischen*], to struggle against this foe." Germany, according to Dornberger's logic, was only fighting for security in Europe, "So that our children will have better living conditions than we did, and so that no European state is ever in the position, out of envy or mistrust, of plotting a war of all against all." Assuaging his audience's potential fear of the Red Army, which only three months earlier had crushed the Sixth Army at Stalingrad, a blow from which the *Ostheer* would never recover, he boasted, "Militarily, we are absolutely superior to all of the soldiers of the world, especially the Russians. Just ask our soldiers on the Eastern Front, and they will confirm it."[46] There can be no doubt that many high-ranking officers in the Army had a long and established fear of the Soviet threat. Even so, Dornberger's remarks reveal the depth to which the chief administrator of Germany's missile program bought into this fear of communist aggression and internalized the National Socialist message. Like so many others, he never once considered that the tide of war had irrevocably turned against his country. Dornberger sought to instill the idea that the V-2 would see to it that Germany's fortunes never waned.

Germany as a nation of victims was an old canard in the Nazi propaganda machine. Army leadership had also long since bought into the notion, exploited heavily by the Nazis, that Germany was the victim of ruthless foreign enemies who unceasingly sought the prostration of their nation. As a career soldier and influential officer in the armed forces, Dornberger had worked tirelessly to overcome the limitations of the Treaty of Versailles and then restore Germany to what he perceived

[46] Dornberger, Betriebsappell am 18.6.43, p. 1, FE 833, NASM.

to be its rightful place as the most powerful nation in Europe. Moreover, as an engineer, Dornberger wholeheartedly believed that his profession must play an important role in this effort.

Turning to the tasks before the German engineering community, especially those at Peenemünde, Dornberger emphasized their importance in the current struggle. "They [Germany's enemies] want to come," he challenged. "Well let them come. We will give them a proper reception. So that we can do so, so that we can pay them back for all of the damage they have done to Germany and the European nations, it is essential that the German armaments industry works continuously in order to put the best weapons in the hands of the best soldiers in the world." German engineers and workers "Must through action prove every day that they, as outstanding representatives of the German nation [*Volk*], acknowledge our nation's claim to leadership in Europe."[47] Much like the Nazi propaganda regarding technology that became so prevalent in the 1920s and '30s, Dornberger celebrated the engineers' unique contribution to strengthening German society.[48] The value of the engineer lay in his ability to provide the nation with the technological muscle it needed to fend off its enemies and bring about final victory over them. He exalted the engineers as the vanguard of this endeavor. Constructing the missile was to be the centerpiece of such an effort.

For Dornberger, the work of those at Peenemünde "plays a decisive role" in the struggle. Returning to his theme of Germany as the victim of foreign aggression in order to emphasize the Peenemünders' importance in the nation's efforts, he

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[47] Ibid., p. 2.
[48] See esp. Herf, *Reactionary Modernism*, and Karl-Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Düsseldorf: Droste Verlag, 1974.)

emphasized the destruction that the Allied bombing campaign spread across Germany. "We wish to pay the English back for the terrible sorrow that they have caused to our country, especially our women and children, through their terror attacks," he declared. The missile was particularly valuable because it would allow Germany to do this without risking "precious German blood" in the crew of an airplane.[49] In this war "for the very existence of the German nation [*deutschen Volkes*]," all other concerns were secondary. Dornberger implored the Peenemünders to set aside all of their personal desires and concerns so that their work in the name of the nation could be quickly completed. "We must do our utmost in the unshakeable belief that we can bring our new technology into operation as soon as possible," he exhorted.[50]

Dornberger's call for sacrifice then turned to the conditions themselves at Peenemünde. He pointed out that the Army provided the Peenemünders with "the archetype of a National Socialist factory," complete with "the most modern technical and social considerations." Dornberger informed them that Peenemünde's leadership had done everything it could to set up a facility in which so many people could come together and work efficiently and enthusiastically on the missile. He would, he announced, do everything in his power to ensure that conditions remained that way. However, he also warned that "I will ruthlessly come down on those who believe, to the detriment of the employees, that their own interests come ahead of the project."[51] Since the Army had provided for all of the cares that the Peenemünders could possible have, Dornberger felt that there was no excuse for them to concentrate on

[49] Dornberger, Betriebsappell am 18.6.43, p. 2, FE 833, NASM.
[50] Ibdi., p. 3.
[51] Ibid., p. 4.

anything other than the tasks provided for them. As the "archetypal Nazi factory" (complete, he neglected to mention, with foreign slave labor), the production plant made high output possible by ensuring that workers there were well-compensated financially, socially, and culturally.

Dornberger then took the opportunity to remind the Peenemünders of the demands that would be made on them because of the unique situation in which they worked. The most important of these was the demand for secrecy. Dornberger warned the employees that "You must remember that every thoughtless word you speak about our work here, about our results, about our goals, can come to the ears of the enemy." He directed the Peenemünders to actively police themselves for secrecy violations, stating that "You yourselves are the best custodians of secrecy … Strike the gossipers on their big mouths [sic. – "*Schlagt den Schwätzern aufs Maul*"]. Get them on the hook and report them for punishment."[52] Loose lips, the general cautioned, could cost not only their own lives, but also the lives of their families and coworkers. A spy could be anyone that they did not know, according to Dornberger, especially if he or she asked too many questions. The general then gave the assembled group an ominous warning about the risks they ran if they defied secrecy regulations: "Apart from the danger of the enemy, you also run the risk of being arrested and spending the rest of your days dressed in black and white as a prisoner. Be assured that in such a case, I will have no mercy."[53] This threat to imprison in a concentration camp, with no chance of release, those who broke secrecy regulations, is totally ignored in all of the post-war memoirs and hagiographies of the "rocket

[52] Ibid., p. 4.
[53] Ibid., p. 5.

team." It is perhaps the only direct surviving statement of the coercion that the program's senior military leadership engaged in to protect their project. Dornberger clearly had no objection to the use of force within the increasingly oppressive police state. Though Himmler's SS would steadily assert control over the missile program later in 1943 through the end of the war, Dornberger made this threat independently of any ideologically motivated police organization or directive from the regime. His remark betrays a certain ruthlessness that he increasingly became willing to employ in order to see the project through to its conclusion. It also foreshadowed his willingness to cooperate with the SS to use even more brutal tactics to get the rocket into mass deployment.[54] Finally, it exposed the Peenemünders even further to the violence, brutality, and capriciousness of the regime. As the Damoclean Sword of imprisonment in a concentration camp increasingly hung over their own heads, they would go on to become even less concerned with humanitarian considerations in the completion of their tasks. When concentration camp manpower became the primary means of production, threats such as Dornberger's only made more extreme and violent methods of punishment an increasingly conceivable option for all employees, and the victims of this punishment were inevitably the prisoners themselves.

The General, now in full form, then turned to what it would take to bring their project to a successful conclusion. Reminding them again that the nation was in the midst of total war, he explained that such times required every individual's last effort. To overcome the inevitable frustration, exhaustion, and human difficulties that would come with this work, he turned to what was fast becoming the Nazi regime's primary solution to the increasingly intractable problems facing the nation in the war. "The

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[54] I examine the details of this cooperation more fully in chapter 4.

will," Dornberger lectured, "is always the best medicine. Total war demands total action from everyone."[55] Every last minute of work time must be dedicated to the work at hand. Employees at the facility "must be the bearers of the unshakeable belief in our success. You must fill the newly arriving employees with your spirit and inspire them with your acts." He implored individuals to notallow their minds drift to matters other than their tasks and to focus completely on their work in order to turn out the best missiles possible. "He who is careless," Dornberger remarked, "works for the enemy."[56] After his warning to the employees about what would happen to them if they did indeed work for the enemy, the meaning of this comment was no doubt perfectly clear.

Dornberger spent the rest of his long speech going over more limited, practical issues. For example, in addition to telling employees to take care to avoid accidents and to keep work areas clean, he also warned employees not to smoke in the very old forest surrounding the factory because of the risk of fire destroying the installation. Men were also to keep their hands off of the women who would be working there. Of note, however, he went out of his way to inform them that in the factory, rank was irrelevant. Only factory expertise mattered. In addition, he noted that in this, the fourth year of the war, they had to reckon with the use of foreign labor, concentration camp prisoners, and prisoners of war. "Lead them in their work," Dornberger advised. "Show them what a German can do. But do not engage in any chicanery with them."[57] He categorically forbade the Peenemünders from mistreating prisoners. However, notably absent from this portion of the speech was

[55] Dornberger, Betriebsapell am 18.6.1943, p. 7, FE 833, NASM.
[56] Ibid., p. 6.
[57] Ibid., 8-10, 13.

any threat of action against any individuals who did indeed act poorly with regard to the prisoners. In the event, virtually no one did, though incidents between civilian employees and concentration camp prisoners would increase later in the war at the underground factory Dora-Mittelbau.

Nearing the end of his speech, Dornberger attempted to spell out the importance of the achievements at Peenemünde. “My comrades!” he cheered, “What has been produced in the last few years here at Peenemünde is a part of history. If at some point, the history of the technology of the war is written, a special place in it will be devoted to our influential work here.”[58] German soldiers, he stated, were doing their part. Those at Peenemünde, he argued, were obligated to give them their best efforts. “Our only task is and remains to help to victory the man who for centuries of German history has been appointed to make the German nation free.” He finally closed his speech with a crescendo of “Sieg Heils” to “Our Führer and Supreme Commander.”[59]

There is no evidence that indicates the reactions of those Peenemünders who heard or heard about Dornberger’s speech. However, one can plausibly argue that it had the desired effect of bolstering their dedication, for whatever reason, to the success of the program. Dornberger’s speech skillfully blended traditional German patriotism with Nazi ideological motifs while also highlighting and reinforcing many of the unique factors that made missile development so successful at Peenemünde in the first place. By emphasizing the path-breaking nature of their work as well as its singular importance to the war effort, all while playing on the popular fear of the

[58] Ibid., 15.
[59] Ibid., 16.

Soviet Union and the disdain for the Western Allies for bombing their cities into rubble, Dornberger had composed a powerful message that would certainly appeal to many Peenemünders. Their novel and important work made them a part of the hallowed group of people working to “make Germany free.” Moreover, Dornberger’s carefully worded speech made it clear that the regime had done all it could to make their lives as comfortable and as favorable as possible, and now it was up to them to make sure that they did their utmost to defend the benefactors of their work. Betraying the government’s trust or giving anything less than their full dedication would result in swift and harsh official reaction.

Even so, Dornberger’s plea for the engineers to immerse themselves in their tasks proved unnecessary. Their dedication to this project, his entreaties aside, was second to none. Those whose dedication faded or who never fully committed themselves to the work in the first place found themselves either removed from their positions rather quickly and transferred to tasks that required less of them or working in positions of much stricter supervision. Dornberger’s speech, in addition to illustrating his depth of dedication to many Nazi ideals, highlights nearly all of the factors that established this dynamic at Peenemünde, from strict adherence to secrecy, dedication to patriotic goals, and the singular feeling of professional importance among the employees, that made the work at Peenemünde so successful.

Dornberger’s sentiments had fertile ground among his subordinates. Earlier in 1943, his Chief of Staff for liquid fueled rocketry, Lieutenant Colonel Georg Thom, composed a report, passed to high ranking military authorities as well as to Peenemünde management, entitled “Das Gerät A-4 im totalen Krieg” (The A-4

Instrument in Total War). In it, Thom emphasized that in total war, all means of achieving victory should be attempted and that all weapons, no matter what the cost, were important tools for achieving this goal. He argued that "In modern war, the necessary types of weapons can no longer be made dependent on their cost of construction and manufacture, on the more or less great number of front line and rear echelon troops that use them, or on correctly marshaling these weapons and soldiers – *they depend alone on the toughness and morale of the opponent and on the singular will to strike down the enemy through the employment of all means of war* [*Kriegsmittel*] *and all of the reserves of the nation* [*Volkes*] … *The most important factor is the will* [*to embrace*] *the totality of war!*" [emphasis in original]. Thom went on to argue total war meant precisely what it implied, that every means of winning must be tirelessly brought into operation in order to ensure victory. He blamed Germany's loss in World War I not on any shortage of "inventor spirit," but on the unwillingness of military leaders to embrace all of the possibilities that this spirit could conceive. Moreover, Thom held that missile operations against England were important not only because they saved German lives and valuable raw material (sic!), but also because "In smashing the English nerve, the A-4 is far superior to the airplane." He concluded by writing that "In this decisive hour, Germany cannot be strong enough!"[60]

[60] Georg Thom Report, "Das Gerät A-4 im totalen Krieg," RH8/v.1231, Bundesarchiv/Mitlitärarchiv (BA/MA). Thom disingenuously argued that the loss of one bomber was equal to the loss of ten single-use missiles. While there can obviously be no price on the lives of the bomber crew members, the resources, expense, and man-hours dedicated to missile operations, from development through mass production and deployment, were astronomically higher than bomber operations and of far less strategic value.

Thom's report, then, made a number of issues clear. Those taking part in the fighting, including, he implied, armaments engineers on the home front, must not spare any energy in their quest for victory. Total war was ruthless, violent business that depended more than anything else on the will of the nations fighting it. Though all weapons were important for this effort, it was in this area, that of the national will to fight a total war, that the missile was particularly important. Specialists at Peenemünde must be willing to develop a weapon that in its surprise and indefensible application would destroy England's desire to fight on by raining unstoppable destruction on its cities (Thom's report included a hand-drawn illustration of a burning city quarter). Thom placed the Peenemünders' activities squarely in the middle of the total war effort. Their will to go to these lengths, he implied, would result in the utter defeat of their enemies.

Thom's report also clarified the context in which the Peenemünders were working. Clearly, they were building what was envisioned by their Army masters as an important, if not decisive weapon that, in its operation against civilian targets, pointed the way toward victory in total war. His report, Dornberger's speech in the assembly hall, and other evocations of this sort helped cement what anthropologist Hugh Gusterson has in, his work on the Lawrence Livermore Nuclear Laboratory, called the "central axiom" of life at the facility.[61] At Peenemünde, this central axiom was that the specialists were there to produce a weapon to defend their nation, even Western civilization, against enemies who were bent on destroying it. This was at the heart of their reason for being on the base. All other concerns were unimportant.

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[61] Hugh Gusterson, *Nuclear Rites: A Weapons Laboratory at the End of the Cold War* (Berkeley, CA: University of California Press, 1996), 56.

Dornberger's and Thom's sentiments may, on the surface, appear to be nothing more than mere nationalist and even ideological propaganda parroted from Goebbels for the benefit of the program's masters in the government. Even if there is some truth to this, their statements still established a particular milieu in which the Peenemünders operated. Clifford Geertz has perceptively pointed out that with enough use, powerful ideological messages can easily be adopted into widespread utilization and become interpreted as a given, or, in other words, as common sense. He writes, "Common sense is not what the mind cleared of cant spontaneously apprehends; it is what the mind filled with presuppositions concludes."[62] Part of the experience of being a Peenemünder was coming to understand the significance that this central axiom played in establishing a framework for all other activities by fostering the presupposition that working on the missile to defend the nation and regime was the sine qua non of their professional lives. Indeed, events such as Dornberger's speech helped to transform ideological drivel into simple truths for the Peenemünders.

There is, of course, some question as to whether the Peenemünders truly believed in this axiom and its ideologically loaded message. Admittedly, there are no extant German documents that directly indicate their belief in this notion. However, former Peenemünders Peter Wegener and Dieter Huzel acknowledged that it was an important, if unspoken assumption that their work was absolutely central to the survival of the nation. Wegener wrote that "Whatever personal opinions might have been held by individuals, the support of the war effort was uncritical: the technical work had to be done in the shortest possible time."[63] Huzel, whose memoir tends to

[62] Clifford Geertz, *Local Knowledge* (New York: Basic Books, 1983), 84.
[63] Wegener, *The Peenemünde Wind Tunnels*, 41.

whitewash the activities at Peenemünde much more than Wegener's, explained with candor that the most important factor motivating their work "was the realization that the job was critical to the war effort, and that a long working day was merely a nuisance compared to the hardships endured by others."[64] Wind Tunnel Chief and local party leader Rudolf Hermann stated "Sure, already in Germany during the war, we were only concerned about getting a weapon ready for the war, nothing else."[65] In 1972, in an effort to justify his actions and to distance himself from what he called the "misuse" of his work, von Braun offered,

> I deeply and sincerely regret the victims of the rockets [sic]; but there were victims on both sides. I repeatedly raised protests against the misuse of the rockets as tools of destruction. But war is war, and since my country found itself at war [*und da mein Land sich im Krieg befand*], I had the conviction that I did not have the right to bring moral criteria into the matter. My obligation was to help win the war, whether I had sympathy for the government or not. I had none.[66]

Perhaps Von Braun truly did not, as he claimed, have any sympathy for National Socialism. Even so, he made absolutely no protests about the use to which he was being put. Worse, his argument about the victimization Germany reflected the rhetoric in which Nazis and their sympathizers (such as Dornberger) cast the reasons for war, and would be echoed nearly fifteen years afterwards by right wing historian Andreas Hillgruber in his book *Zweierlei Untergang* (*Two Kinds of Ruin*), a work that earned Hillgruber the opprobrium of most of the historical community.[67] It reveals

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[64] Huzel, *From Peenemünde to Canaveral*, 84.
[65] "The Memoirs of Rudolph Hermann," 18, UAH.
[66] Bob Ward, ed, *Wernher von Braun Anekdotisch* (Esslingen: Bechtle Verlag, 1972), 31.
[67] See Andreas Hilgruber, *Zweierlei Untergang: die. Zerschlagung des. Deutcshen. Reiches und das. Ende des europaischen Judentums* (Berlin: Siedler, 1986). Hillgruber relativized the Holocaust by comparing the massacre of European Jews favorably with Stalin's use of resettlement camps as well as Germany's own ruin (*Untergang*) and victimization at the hands of Allied forces. This work

how deeply the rhetoric of victimization penetrated the consciousness the Peenemünders, even almost thirty years after the fact. According to von Braun, Germany had passively "found itself" at war, rather than having actively and unilaterally embarked on war. Germans were in every way equal victims of the war as their enemies.[68] His understandable, but reflexive, patriotism and nationalism only fed the Nazi rhetoric, and he became fully imbued with Peenemünde's central mission of unquestioned service to the state.

Clearly therefore, the Peenemünders did not simply dismiss rhetoric such as Dornberger's and Thom's. Certainly, some questioned the assertions that the V-2 was as decisive a weapon as regime authorities argued, but even these thoughts were largely kept private.[69] Documents such as Thom's held out the promise of the continuation of their unique social and professional existence while drawing on National Socialist ideological tenets justify their work. Even if some Peenemünders thought dependence on the missile was tactically and technically misguided, they nevertheless reflexively held that the work was central to their nation's survival. Many at Peenemünde embraced this message, and it became axiomatic that missile development and production in the midst of total war played an essential part in helping Germany defeat its enemies, and therefore must completed as quickly as possible.

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contributed to the uproar already created by Ernst Nölte in his controversial article in the *Frankfurter Allgemeine Zeitung*, "Vergangenheit die nicht vergehen will," June 6, 1986. The works touched off a furious debate in Germany over the nature of German historical understanding and German self-conceptions. For the best discussion of this *Historikerstreit*, see Charles Maier, *The Unmasterable Past* (Cambridge MA: Harvard University Press, 1988).

68 Von Braun made no mention of the Jews, but he presumably was including them as well.

69 Wegener, *The Peenemünde Wind Tunnels*, 43.

There is also postwar evidence to suggest that the Peenemünders agreed with Dornberger's general rhetoric about the supposedly heroic position occupied by Nazi Germany in the world order. In June 1945, shortly after the German surrender, many of the leading Peenemünders, including von Braun, Dornberger, Riedel III, and many others, were in the custody of the U.S. Army. They were held at Garmisch-Partenkirchen, near the Austrian border, awaiting transfer to technical positions in the United States, a project termed Operation Overcast, which later became Project Paperclip. Second Lieutenant Walter Jessel of the Army's Military Intelligence Service (MIS) conducted a security check of the personnel and wrote a report that in part assessed the Peenemünders' political and security liabilities. Jessel's report indicates that the specialists actually did internalize the political messages that they received during the war. He wrote that among the Peenemünders in Garmisch-Partenkirchen, "There is almost nowhere any realization that there was something basically wrong with Germany's war or the employment of V-weapons." The Peenemünders refused to acknowledge German responsibility for starting the war, preferring instead to view their nation as a victim of foreign aggression. Nor did they have any compunction about using their work for destructive purposes.[70] This observation by Jessel was completely and conveniently forgotten by the Peenemünders after they came to the United States to begin their work. No memoirs, interviews, or histories written after the war by their enthusiastic and blinkered supporters raise the issue of war guilt, while nearly all of them point to some degree of regret that their rocket was employed as a missile. Closer to the truth is that even

[70] Osborne to Army Chief of Staff, G-2, USFET, Appendix A, Walter Jessel, Special Screening Report, 10/29/45, RG 260, OMGUS/FIAT, Box 8, folder 47.94, NARA. My thanks to Mike Neufeld for bringing this document to my attention.

the less ideologically pre-disposed Peenemünders were thoroughly imbued with the Nazi rhetoric of victimization and were unapologetic about the goals toward which they worked during the war.

Moreover, Jessel pointed out that nearly all of the missile specialists were convinced that war between the U.S. and Soviet Union was "around the corner." Jessel wrote that "They shake their heads in amusement and some contempt at our political ignorance and are impatient at our slowness in recognizing the true saviors of Western Civilization from Asia's hordes."[71] Undoubtedly, many Peenemünde specialists bought in to the aggressive anti-communist rhetoric spewed by Dornberger and prominent party ideologues during the war. Of course, anti-communism is not a crime, but to characterize the unequaled slaughter conducted by the Nazi regime as a service to western civilization is, to the outsider, a blatant and base misconstruction of the facts and an affront to the memories of the victims of Nazi aggression. On the other hand, to Peenemünders, this was simply the articulation of the central axiom of their former institution, which was an outgrowth of vicious National Socialist rhetoric about communists, Slavs, and Jews. Dornberger's anti-communist message and Thom's call to embrace total war inculcated and reinforced Peenemünde's central axiom, borne of Nazi rhetoric, that missile development and production was essential to the survival of the German nation. This powerful ideological message became an undisputed, unquestioned fact at Peenemünde.

Life in National Socialist Germany was permeated with ideological messages designed to imbue its citizens with the strength, determination, and benefits of Nazi

[71] Ibid. Of the Allies' refusal to acknowledge the "service" Germany supposedly performed for the western world, Jessel also wrote pointedly that this "Does not prevent them from playing with the idea of selling out to Asia's hordes if such recognition is not soon extended."

governance and the malevolence, corruption, and immorality of Jews, Slavs, Communists, and others. The Goebbels propaganda machine, in its tireless effort to manufacture and maintain consensus among the German population, ensured that these ideas were inescapable.[72] Their efforts were largely successful. Avraham Barkai writes that "Seven or eight years of fanatical ideological indoctrination and concrete visual instruction in racial matters could befog the consciences of millions of Germans and corrode their moral inhibitions."[73] Jessel's report indicates that important segments of Peenemünde's professional community were not immune to the ubiquitous barrage that the Propaganda Ministry and others on the base itself regularly poured forth. The National Socialist and ideological components of life at Peenemünde, therefore, cannot be ignored.

In the first place, the percentage of people at Peenemünde who were members of the Nazi Party was remarkably high, compared to Germany overall. Many of the heads of administrative divisions and sections at Peenemünde, including Braun, were party members.[74] A substantial number of them showed some likely form of ideological commitment to party principles before or during 1933. Arthur Rudolph

[72] On the scope and effectiveness of propaganda during the Nazi period, see David Welch, ed., *Nazi Propaganda: The Power and Limitations* (Totowa, New Jersey: Barnes and Noble Books, 1983), Ian Kershaw, *The Hitler Myth: Image and Reality in the Third Reich*, 2nd Edition, (New York: Oxford University Press, 2001). Martin Broszat also long ago offered a convincing explanation that "social motivations" bonded the German population to Hitler and the Nazis. See Martin Broszat, "Soziale Motivation und Führer-Bindung des Nationalsozialismus," *Vierteljahreshefte für Zeitgeschichte* 18 (1970), 392-409.
[73] Avaraham Barkai, "The German *Volksgemeinschaft* from the Persecution of the Jews to the 'Final Solution'," Michael Burleigh, ed., *Confronting the Nazi Past: New Debates in Modern German History*(New York: St. Martin's Press, 1996), 96.
[74] Though Army and regime officials reorganized Peenemünde's administrative structure several times, it generally retained the same core group of administrators involved in both development and production. For the various permutations of the facility's administrative structure, see Neufeld, *The Rocket and the Reich*, 285-288. See also administrative charts in files AV7/85, Bd. 33, BStU and RHE 28/83 USA, Bundesbeauftragte für die Unterlagen des Staatssicherheitsdienstes der ehemaligen Deutschen Demokratischen Republik (BStU).

joined the Nazis in June 1931, well before their seizure of power. Rudolf Herrmann, the brilliant head of the Aerodynamics Institute who worked previously at the Technical University at Aachen, joined the SA in 1933, as did Kurt Debus, the future head of operations at Test Stand VII (used for launch tests), becoming a member of the SS in 1940.[75] Herrmann was also the branch leader of the local party office on Usedom from 1941 until his departure in 1943. Hans Lindenberg, one of Thiel's deputies in the propulsion section, entered the party in 1934.[76] Six, Braun among them, entered the Party in 1937 or later, but at least one of these, longtime rocket enthusiast Walter "Papa" Riedel, first voted for the Nazis in 1933.[77]

Though a lack of documentation and the shifting numbers of employees at the base make it difficult to arrive at firm statistical conclusions with any surety, generally speaking, party membership among leading Peenemünders was higher than the average in Nazi Germany. One helpful source for making this determination originated after the cessation of hostilities. In late 1945, 84 technical specialists from Peenemünde filled out background forms after being shipped to the United States by Army authorities. These forms provide a wealth of data on the specialists' education, family background, and political affiliation. Though party membership is not always a good indicator of ideological commitment, it at least provides a rough guide to the

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[75] Arthur Rudolph Dossier, RG 319, Records of the Army Staff, Counter Intelligence Corps (CIC), Records of the Investigatory Records Repository (IRR) [hereafter cited as IRR], box 636, NARA. Rudolf Herrman Dossier, RG 319, IRR, Box 279, National Archives and Records Administration (NARA). Kurt Debus SS Officer Dossier, Roll A3343-RS-A5426, RG 242, NARA. Debus lied to Allied investigators after the war about his SS past, claiming that he was merely an SS candidate. See his Basic Personnel Record, RG 165, Records of the Army Chief of Staff, G-2, Intelligence Division, Captured POW and Material Branch, Enemy POW Interrogation File, 1943-1945, Box 703, Folder "Boston," NARA. From July 1962 to November 1974, he was the first director of the Kennedy Space Center, overseeing the Mercury, Gemini, and Apollo programs.

[76] Hans Lindenberg Basic Personnel Record, RG 165, Box 703, Folder "Boston," NARA.

[77] Erich Ball, Gerhard Reisig, Ernst Steinhoff, Bernhard Tessmann Basic Personnel Records, RG 165, Box 703, Folder "Boston," NARA. Walter Riedel Dossier, RG 319, IRR, Box 371, NARA.

extent to which Peenemünde scientists, engineers, and technicians were willing become fellow travelers with the party. The numbers bear out their general affinity for National Socialism. Forty-three of these men, or 48%, indicated that they were formerly members of the Nazi Party. Of this number, eleven joined before or during 1933. Twenty-one entered the party between 1937 and 1939, and eleven joined after the outbreak of war, including three who joined in 1942 or later. Of the forty-one who were not party members, nine (22%) admitted their membership in organizations that had strong elements of Nazi ideology, such as the National Socialist Students' League, SA, or SS.[78]

One instructive example is that of Anton Beier, an engineer employed at Peenemünde between 1938 and 1945. Born in 1906 in Upper Silesia, Beier earned an engineering degree at the Mittweids Technical College in Saxony and in 1930, landed a job with the municipal utilities in the town of Ziegenhalls, in Upper Silesia. However, in 1932, Beier lost his modest job to the Great Depression and spent approximately a year on the unemployment lists. However, 1933 proved to be a pivotal year for him. In March, Beier embraced the Nazi movement, which was flushed with victory after Hitler's recent appointment to the Chancellor's post. In addition to joining the party, according to his background questionnaire, Beier also enrolled in the SS, where he would eventually rise to the rank of *Scharführer* (Staff Sergeant). His employment fortunes changed as well. He found a job with the customs office in Neustadt in Upper Silesia that paid him a modest 4800 Reichsmarks

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[78] See the collection of background dossiers in RG 165, Records of the Army Chief of Staff, G-2, Intelligence Division, Captured POW and Material Branch, Enemy POW Interrogation File, 1943-1945, Box 703, Folder "Boston," NARA. This file does not include information on Wernher von Braun, who was both a Nazi party member (1937) and member of the SS (1940). Thanks to Mike Neufeld for pointing out this collection to me.

per year. After four years in this office, he moved on to work for the Weigel Werke corporation, which specialized in the planning and installation of breweries. After a year with the Weigel Werke, he applied for and received a job at Peenemünde, working as an engineer in charge of installing test stands. According the Weigel, his work at the facility paid him a very respectable 9600 Reichsmarks per year.[79]

Beier's case is typical for many technical professionals throughout Germany in the early 1930s. He was the victim of the crushing economic conditions in the country during this period, losing his relatively low-paying position and spending a substantial amount of time among the ranks of the unemployed. At the same time, he was receptive to the strident appeals of the Nazi party and joined its ideological vanguard, which among other things, promised to raise the nation out to of the swamp of the depression while glorifying the important work of the German technical professionals. In the ten years between 1933 and 1943, his salary more than doubled, he found a prestigious job of major consequence, and he assumed a position of importance in his nation's most elite cadre of Nazis. Beier had handsomely benefited not only from Hitler's rapid rise to power, but also from the Führer's aggressive rearmament efforts in which the missile program would assume a central place.

Clearly then, a disproportionate number of party members held important positions in the management strata of the facility. This was due to a number of different factors. Many of these, however, had to do with the larger demographic factors at work in Germany in the early twentieth century. Upper-level civilian managers at Peenemünde had many characteristics in common. Most, like Beier,

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[79] Anton Beier Basic Personnel Record, RG 165, Box 703, Folder "Boston," NARA.

emerged from the same age cohort, born between 1900 and 1914.[80] The young men born in these years experienced profound crises of war, revolution, and economic collapse. Their educations in the turbulent academic climate of the 1920s and 1930s tended to encourage their support for National Socialism. German universities, especially in the postwar years, bred a virulent political radicalism that excoriated democracy and saw the solution for Germany's problems in extreme right-wing politics. Many in this "generation of the unbound" quickly became disillusioned with both traditional and republican institutions of authority and found in National Socialism a vibrant third way.[81]

Additionally, the majority of these men, von Braun an obvious exception, came from middle class or lower middle class backgrounds. In the economically lean years between 1918 and 1933, many of them undoubtedly felt themselves at the mercy of forces beyond their control. The emphasis placed by Nazi ideologues on the value of technology and the technological professions, hitherto disdained by the "old order" of conservative elites and "exploited" by the new order of capitalists and industrialists, encouraged young technical specialists to offer their support to a party that welcomed their particular talents and promised them a place of high esteem.[82]

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[80] Personnel dossiers indicate that 68 of the first 102 specialists from Peenemünde and Mittelwerk were born between 1900 and 1913. A further 25 were born in the years of World War I.
[81] Michael Wildt coins this term in his recent and excellent book *Generation des Unbedingten: Das Führerkorps des Reichssicherheitshauptamtes (Hamburg: Hamburg Edition, 2002).*
[82] On universities and National Socialism, see, for example, Fritz Ringer, *The Decline of the German Mandarins: The German Academic Community* (Hanover: Wesleyan University Press, 1969, reprinted1983); Jonathan Harwood, "The Rise of the Party-Political Professor? Changing Self-understandings among German Academics, 1890-1933," Doris Kaufmann, ed., *Geschichte der Kaiser-Wilhelm Gesellschaft im Nationalsozialismus: Bestandsaufnahme und Perspektive der Forshung* (Göttingen: Walstein, 2000), 21-45; Steven Remy, *The Heidelberg Myth: The Nazification and Denazification of a German University* (Cambridge, MA: Harvard University Press, 2002). On technology and National Socialism, see Karl-Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Düsseldorf: Droste Verlag, 1974); Jeffrey Herf, *Reactionary Modernism: Technology, Culture, and Politics in Weimar and the Third Reich* (Cambridge: Cambridge University Press, 1984); Kees Gispen,

Moreover, the National Socialist party was on the dramatic rise in the late 1920s and early 1930s, precisely the point at which many of these individuals would begin to develop an adult political consciousness. The temptation to attach their wagons to a rising political star that made no bones about embracing technological work in the first place proved to be too much for many to resist. Von Braun was asked to join the party and did so out of concern for his job, but he certainly was aware of the possibility that extra favors might be curried through party membership. Finally, many owed their jobs and prosperity to the Nazi rearmament project.

These common socio-economic and political factors were the primary forces in encouraging their membership in the Nazi party. Most Peenemünders came of age with the Nazi regime and its sectarian hostility to all other sources of political, social, and cultural ideas. Even those who were not red-hot ideologues had no other way of conceiving their role except as to serve the Nazi state. Even if some individuals, such as von Braun late in the war, began to have concerns about the legitimacy of National Socialism, their doubts could barely find expression. They were raised in an environment in which individuals were taught to view the world around them exclusively in the terms cast by the Nazi regime itself.

National Socialism drew many supporters this way. Norbert Frei's important work bears out the fact that Nazi propaganda often found sympathetic ears among the majority of Germans, even those who did not join the party. He shows conclusively that explanations for the success of the regime falter completely unless one comes to terms with the fact that the party was able to produce "powerful socially binding

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Poems in Steel: National Socialism and the Politics of Inventing from Weimar to Bonn (New York: Berghahn Books, 2002).

forces" and forge a durable national unity. The vehicle by which this was most clearly accomplished was the notion of the *Volksgemeinschaft*. Frei argues that in the years between 1933 and 1939 most Germans embraced the idea that life had changed for the better under the Nazis. "A large majority of Germans," he writes, "Really believed in a 'national resurrection' and in their chances of a personal career, in a heroic future, and in a better life for themselves and future generations." During the war years, Frei shows that the Nazis enjoyed a great deal of success in their efforts to build a feeling of social equality among Germany's (Aryan) citizens. These Germans, despite their lack of enthusiasm for the war, showed a profound willingness to sacrifice on behalf of this feeling of national community and the party that forged it. Any remaining doubts melted in the face of early victories. The virtually unimpeded destruction through air attacks later in the war produced a ubiquitous but resigned siege mentality that was based on the commonality of suffering which only reinforced the idea of a "national community."[83] The Nazis' ideological messages had gotten through.

Under these circumstances, the constant barrage of National Socialist ideology could only help but fortify the Peenemünders' will to fight on or to make ever-more sacrifices. Between 1937 and 1943, engineers at Peenemünde would had to have been stubbornly dull-witted, obtuse, and imperceptive to miss the meanings of these

[83] Norbert Frei, "Peoples' Community and War: Hitler's Popular Support," in Hans Mommsen, ed., *The Third Reich Between Image and Reality: New Perspectives on German History* (Oxford: Berg, 2001), 59-75. One of Frei's many useful contributions in this essay is to point out that it is a mistake for historians to underestimate the pull of ideology, no matter how crackpot it may be, among average Germans. In addition, Avraham Barkai argues convincingly that "Traditional hostility towards Jews was deeply rooted in almost every section of the population." This deep-seated anti-Semitism, such a critical part of the *Volksgemeinschaft*, became even more widely accepted by the population at large once it had been elevated by the Nazi Party to a state ideology. See Avaraham Barkai, "The German *Volksgemeinschaft*," 85.

messages in their lives, a condition for which there is absolutely no evidence. The Peenemünders embraced the goals of the institution for which they worked, knowing full-well the purpose and aims of the regime. Though much of this was for reasons that were explicitly non-ideological, the steady drumbeat of National Socialist rhetoric and imperatives was the kernel upon which Peenemünde's central axiom was articulated. Though this identification would be strained in the last eighteen months of the war, the relationship between the regime and missile program proved to be rather durable and sturdy.

On the other hand, access to a comfortable life and the pull of any ideological imperatives still does not fully explain the absolute dedication of Peenemünde's employees to the institution's goals. A third factor in motivating their dedication had to do with the daily professional duties and every day work dynamic at Peenemünde. What were the daily conditions of work on the shop floor at Peenemünde? What factors most impacted the way in which they carried out their work? A project the size of the V-2 program required a careful strategy for utilizing both personnel and material so that neither was wasted in the increasingly competitive and pressurized armaments industry. What was that strategy? The answers to these questions help get to the root of the success of the missile endeavor at Peenemünde.

Working at Peenemünde was by no means an easy assignment. This was due mainly to the intense pressure placed by military authorities on the Peenemünders to produce a viable weapon. As early as September 1939, Dornberger secured an order from Walther von Brauchitsch, the Army's Commander in Chief, which ensured that the A-4 project would be guaranteed access to the resources it needed as the new war progressed. However, in return, Dornberger agreed that the missile would be ready two years earlier, in 1941 instead of 1943.[84] Among the military hierarchy, this immediately raised unrealistic expectations of the weapon's state of readiness, and any delays would cast doubt on the Peenemünders' ability to create a functional weapon by a specific deadline. At the same time, it forced Dornberger to make even greater demands on the Reich's already strained labor and raw materials so that the missile's large production plant at Peenemünde would be ready to go into action when development was complete.[85] In any case, Brauchitsch did not give Dornberger carte blanche. He intended to keep a close watch on the program and demanded quarterly reports from Dornberger on the progress of development.[86] Later that year, Dornberger raised even greater expectations of the development work at Peenemünde, forecasting, in addition to an operational V-2 by 1941, another missile, ready by summer 1941, with a payload of one ton and the extended range of 500 kilometers, and yet another missile with a four ton payload and a range of 800 kilometers, which would be complete by the end of 1943.[87]

Much of the development pressure, then, came from Dornberger himself. These grandiose development plans indicate both a fundamental misunderstanding of the complex problems involved in missile development in addition to a grave miscalculation, made for political reasons, of the advances in rocket technology that could be made in so short a time. By promising so much, Dornberger put his own

[84] Entstehungsgeschichte der Fertigungstelle Peenemünde, 9/6/39, RH8/v.1206, BA/MA. Von Brauchitsch to Dornberger, 9/5/39, FE 342, NASM.
[85] On the battles over the priority of missile production, see Michael Neufeld "Hitler, The V-2, and the Battle for Priority, 1939-1943," *The Journal of Military History* 57/3 (July 1993), 511-538. Neufeld shows that the priority battles over the missile program were fought largely over the production plant and that development was only minimally effected.
[86] Von Brauchitsch to Dornberger, 9/5/39, FE 342, NASM.
[87] Dornberger, Vortragsnotiz, 12/14/39, FE 349, NASM.

engineers under extreme pressure to craft an operational ballistic missile in an impossibly short time. He and his subordinates imposed these deadlines in an effort to maintain official high level support for Peenemünde's activities, which, he claimed, were of surpassing military importance. From the earliest days of the war, missile developers at Peenemünde faced unachievable demands to complete their work and were forced to labor under wildly impractical deadlines that, despite their best efforts, they could never meet.

For example, Leo Zanssen, base commander at Peenemünde, wrote in June 1940 that developers would have the first experimental rocket on the test stand by August 1941, and a test run of twenty missiles would be ready a year later. Zanssen reported that by the end of 1942, the production plant at Peenemünde would be turning out five hundred missiles per year.[88] As it became more apparent that this schedule could not be met, Dornberger ordered his section chiefs to make monthly reports to him so that he would have a better picture of the problems caused by delays in each section.[89] In October 1941, he wrote to the Army General Staff with a revised schedule indicating that development would be completed by the fall of 1942 and that preparations were under way to manufacture as many as 150,000 missiles, if Hitler would only give the order.[90] This was a patently absurd number, given Germany's economic, military, and industrial capabilities. Two months later, Dornberger increased the pressure on the Peenemünde developers by announcing to them that in order to maintain support of the Army higher authorities, the first experimental

[88] Zanssen report, 6/20/40, FE 357, NASM.
[89] Dornberger to Zanssen, 12/16/40, FE 349, NASM.
[90] Dornberger to Koch, 10/11/41, FE 341, NASM.

missile had to be launched by the end of February 1942.[91] After the Peenemünders failed to launch a rocket in that month, Dornberger wrote to Speer that the first test launch would not be attempted until early June 1942.[92]

During and after the war, Dornberger blamed these delays on the varying levels of wartime priority and, therefore, fluctuations in the availability of raw materials and resources given to the work at Peenemünde. The convoluted, ever-shifting government priority rating system for wartime industrial projects alternately ranked Peenemünde as a super-priority project to, during the Battle of Britain, as low as a third level priority.[93] Closer to the truth, however, was that the sheer complexity of the technology was the most important factor in the Peenemünder's inability to meet the shortened deadlines. Designing an engine that could atomize and mix the propellants, feed them into the combustion chamber at extremely high pressure, and produce the required exhaust velocity and thrust, all while cooling the combustion chamber so that it did not explode, was only one of the more daunting challenges facing the designers. Guidance, steering, and supersonic aerodynamics also presented their own seemingly insurmountable obstacles. The first static test model of the A-4 arrived on the test stand in October 1940. A raft of problems kept it there through the middle of 1941. Two other test models were catastrophic failures, spectacularly exploding on the test stand in late October and early November 1941, damaging much of the measuring and launch equipment. In early 1942, another delicate test model slipped out of its corset and crashed to the ground after being tanked with liquid oxygen, the extremely cold temperatures of which caused the fuselage to shrink.

[91] Dornberger Aktennotiz, 12/23/41, FE 728/E, NASM.
[92] Dornberger to Speer, 2/3/42, FE 342, NASM.
[93] Michael Neufeld, "Hitler, the V-2, and the Battle for Priority, 1939-1943," 511-538.

Other problems delayed launch activities until October of that year.[94] Rocket development proved to be a much more difficult and demanding technology to bring into being than anyone among the military or civilian specialists anticipated.

By September 1942, a raft of technical glitches and development errors meant that the rocket had yet to conduct a successful test flight. The absolute failure to meet any of the deadlines assigned by Dornberger only increased the regime's pessimism about the missile. At the end of September, a despairing Dornberger wrote to Peenemünde that Hitler had come to believe that the missile would not be accurate enough to deliver its payload over a long range. Armaments Minister Albert Speer, General Friederich Fromm (the Head of Army Armaments and Commander of the Reserve Army), and Field Marshall Erhard Milch, Göring's deputy in the Air Ministry, also all doubted the success of Dornberger's project. Dornberger admitted that with the current military situation, especially the massive consumption of material on the increasingly worrisome Eastern Front, it was understandable that they bridled at committing so many of their resources to a project whose prospects for success were entirely unknown. He wrote to the Peenemünders that "That fight can be conducted with many great prospects of success if the first successful launch experiment is behind us and the results of this test came quickly one after the other. I now have the impression *that we only have a few months' time* to produce proof of the success of our development, its suitability for factory production, and its usefulness at the front [Emphasis in original]." Dornberger praised the efforts of the developers, but cautioned that regime authorities were not interested in their difficulties. "They are only interested," he continued, "in when we will get how

[94] Neufeld, *The Rocket and the Reich*, 155-156, 158.

many pieces into operation. Only then can they direct the support that a project will give to the life and death struggle of a nation." He went on to request that the Peenemünders pour all of their energy into launching twenty test rockets by the end of December and that they extend their working hours, taking no days off, in order to meet this goal.[95]

Dornberger's behavior regarding the development schedule fits a pattern common to the military-industrial complex in many nations.[96] His predictions of technical performance, at best, overly optimistic and at worst, absurd, betrayed his strong desire, in this case politically motivated, to deliver the promised performance from the missile in an extremely short span of time, despite the fact that no project of this sort had ever been attempted. This phenomenon has been termed "self-efficacy" by psychologists. They argue that modifications and advancements across a variety of endeavors can be motivated by the *belief* that such changes are possible, even in cases in which there is no evidence to indicate that this shift is achievable. Furthermore, self-efficacy is a strong determinant in whether an entity attempts a given task, the degree of persistence when the group encounters difficulties, and the ultimate success of the effort.[97] For Dornberger, the efficaciousness of missile development was never in doubt, prompting the general to make promises that he had no idea how to fulfill. However, consciously or unconsciously, he understood that he would receive no high level support, so essential to the life of the missile project, if he

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[95] Dornberger to Peenemünde, 10/29/42, FE 342, NASM.
[96] Phillip Scranton's fascinating new research on jet engine development in the Cold War, tentatively titled "Fabricating Innovation: Specialty Production in Cold War America," is an excellent example of how self-efficacy theory can be applied to the history of technology.
[97] Anthony Bandura, "Self-efficacy: Toward a Unifying Theory of Behaviour Change," *Psychological Review*, 84 (1977), 191-215. Bandura is the first to conceptualize this theory.

did not make these promises. In essence, it was in large part due to his assurances of the missile's availability and performance that the entire project did not whither on the vine for lack of resources. Nevertheless, there were negative consequences of his strategy.

Developers at Peenemünde clearly felt the strain of Dornberger's demands. Even if Dornberger had not agreed to shorten the deadline for operations by two years and then set overly optimistic deadlines, the Peenemünders likely would have found the work to be carried out under intense circumstances anyway. The difficulties inherent in working in an entirely new field of technology, with its host of unknown problems, made it virtually impossible to accurately predict a date by which testing could be completed and mass-produced missiles could be brought into operation. The General's optimism, politically motivated, but also a sign of his faith in the development engineers, only made matters more difficult. For example, even without Dornberger's plea to extend the employees' shifts, working hours were always relatively long, averaging upwards of twelve hours per day. Nevertheless, the Peenemünders responded to their leader's call, often extending their shifts to 'round the clock work before important tests.[98] Despite the natural difficulties inherent in nurturing a radically new technology through its growing pains and the increased problems created by Dornberger's arguably dishonest development schedule, the development specialists at Peenemünde proved absolutely willing to make sacrifices in order to achieve the goals laid out for them by military and political leaders. Given these demanding goals, pressure to produce successful results was omnipresent.

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[98] Wegener, *The Peenemünde Wind Tunnels*, 20. Georg Tiesenhausen OHI, NASM. Huzel, *From Peenemünde to Canaveral*, 79.

Georg von Tiesenhausen noted that "We worked under colossal strain at Peenemünde."[99] Propulsion specialist Konrad Dannenberg recalled that "There was always a lot of pressure … I certainly felt the pressure."[100] Nevertheless, the Peenemünders showed that they were willing to completely dedicate themselves to their work, and despite the political and military demands made upon them, demonstrated a resilience that spoke volumes about their professionalism and individual dedication to the goals of the missile program.

The seemingly unending technical difficulties and the mounting pressures that came with them drove some of the engineers to the brink of despair. Walter Thiel, the mercurial, fastidious, and absolutely brilliant propulsion group chief, wrote to Braun in early 1943, several months before production would begin, that he was completely exhausted. Thiel was dyspeptic over his inability to make the fuel pumps function reliably and to simplify the design of the fuel injectors. He left Peenemünde for a much needed vacation in March.[101] Despite these problems and many others, the Peenemünders soldiered on. Dieter Huzel put it most succinctly, writing that "If there were technical difficulties that strained the so-called state of the art, there were also times that tried the mettle of the men at Peenemünde, for above all this was a place of human beings. There were days when even the toughest minds seemed to run out of resources, only to bounce back full of new ideas, drive, and enthusiasm – often after a long and sleepless night."[102] Undoubtedly, the tasks taken on by the Peenemünders were some of the most difficult and complex of their careers. The

[99] Tiesenhausen OHI, NASM.
[100] Dannenberg OHI, NASM.
[101] Thiel to Braun, 3/16/43, FE 692/F, NASM.
[102] Huzel, *Peenemünde to Canaveral*, 80.

pressure of the war only complicated matters. Nevertheless, the rocket specialists at Peenemünde succeeded in bringing the world's first ballistic missile, a technology that existed only in the minds of science fiction writers and amateur enthusiasts, from the drawing board and into mass production in only seven years, a feat that took no small amount of determination and resilience. Huzel's remark about the engineers' intellectual fortitude points to this strength and reveals a strong professional identification with the development of this new technology. Indeed, the technology of rocketry proved to be one of the most important factors in facilitating their identification with the goals of the institution, despite the tremendous strain it placed on them.

The novel and unique tasks performed in the workshops and production facilities was a part of the appeal of working at the base. Though it had come a long way from the days of short means and primitive experiments at the *Raketenflugplatz*, rocket technology as practiced at Peenemünde was still in its infancy. Braun's deputy, Eberhard Rees, who also helped set up the production plant at Peenemünde, held that "Rocketry at that time was quite new, and it was for engineers very, very interesting. Peenemünde was for most engineers a most interesting place."[103] Karl Heimburg agreed with Rees, remembering "Even for those who had no contact at all with the rocket fad of the 1920s, work at Peenemünde was incredibly exciting because it was so new, so radical."[104] The cutting edge nature of the work helped drive the employees' enthusiasm and provided them with the energy they needed to continue in the face military pressure and technological failure. Measurement

[103] Eberhard Rees OHI, NASM.
[104] Karl Heimburg OHI, NASM.

specialist Gerhard Reisig stated with only slight exaggeration that “It was always exciting … I can’t remember a single day at Peenemünde that was not exciting or at least interesting, because something was always up.”[105] The gifted aerodynamicist Rudolf Hermann, a Docent at the Technical University of Aachen before coming to Peenemünde, turned down another job as a Professor at the University of Braunschweig in 1937 “because I saw all the possibilities at Peenemünde with the rocket development, big problems to solve.”[106] In tackling these problems, many, like Hermann, doubtless also saw an excellent chance for career advancement at the base that surpassed that offered by the university. Clearly, for many Peenemünders, the cutting edge nature of their work spurred their excitement and was reason for many of them to continue, despite the strain of short deadlines and the growing pains inherent to a radically new technology.

The first-rate technical facilities themselves offered another incentive to work at Peenemünde. Upon being offered a position as an assistant to the chief engineer at test stand seven, from which all missile launch tests were performed, Huzel, who began at Peenemünde in the guidance section under Ernst Steinhoff, wrote “Finally! Here was the break I had been seeking … Such an assignment would bring me right into the heart of the experimental rocket development, in the largest and most complete facility in the plant.”[107] For Huzel, work at test stand seven, from which the first man-made vehicle to reach space was launched, represented the pinnacle of his professional career. Rudolf Hermann’s case is also instructive. He began his association with Braun in early January 1936, when the budding rocketeer traveled to

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[105] Gerhard Reisig OHI, NASM.
[106] Rudolf Hermann Memoirs, (unpublished), 16, UAH.
[107] Huzel, *From Peenemünde to Canaveral*, 65.

TU Aachen to request that they be given permission to use the small supersonic wind tunnel there (the square-shaped tunnel was four inches on a side), the maximum velocity of which was Mach 3.3, just over three times the speed of sound. When it became apparent that Peenemünde would need its own wind tunnel, Braun offered Hermann the chance to run what would be the world's largest and fastest facility, measuring sixteen inches per side with a maximum velocity of Mach 4.4. Casting aside the chance for a full Professorship at TU Braunschweig, which the university offered the Docent at nearly the same time, Hermann jumped at the opportunity and came to Peenemünde on April 1, 1937. The excitement of the work as well as the unequaled technical resources made the offer too much to resist.[108] By the middle of 1939, Hermann's staff at the institute reached sixty, and by 1943, he had 200 employees at his disposal.[109] The talented aerodynamicist had made what by any measure was a significant professional step forward.

In addition, many of the scientists, technicians, and engineers at Peenemünde either received civilian draft exemptions to work there or were already members of the Army. At the beginning of 1940, nearly 1700 employees at Peenemünde had civilian draft exemptions, and, though exact numbers are unavailable, this number dramatically increased as the regime dedicated more technical specialists to the base over the next three years.[110] This mutually beneficial arrangement lasted until late in the war, when overwhelming personnel shortages forced the army to seek more soldiers wherever they could find them, while local party authorities attempted to conscript more and more individuals into the *Volkssturm* militia units. Even so, many

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[108] Hermann, Memoirs, 16-17, UAH. Neufeld, *The Rocket and the Reich*, 86-87.
[109] Neufeld, *The Rocket and the Reich*, 88.
[110] Peenemünde employment survey, 1/1/40, FE 357, NASM.

Peenemünders survived such harrowing close calls. Guidance specialist Walter Hauesserman's case is typical. Though he was drafted in September 1939, Ernst Steinhoff, who had many contacts at TU Darmstadt, where Hauesserman earned his Diploma-Engineer degree in 1938, managed to get Hauesserman removed from the army and sent to Peenemünde in December 1939. There, Hauesserman received his civilian draft exemption so he could work uninterrupted in the guidance department. However, in the middle of 1943, Hauesserman received orders to report to his old unit to join the fighting on the Eastern Front. By this point, the engineer had contributed a number of important advances to the guidance system of the V-2. According to Hauesserman, Von Braun intervened with army authorities on the basis that it was imperative that he be allowed to continue his work. Because of von Braun's intervention, Hauesserman maintained his draft exempt status and went on to perform valuable guidance work on the V-2, the Wasserfall anti-aircraft missile, and advanced torpedoes for the navy.[111] His technical expertise, therefore, offered him the chance to both fulfill important professional goals while avoiding some of the worst horrors of war at the front.

However, another group of specialists at Peenemünde did not receive draft exemptions. Rather, they were members of an army unit, ordered into creation in late 1941 by von Brauchitsch, called *Versuchskommando Nord* (VkN – Northern Experimental Command). The VkN, under the command of a Major Heigl, a career officer with no technical experience, first numbered approximately 620 men, but rapidly expanded to nine companies of about 300 men each, nearly all of whom had

[111] Walter Hauesserman OHI, NASM.

formal engineering or technical backgrounds.[112] The Army classified these soldiers as front line troops on temporary duty in Peenemünde, which officially kept them off limits from civilian authorities who might wish to requisition them for any number of projects. Soldiers of the VkN worked in both the development workshops and production plant.[113] Payment for these men was excellent, by Army standards. Though the officers received standard Army scale salary, which was marginally less than they would receive as civilians, the enlisted men earned approximately the same amount of money as civilians at the base, which was a major increase in the standard Army salary.[114]

VkN members found even more important reasons to consider their assignment to Peenemünde a stroke of good fortune. Of course, the most important of these was that they no longer feared for their lives every day, especially those who came from the Eastern Front. Peter Wegener, who found himself assigned to Peenemünde in the spring of 1943 after serving on the Eastern Front, wrote that he was "continually mindful of the great advantage of not being involved in further fighting in Russia, fighting that turned increasingly into disaster for the German troops. I shared my father's frequently repeated view, based on his World War I experience, that in war, any place where nobody shoots at you is fine. I had no responsibilities for others or daily worries about survival."[115] Huzel, who also served in the Soviet campaign, paints an even more vivid picture of the contrast between the

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[112] Organisatorische Massnahmen seit Führererlass, date unclear, likely early 1942, FE 692/C, NASM. Unidentified prisoner of war statement, NASM File "V-2 (A-4) Missile (Germany, WWII) Intelligence Interrogations." Guido de Maeseneer, *Peenemünde : the Extraordinary Story of Hitler's Secret Weapons V-1 and V-2*, (Vancouver, Canada : AJ Publishing, 2001), 102-103.
[113] Organisatorische Massnahmen seit Führererlass, FE 692/C, NASM.
[114] Huzel, *From Peenemünde to Canaveral*, 34. Huzel himself was a member of the VkN, drawn from the Eastern Front in the winter of 1942.
[115] Wegener, *The Peenemünde Wind Tunnels*, 19.

front and Peenemünde. "The trying business of constant alert," he wrote, "the automatic feeling of guilt at the mere sight of a trim uniform, the old frustration of motion for motion's sake, were fast fading … Outside the summer air was fresh and clean, the afternoon sun bright and warm, and the war a long, dim way off."[116]

The daily routines of this military unit were surprisingly casual, and the trappings of military life were almost non-existent. When Wegener arrived at Peenemünde late in the evening and reported for duty, declaring in his best military voice his name and assignment, he was greeted by a man in pajamas who told him that he could have waited until the morning, to find quarters for the night, and to come back the next day.[117] Though many soldiers ate in the Army mess hall, individuals were not always expected to eat meals with their comrades. Rather, they were able to take meals wherever they preferred, either in the local resort town of Zinnowitz or one of the Army cantinas. Of the daily role calls, Huzel fondly recalled the straggling, sleepy, half-dressed soldiers who would climb out of bed, form terrible lines, and chide their sergeant for calling the role too slowly. He noted with delight, "From a strictly military point of view, this was a mess. Personally, it was a pleasure."[118] Beginning in early 1944, certain VkN soldiers were even allowed to wear civilian clothes. This was largely done for reasons of security, as more VkN specialists made long and secretive trips to the various assembly plants across Germany.[119] In addition, military rank melted away in the face of professional qualifications. It was not uncommon for a corporal who also happened to hold an

[116] Huzel, *From Peenemünde to Canaveral*, 39.
[117] Wegener, *The Peenemünde Wind Tunnels*, 13.
[118] Huzel, *From Peenemünde to Canaveral*, 36, 39-40.
[119] Storch to Heigl, 1/15/44, FE 732, NASM. See also Storch to Heigl 10/17/44, Heigl to Storch, 10/23/44, both in RH8/v.1941, BA/MA, and Storch to Heigl, 1/3/45, FE 732, NASM.

advanced degree in engineering to give orders to his technically less-qualified superior officers when they were on the shop floor.[120] Indeed, military considerations were entirely secondary to technical ones. As it did for civilians, life at Peenemünde proved to be idyllic for soldiers who had only recently endured the savagery of the war, only to find themselves dropped into the middle of a virtual technological and scientific paradise.

VkN specialists adjusted quickly to their work. One report noted, "The new employees of the Northern Experimental Command have generally proven their value and clearly find happiness in their work."[121] A central component to this new-found satisfaction with their work was found in its professional elements and the contrast to the misuse of their talents at the front. Huzel illustrated this frustration, writing, "My duties on the Russian front made no use whatsoever of my degree and years of experience in engineering. I was a *Landser*, an ordinary foot soldier, and my real capabilities, along with those of thousands of other good technical people drafted in a similar manner, were lost to the now-desperate German war effort." Of the idea of removing technical specialists from the front and placing them at jobs that utilized their abilities, he wrote with joy that remained undisguised even forty years after the war, "Overnight, Ph.D.s were liberated from KP duty, masters of science were recalled from orderly service, mathematicians were hauled out of bakeries, and precision mechanics ceased to be truck drivers."[122] Once away from the front and in

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[120] Helmut Hoelzer OHI, NASM.
[121] Organisatorische Massnahmen seit Führererlass, FE 692/C, NASM. The same report noted, however, that unskilled employees were still in desperately short supply and noted the ongoing failures to overcome this bottleneck. Peenemünde engineers eventually chose slave labor as the solution. See chapter four.
[122] Huzel, *From Peenemünde to Canaveral*, 23, 27.

place at the aerodynamics institute, former infantryman Wegener wrote with satisfaction that "I was learning a great deal of fascinating science and engineering and was slowly adapting to intellectual challenges."[123] Thus, in a number of ways, the soldiers of the VkN endowed their work with a great deal of personal significance. Not only did it save their lives, but it also removed them from the most frustrating elements of military life, paid them very well, and catered to their professional aspirations by setting them to work on some of the most cutting-edge technology on the planet. In a world in which the alternative to their work was carrying a rifle on the Eastern front, these considerations went a long way toward ensuring their unequivocal dedication to their work.

For military and civilian employees alike, absolute cooperation and teamwork in the missile endeavor was essential to their success. Indeed, despite the tight regulations governing secrecy, administrators at Peenemünde encouraged a great deal of collaboration between workshops. For example, in a circular sent to Peenemünde in June 1942 that clarified the division of labor between various development and assembly branches, Dornberger emphasized that "*The clear, full understanding and cooperation of all divisions is the indispensable precondition for the success of the entire project* [emphasis in original]."[124] To ensure this collaboration, administrative divisions and the workshops that comprised them mutually supported each other, actively communicating questions, problems, concerns, and experimental results in order to most effectively utilize the little time available to them. Service regulations directed division and workshop managers to freely and punctually communicate

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[123] Wegener, *The Peenemünde Wind Tunnels*, 19.
[124] Dornberger, Entwicklung und Fertigung des Gerätes A 4," 6/6/42, RH8/v. 1959, BA/MA.

information requested by their partners in other areas. For example, they specifically mandated that the manager of the group in charge of static and launch tests maintain as close cooperation as possible with the Aerodynamics Institute and the Measurement Group. Regulations also directed employees of the Ballistics Office to work closely with development engineers in the Technical Office and Aerodynamics group.[125] The utterly complex nature of rocket development meant that cooperation between specific divisions and specializations was absolutely essential to the project's success. By inserting provisions regarding cooperation between Peenemünde's specific technical divisions into the service regulations, the facility's administrators formalized a cooperative environment and made technical collaboration a hallmark of rocket development.

This was the result of a set of thoughtful, conscious decisions made by Braun and others regarding the best way to rapidly development missile technology. Braun's ideas fundamentally shaped the emerging profession of rocket engineering in the middle of the twentieth century. For him, the absolute complexity of rocket and missile technology demanded that cooperation between diverse specialists be the permanent watchword. Writing after the war in an American periodical, he emphasized that "The missile field, extending as far as it does into technical areas as far apart as fuel chemistry and ultra-high frequency radio, stress analysis and supersonic aerodynamics, materials research and gyroscopes, pure mathematics and shop management, cannot possibly be encompassed by a single brain. As in baseball, good players are needed, but it is the quality of the teamwork among these players

[125] Dienstanweisung für das Prüffeld, Dienstordnung für das Ballistische Büro, Dienstordnung für die Abteilung Messgruppe, 1937, all in FE 348, NASM.

that decides whether they are big league or bush league."[126] Though his own case might be considered an exception, for Braun, there could be no single individual capable of understanding all of the intricacies such a difficult project. The mark of a professional rocket engineer was his ability to understand this and work with others of varying skills and specializations to bring the project to its successful conclusion. He continued, "Whether they are scientists, engineers, or mechanics, they must be given an opportunity to learn to appreciate the capabilities and accomplishments of their fellow team members. In guided missile development this is particularly important because there simply cannot be an argument as to what professional group is more important."[127] Cooperation, then, was fundamental to such a difficult endeavor. A good rocket specialist was only partially defined by his technical skill, whatever that may be. Of equal importance was his willingness and ability to work cooperatively with other technical and scientific experts, an aspect of the activities at Peenemünde that was both formally and informally encouraged.

Braun's ideas, while put to paper after the war, fundamentally shaped interpersonal relationships at Peenemünde during the Nazi period. Unfailingly, the testimonies of former Peenemünders after the war indicated that Peenemünde was a facility in which cooperation and collaboration were the rules of the day. Helmut Zoike warmly remembered that "The main thing of the whole story was the teamwork that people had there." Zoike went on to credit Braun with setting an excellent example of hard work, teamwork, and leadership.[128] Gerhard Reisig, the Chief of the Measurement Section, also noted Braun's central role in setting the tone of

[126] Braun, "Teamwork," 38-39, Box 200, Folder 7, WvB Papers, SRCH.
[127] Ibid., 41.
[128] Helmut Zoike Statement, *Schatten eines Mythos*.

cooperation at the missile facility.[129] The emphasis on teamwork enhanced the individual employees' active identification with each other and their work while offering them the chance to participate in a collaborative venture of surpassing importance. The result was the smooth day-to-day functioning of research and development as well as the establishment of strong bonds of community inside the work place that reinforced those already in place outside of it.

Personal and professional relationships on the shop floor at Peenemünde closely reflected Braun's ideas. The atmosphere in the workshops was almost always friendly and cordial, with employees often referring to each other and even to their superiors by their first names, no small feat in a deeply title-conscious society. Though there inevitably were moments of friction between individuals, work at Peenemünde was for the most part characterized by harmony between both individuals and administrative divisions. Ernst Kütbach, an employee in the measurement section, characterized the workshops as having "A highly tolerant feeling of camaraderie [*Kameradschaft*]."[130] Herbert Lucht remembered that "We were all equals, engineers, doctor engineers, and so forth. And that was always, in my opinion, good for us – this camaraderie."[131] When Peter Wegener arrived at Peenemünde, he found his supervisor at the Aerodynamics Institute, the highly respected Professor Hermann Kurzweg from the University of Leipzig, to be "an exceptionally pleasant person … In retrospect, I find it remarkable that this varied group, disregarding the individuals' particular ranks in the hierarchy of the institute,

[129] Gerhard Reisig OHI, NASM.
[130] Ernst Kütbach Statement, *Originaltonaussagen von Mitarbeiter der ehemaligen Heeresversuchsanstalt Peenemünde-Ost zum Thema Alltag in Peenemünde*, HTIZP.
[131] Lucht Statement, *Peenemünde: Schatten*… .

worked together so smoothly. I never heard a harsh word: everyone helped everyone else, and good humor reigned; in fact, it was a pleasure to work in this place."[132] A thoroughly pleasant and professional environment pervaded the workshops. This was a major factor in the swift technological advances made at Peenemünde. Most employees enjoyed the pleasant professionalism and intellectual respect of their comrades, which made the often arduous and stressful work a far more enjoyable and rewarding experience.

Nevertheless, some friction was unavoidable in a facility with so many employees. However, most of the disagreements remained in the upper levels of the administrative hierarchy and did not filter down to the shop floor. These fissures opened because of the tremendous pressure on the leading Peenemünders to complete the A-4's development and begin mass production. Brauchitsch's order, examined above, as well as Dornberger's unrealistic deadlines that led many higher authorities in the regime to question the efficacy of the missile, sometimes strained relations between department managers at Peenemünde.

For example, the failure to solve these technological problems by the established deadlines as well as the numerous and expensive testing errors were sources of friction between the design bureau, headed by longtime rocket specialist Walter "Papa" Riedel, and other divisions. In an angry memo written in February 1942, near the peak of the missile design and priority crises, Dornberger pointed out that the emphasis on teamwork between the divisions that was laid out in the service regulations was not being practiced. He blamed many of the design problems on this failure, raging that among other things, "Cooperation between the Test Group and the

[132] Peter Wegener, *The Peenemünde Wind Tunnels,* 26-27.

Design Bureau is totally absent."[133] Riedel's Bureau, according to marginalia scribbled on Dornberger's missive by propulsion group head Thiel, would not allow the propulsion or test groups to participate in the overall design process. Moreover, workable design drawings, also the bailiwick of the design group, were largely non-existent.[134] The pressure created by shortened deadlines and development delays spurred Dornberger's heated memo, but the incident reveals deeper problems as well. Riedel, the holder of a two-year engineering degree and an old Kummersdorf employee with deep connections to the rocket movement in the Weimar years, was known to have a difficult personality and resented the influence of neophyte diploma and Ph.D. engineers who were placed above him.[135] A few months later, this inauspicious situation, compounded by the pressure for quick experimental results, forced Riedel out of his position as head of the design group. His difficulties, combined with the increasing professional standards at Peenemünde, hastened his removal. He was replaced by the able diploma-engineer with the ironic and nearly identical name Walther Riedel (no relation to his predecessor, but known by his colleagues as Riedel III – the second Riedel was test stand and deployment chief Klaus Riedel, also no relation).[136] "Papa" Riedel moved into the production planning group, where he was assigned to preparing production drawings – for all intents and purposes, a demotion.[137]

The "Papa" Riedel case is instructive for a number of reasons. Clearly, there was some friction between influential individuals at Peenemünde. In the first place,

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[133] Dornberger Circular to Peenemünde, 2/5/42, in Technical File "Peenemünde #2," NASM.
[134] Ibid. See also Neufeld, *The Rocket and the Reich*, 158-159.
[135] Dannenberg OHI, Rudolph OHI, NASM.
[136] Mueller, OHI, NASM.
[137] Dannenberg OHI, NASM.

this was caused by the tremendous pressure to show experimental results coming from above the Peenemünders' heads. The unrealistic deadlines expected of the developers made for many long nights and several angry memorandums from Dornberger, their chief representative. Total cooperation was paramount if these deadlines were to be met and the program's benefactors satisfied, but the sometimes stubborn and difficult Riedel was faced with a task that was beyond his talents and unsuited to his personality. Though his years at the Heylandt Works and under Braun at Kummersdorf equipped him with a great deal of practical knowledge, his less distinguished education, unwillingness to cooperate with his better educated colleagues, and Peenemünde's increasing academic and professional standards forced Braun to remove Riedel from his important position. The energetic Riedel III, who had more formal academic training and who proved more willing to work collaboratively, moved into his position, and within a short time, the dysfunctional relationship between the design group and other branches dramatically improved. The emphasis on high professional standards is clear in this case. Those who had the requisite training and who could work within the formal and informal stipulations laid out by Peenemünde authorities would flourish, while those who could not would flounder. Though Braun no doubt felt some degree of personal loyalty to his long-time colleague, Riedel's failure to work closely with those in other divisions, as mandated by the service regulations, in addition to his obstreperousness with other Peenemünders, forced Braun's hand. Riedel's lack of formalized engineering training only sealed the matter. In the emerging world of the professional rocket specialist, Riedel was unsuited to a high-ranking administrative position. Though the failures to develop the weapon on time can in no way be laid solely at his feet, its technological complexity, the intense pressure for rapid results, and heavy emphasis placed on teamwork made “Papa” a hindrance which had to be removed.

The Reidel case offers the opportunity to examine another aspect of Braun’s leadership style as well. His management philosophy, though based on teamwork, cooperation, and constructive feedback, also incorporated rewards for particularly hard and successful workers and punishments for those who did not live up to his standards. Though most employees spoke very highly of Braun, who was quick to praise and reward, he was not always positive and encouraging. The young aristocrat proved willing to push disaffected employees back into line, chide managers who broke the rules or missed deadlines, and fire workers who did not live up to his very high standards. His carrot and stick approach went a long way toward urging the Peenemünders to their best efforts.

Employees at Peenemünde often received a number of different kinds of rewards for their work on the missile. These ranged anywhere from official state awards to promotions, bonuses, and the awarding of various titles. Braun himself was the beneficiary of this system. In the summer of 1943, just before the A-4 was to go into mass production, Hitler approved Albert Speer’s request that von Braun be awarded the prestigious title of Professor. The dictator was so impressed with Braun that he insisted on signing the document himself.[138] In the fall of 1944, von Braun and Dornberger both received the War Service Cross for their efforts on behalf of the

[138] Speer meeting minutes, 7/8/43, T-74, Reel 192, RG-242, p. 3,405,674, NARA. Neufeld, *The Rocket and the Reich*, 192.

missile program.[139] Other valuable employees received different awards. In October 1944, a number of engineers who were key in the development and production processes, including propulsion expert Konrad Dannenberg, test engineer Karl Heimburg, and production planner Bernard Tessmann, received from Peenemünde administrators the title Oberingenieur, along with all of the professional recognition and authority that this title held.[140] All employees, no matter what rank or position they held, also won awards for individual technical improvements that they spearheaded. Bruno Helm, an assembly foreman, won a prize for improvements he made in sealing rocket combustion chambers.[141] Less formal measures that encouraged hard work and loyalty were also common. For example, measurement specialist Helmut Hoelzer stated that Braun encouraged debate, but once a decision was made, no matter how difficult, he always made sure that there was no personal damage done by buying personnel a drink or simply visiting them in the workshops the next day to make sure that there were no hard feelings. "Hardly anyone held a grudge against him," Hoelzer reported.[142] This type of personal managerial touch built an excellent repoire between the Technical Director and employees at Peenemünde. Loyalty to von Braun was also a key component in structuring the group reality at Peenemünde. It was also indicative of the positive measures taken by the facility's administrators to reward hard and dedicated work with a range of

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[139] Riedel to Kunze, 12/11/44, FE 732, NASM. Two missile production directors won the award as well.
[140] Braun and Storch to Dannenberg, Hackh, Heimburg, Tessmann, and Martin, 10/15/44, RH8/v.1941, BA/MA.
[141] Bruno Helm Basic Personnel Record, RG 165, Entry 179, Box 703, File "Boston," NA.
[142] Helmut Hoelzer OHI, NASM.

personal and professional honors. These incentives encouraged individual dedication and enhanced personal identification with the goals of the institution of Peenemünde.

However, Braun was also quick to introduce negative measures for employees who failed to live up to his lofty standards or whose performance proved to be a drag on missile development and production. In January 1943, when engineers at Peenemünde were frantically attempting to begin mass production of the missile and pressure from regime authorities for results was rapidly mounting, Braun found himself working almost non-stop in an effort to coordinate the work of the development and production groups. In a memo to a group of engineers charged with organizing the production drawings for electrical parts of the missile, Braun revealed his willingness to use his authority to coerce employees. In no uncertain terms, he informed these engineers, "If I ascertain that the deadlines [for completion of this work] have been exceeded and there has been no report of intervening difficulties, I will call the responsible people into account."[143] In another case, Braun wrote in April 1944 to Georg Rickhey, the General Director of the corporation that mass-produced the V-2 (examined in detail in the next chapter), about a number of engineers who arrived in Peenemünde earlier in the year to continue further missile development. He informed Rickhey that three of these engineers, Thomasowits, Bornfeld, and Debüser, were not cut out for work at Peenemünde because they were, according to Braun, incapable of independent hard work. Further, Braun reported that he gave Bornfeld and Debüser a number of orders that were "in no way carried out to my satisfaction and which they in fact passively resisted." He closed by informing Rickhey that he was transferring all three men to the production facility run

[143] Braun to Arbeitsausschuss "Elektrische Geräte," 6/26/43, FE 732, NASM.

by Rickhey, "where these men will have increased supervision."[144] Without question, Braun was deeply dissatisfied with these engineers, but also understood that their technical training gave them a certain value in a nation struggling with a shortage of technical expertise. Though he wished them out of development at Peenemünde, which required a particular ability to balance independent work with an approach based on teamwork and cooperation, their professional training might still be useful in a different missile facility.

Clearly, Braun expected a great deal out employees that worked under him at Peenemünde. Despite his aforementioned long association with "Papa" Riedel, Braun understood that Riedel hindered the rapid completion of the experimental missile and therefore had to be moved out of his position. As the war progressed and pressure to deploy the V-2 mounted, Braun also proved more and more willing to call people on the carpet if they missed deadlines or failed to perform satisfactorily. If this failed, the hard-working head of technical development transferred or eliminated the offending employees. Braun's pro-active, interventionist management style, combined with his deep theoretical and technical knowledge, kept his employees in line as much as it drove his own desire to see the program through to success. His approach combined, to the great benefit of the missile program, the carrot and the stick, promising impressive rewards for those who worked hard and swift punishment for those who failed to live up to his standards.

Employees at Peenemünde were also able to, in their own way, take part in many of the hallmarks of the free professional life. Though secrecy regulations

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[144] Braun to Rickhey, 4/23/44, FE 694/a, NASM. The production facility was the infamous underground factory "Mittelwerk," which used slave laborers to construct the V-2. This will be examined in detail in the next chapter.

curtailed some aspects of professional and associational life at Peenemünde, most employees had access to other outlets for their professional aspirations. For example, one of the most important aspects of professional practice is publishing in respected, peer-reviewed journals. The tight rules governing secrecy obviously prevented the Peenemünders from publishing their experimental results in open, publicly accessible, professional journals. The rocket specialists at Peenemünde overcame this limitation on their professional lives by publishing the results of their work internally, within the secret confines of the base. Though the reports were not made accessible to all employees, copies of them were held in a central archival facility on the base. Hundreds of these technical reports, which came to be known as the Peenemünde Archive Reports, detailed the myriad of technical advances in every phase of rocket development and production.[145] Engineers and scientists wrote on everything from their attempts to develop experimental hardware and raw materials to processes for creating new fuels, missile design changes, wind tunnel tests, and assembly techniques. This technical archive was a veritable cornucopia of experimental and production-related material, and its continued growth throughout the war is evidence of the Peenemünders' utter dedication to the success of missile development.[146]

Engineers and scientists at Peenemünde also had other outlets for their professional aspirations. After the outbreak of the war, Ordnance marginally loosened security considerations so that outside experts might be able to take some

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[145] The largest collection of Peenemünde Archive Reports is held by the Deutsches Museum in Munich. In addition, the Fort Eustis microfilm at the Smithsonian National Air and Space museum contains a substantial number of these records.

[146] For example, see report on experiments in connection with the emptying of missile fuel tanks, FE 110, test results on new liquid propellants, FE 128, a report investigating the air flow patterns in the wind tunnel, FE 579, and a mathematical exposition on iteration methods applied to differential equation, FE 621, all held at the NASM archive. These are but a fraction of the hundreds of technical reports that are available to researchers at NASM and the Deutsches Museum.

part in the improving the pace of development at Peenemünde. Brauchitsch's order for the acceleration of work on the missile, shortening the development time from four years to two, was impossible to fulfill, but it led to an intensification of the development work at Peenemünde and a closer cooperation between the military installation and other experts in many of Germany technical universities. The rocket specialists held a small number of conferences in September 1939, which culminated at the facility that month in the "Day of Wisdom," an event in which nearly forty professors came to Peenemünde to contribute their knowledge to the now increasingly intensive work.[147] For a variety of reasons, including ideological commitment as well as scientific interest, university professors were largely willing to work on the development program, and an intensely focused, mutually beneficial relationship was the result for much of the war period. The universities received more funding and professors and researchers in their departments obtained draft exemptions, while Peenemünde received the benefit of their expertise. The technical universities cooperated closely with the engineers and scientists at the base. Especially prominent was the work done for the benefit of the missile program by professors at TU Darmstadt, Dresden, Stuttgart, Hannover, and Göttingen. Their work centered mostly on parts development, but they also helped contribute theoretical and mathematical ideas, such equations designed to help reduce the dispersal of the rocket from its target and increase its range. They also suggested

[147] Neufeld, *The Rocket and the Reich*, 83.

theoretical techniques to assume launch and trajectory angles, as well as write important papers on the abilities of different instruments within the rocket.[148]

Contacts with the technical universities also satisfied important professional goals for those at Peenemünde as well. Particularly thorny issues could be solved by larger meetings and conferences with faculty members at the universities. Peenemünde development specialists met with professors and other engineers who were particularly skilled in certain areas in conferences that could last for several days. The Peenemünders took their questions, solutions, developments, and problems to these conferences in order to hear the solutions proposed by their academic colleagues. The engineers, all of whom were almost always Doctor-Engineers or Diploma-Engineers (mere technicians were rarely, if ever, invited), updated their colleagues on the latest research in the field, learned about the newest advances in technology, and traded development ideas in their particular field of work. In this way, Peenemünde development engineers and scientists were able to reinforce their professional standing among their colleagues as well as meet and work with like-minded individuals who had the same interests. These were, in short, professional conferences of the highest order, designed for the same purposes as those in other academic and professional meetings, and went a long way toward satisfying the professional ideals of engineering and scientific specialists at Peenemünde.[149]

All of their cutting edge work combined with the exclusivity of the technical community at Peenemünde to awake in the specialists an increased sense of

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[148] Reisig, *Raketenforschung*, 100-103. Reisig's measurement section especially benefited from the connections to the technical universities.
[149] See, for example, Protokoll über die VP-Hochschultagung in Darmstadt, 29.9 bis 1.10.42, RH8/v.1265, BA/MA. This particular meeting focused on how to solve several of the seemingly intractable guidance problems.

professional self-worth. William J. Goode has argued that the elite of any profession is almost always conscious of a communal identity.[150] This was certainly the case at Peenemünde. The specialists there increasingly came to define themselves in terms of their very unique work and showed a great deal of pride in what they were doing. Gerhard Hufer stated that, "I was immensely proud to be at Peenemünde and associated with that wonder weapon which we called the V-2. We knew all about the so-called V-1 flying bomb, but it was our rocket that was the big hope. We realized that the enemy could shoot down the V-1, but they could have no defense against our rockets."[151] Another specialist declared to Huzel shortly after his arrival on the base, "We here are super engineers!"[152] Huzel's own opinion was somewhat more modest, but still an evocative statement of his belief in his colleague's professional worth. He wrote that they were "believing, stubborn, undaunted, hard workers" whose genius, "given unshaken belief, untiring effort, ingenuity, hard work, dedication, is capable of solving almost anything."[153] Clearly, the work performed at Peenemünde did not merely satisfy the technical specialists' professional goals. Rather, they came to view themselves as elite members of their profession. Only the dauntless "super engineer" was capable of gaining entry into this community and also helping it to reproduce by continuing to some of the most complex technical challenges in the world. The Peenemunde engineers' sense of significance, their professional achievements, career development, peer prestige, were largely a function of the elite community constructed at the base.

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[150] William J. Goode, "Community Within a Community: The Professions," *American Sociological Review*, 22/2 (April 1957), 194.
[151] Quoted in Middlebrook, *The Peenemünde Raid*, p. 28.
[152] Huzel, *From Peenemünde to Canaveral*, p. 77.
[153] Ibid., pp. 77-78.

Peenemünde specialists needed every bit of the fortitude that they could muster for their work on the missile. A seemingly endless series of problems plagued the missile's development and caused a good deal of tension between the divisions on the base. However, in the late afternoon of October 3, 1942, the Peenemünders' hard work finally paid off. The rocket labeled A4/V4, the fourth experimental launch rocket, lifted off from its platform flew away east over the Baltic Sea. It achieved a maximum speed of nearly 3500 miles per hour as it flew to an altitude of fifty miles and crashed into the sea nearly 120 miles away. This was the first time that any man-made instrument had actually made it into space, and it was a titanic achievement. Dornberger wrote that "I am not ashamed to admit that I wept with joy. I couldn't speak for a moment; my emotion was too great. I could see that Colonel Zanssen was in the same state … We yelled and embraced each other like excited little boys." According to Dornberger, everyone who participated in the test was doing the same.[154] Werner Rosinski recalled that after the launch, "Everyone was really excited. Everybody thought that we've got it made now."[155] That evening, Dornberger held a celebration in the officers' club at Peenemünde in which he delivered a speech using language that was striking in its similarity to the Weimar rocket enthusiasts'. Describing his panegyric in his post-war memoirs, Dornberger stated to those assembled that "The following points may be deemed of decisive significance in the history of technology: we have invaded space with our rocket and for the first – mark this well – have used space as a bridge between two points on the earth … To land, sea, and air may now be added infinite empty space and an area of

[154] Dornberger, *V-2*, 12-13.
[155] Wernher Rosinski Interview with sociologist Donald E. Tarter, University of Alabama Huntsville (UAH).

future intercontinental traffic, thereby acquiring political importance." Though Dornberger raised space travel as an obvious result of their work, he went on to emphasize to his listeners that this was not their first priority. "So long as the war lasts," he pointed out, "our most urgent task can only be the rapid perfecting of the rocket as a weapon."[156] The exigencies of war would not wait.

Nevertheless, despite this profoundly impressive technological achievement, it was also, as Michael Neufeld points out, very lucky.[157] Major developmental problems still existed, and it would be many months before the Peenemünders would be able to construct a reliable, problem-free, easily mass-produced weapon. Even so, the successful launch caught the attention of many important members of the regime, and the pressure to succeed grew even more while powerful organizations jockeyed for control of the program. Despite this, the Peenemünders continued on, laboring tirelessly to capitalize on their remarkable achievement.

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The personal and professional dynamics in place at the Army's secret rocket facility on the Baltic coast were central to the process of remolding its individual technical specialists' heterogeneous identities into Peenemünders, a unified, homogenous community with a singular professional vision. This process involved a subtle, but relentless process of re-socialization into the secret world of the Peenemünde army rocket center, and was based on the convergence of a number of powerful forces. In the first place, Peenemünde did indeed prove to be a paradise, as Fritz Todt complained in 1941. The living accommodations, food situation, and

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[156] Dornberger, *V-2*, 17.
[157] Neufeld, *The Rocket and the Reich*, 165.

social arrangements were all first-rate and far better than anything else that existed in wartime Germany. Peenemünde employees availed themselves of the numerous diversions that living on Usedom offered, and found that their assignment to the rocket facility was a major stroke of personal good fortune.

In addition, employees at Peenemünde also fulfilled many of their professional ambitions at the base. They carried out their exciting, cutting edge work in an atmosphere of collegiality and respect that enhanced their dedication to the project at the same time as it established a specialized blueprint for the emergent profession of rocket engineering. They were fully conscious of the "community of profession" and self-identified as the elite of German engineering. Moreover, the Peenemünders accepted as a given that they were there to develop and produce a ballistic missile to help defend their nation against the onslaught of its enemies. They adhered to their institution's central axiom fully automatically, and all other considerations were secondary to the successful completion of this task.

When combined with the overwhelming labor shortage that Germany experienced during the war, this situation would have a devastating effect on the lives of foreign workers dragooned into armaments production and the ill-fated prisoners that SS pressed into slave labor. In this climate of utter dedication to the goals of the Peenemünde project, the missile specialists' interests outweighed the concerns of any other groups. Even those Peenemünders who did not agree with use of forced and slave labor nonetheless condoned its practice, partially because of disciplinary coercion enacted by the regime and partially because the concerns of these unfortunate prisoners weighed lightly in the balance. The interests of the slave laborers paled in comparison to those of the engineers, who staked their personal and professional lives on rocket development and production. Their identification with the goals of the rocket project, learned and internalized in Peenemünde, would deeply implicate them in the systematic torture and murder of concentration camp prisoners at the terrifying underground factory of Mittelwerk.

Chapter 4

The Armaments Ministry, the SS, and Foreign Labor at Peenemünde

Developmental success in October 1942 spurred the increased interest of very powerful organizations within the Third Reich. Albert Speer's Armaments Ministry had, under Fritz Todt, been content to supply labor and technical guidance to the construction at Usedom, but saw that the time was finally right to seize the reigns of the program and push for the highest priority for mass producing the nation's newest technological marvel. In addition, Heinrich Himmler, whose fascination with technical novelty was surpassed only by his ideological fervor and understated barbarity, increasingly came to see his SS as the organization most fit to guide the burgeoning success of the missile program. The Army, though still a powerful factor in decisions about the program, began a steady decline in influence over its prized possession. Nevertheless, its long-time civilian and military specialists at Peenemünde proved themselves to be perfectly willing to cooperate with these new, but contentious allies. The Peenemünders, despite some misgivings, accepted their ideologically motivated, often intrusive masters, ultimately discovering that collaboration with these organizations could assist them in very important ways on the path to completion of their work.

Nevertheless, at the end of 1942, many obstacles still loomed in their way. Perhaps the most intransigent of these was the labor supply needed to continue and expand their work. German industry in general suffered from a labor shortage, but by early 1943, those at Peenemünde felt it most acutely. The developmental success in October of the previous year meant that the regime expected mass production shortly thereafter, but a number of difficult development and production problems remained. The developmental issues would have to be solved by sheer determination and intelligence, but the labor problem remained hugely problematic as long as their nation's general dearth of workers continued. In early 1943, administrators at Peenemünde solved this problem by agreeing to the use of concentration camp slave labor to mass produce the V-2 missile. The employment of slave labor in the missile program illustrates the extent to which its participants, many of whom were not particularly motivated National Socialists, came to identify their success, both professionally and personally, with the production and deployment of the missile. They became eager and willing participants in the wanton exploitation of perceived racial and national enemies in order to further their own ends and, as a consequence, defend the Nazi state. Motivating all of this was the internalization of the cultural dynamic unique to Peenemünde in which secrecy, ideology, and group-level self-interest all played a paramount role.

This chapter examines the growing collaboration between the Peenemünde missile base, the Armaments Ministry, and the SS. The outcome of this collaboration was the Peenemünders' decision to employ slave labor in their work. Many specialists at the missile base resented the intrusion of Speer's Ministry into their bailiwick, but were kept in line by the judicious employment of administrative muscle as well as the common end of defending the regime – all of this despite of the dislike that many Peenemünde specialists had for certain Armaments Ministry engineers. When Reichsführer-SS Heinrich Himmler signaled his interest in the missile program, leading Peenemünders also initially blanched at the idea, but as wartime manpower demands increasingly endangered their institution's central goal of producing thousands of operational missiles, they turned to the SS for the solutions to their problems. The catastrophic result of this cooperation was the terrible underground camp and factory known as Dora-Mittelbau.

Even before the SS transferred mass production to Dora, the Peenemünders had the opportunity to view slave labor for themselves on Usedom. This chapter also examines, for the first time, the conditions of forced and slave labor at Peenemünde itself. Though more work yet needs to be done in this area to draw firm conclusions about the scope and dynamics of foreign labor on Usedom, it is clear that what mattered most for the survival chances of foreign labor at Peenemünde had nothing to do with Nazi conceptions of race. Rather, they had everything to do with the technical skill of individual workers. Frighteningly, conditions for these workers at Peenemünde mirrored those discovered by the even more unfortunate laborers at Dora Mittelbau.

Setting aside the work of investigative journalists on one hand, for whom the engineers' guilt in SS crimes is a foregone conclusion, and postwar rocketry enthusiasts on the other, who argue equally implausibly that the Peenemünders were innocent victims caught up in a battle of institutional forces beyond their control (if they mention Mittelwerk at all), the work by professional historians in this area has been instructive, but problematic.[1] Recent studies have done a great deal to elucidate

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[1] Though slave labor in the missile program began receiving historians' attention in the late 1960s, it remained a relatively unknown phenomenon until only recently. East German historians were the first to begin serious study of the camp, and they did so relatively early compared to historians elsewhere. A student research circle at Humboldt University, led by Walter Bartel, himself a former prisoner at Buchenwald, produced a number of masters theses and dissertations on the subject. Many are now difficult to find, but may be located in the Stasi archive (*Die Bundesbeauftragte für die Unterlagen des Staatssicherheitsdienstes der ehemaligen Deutschen Demokratischen Republik -- BStU*) in Berlin. See,

the framework in which the decision to employ slave labor was made as well as the actual conditions of those prisoners who worked to manufacture the missile in the underground factory. However, this scholarship tends to draw too strict a division between the development engineers at Peenemünde and the production engineers from the Armaments Ministry and SS. Their arguments strongly imply that once mass production began, with labor supplied by the SS, development specialists at Peenemünde had a minimal and uneven impact on the V-2 program generally, only suggesting minor technical changes to improve performance and to solve some of the more intransigent operational issues. Production engineers supplied by the Armaments Ministry and SS, they indicate, began to dominate the most important

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for example, Gotz Dieckmann, “Existenzbegingungen und Widerstand im Konzentrationslager-Dora-Mittelbau unter dem Aspekt der funkionellen Einbeziehung der SS in das System der faschistischen Kriegswirtschaft,” Ph.D. Dissertation, Humboldt University, 1968, and Laurenz Demps, “Zum weiteren Ausbau des staatsmonopolistischen Apparates der faschistischen Kriegswirtschaft in den Jahren 1943 bis 1945 und zur Rolle der SS und der Konzentrationslager im Rahmen der Rüstungsproduktion, dargestellt am Beispiel der unterirdischen Verlagerung von Teilen der Rüstungsindustrie,” Ph.D. Dissertation, Humboldt University, 1970. Much of this work was motivated by the West German Dora trial in Essen from 1967-1970, and focused on the main camp of Dora itself, ignoring its many subsidiary camps. The first West German study of Dora-Mittelbau was Manfred Bornemann and Martin Broszat, “Das KL Dora-Mittelbau,” in *Studien zur Geschichte der Konzentrationslager*, Schriftenreihe der Vierteljahreshefte für Zeitgeschichte, 21 (Stuttgart: Deutsche Verlags Anstalt, 1970), 154-198, and Bornemann, *Geheimprojekt Mittelbau: Die Geschichte der deutschen V-Waffen Werke* (Munich: Lehmann, 1971). Both studies drew largely from the previous East German work. After this flurry, work on the Dora camp was largely dormant until the 1990s. The work of Michael Neufeld *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1995) and Rainer Eisfeld, *Die Unmenschliche Fabrik: V-2 Produktion und Mittelbau-Dora* (Erfurt: Landeszentrale für Politische Bildung Thüringen, 1993) necessarily focused on missile production at Dora, but even more recent studies have refocused the historiography of this camp on its subsidiaries, where the majority of the inmates perished while working at massive construction projects. See Joachim Neander, *Das Konzentrationslager "Mittelbau" in der Endphase der nationalsozialistischen Diktatur : zur Geschichte des letzten im "Dritten Reich" gegründeten selbständigen Konzentrationslagers unter besonderer Berücksichtigung seiner Auflösungsphase* (Clausthal-Zellerfeld : Papierflieger, 1999), Andre Sellier, *A History of the Dora Camp: The Story of the Nazi Slave Labor Camp That Secretly Manufactured V-2 Rockets* Transl. By Stephen Wright and Susan Taponier, (Chicago: Ivan R. Dee, 2003), and Jens-Christian Wagner’s magisterial, unequalled *Produktion des Todes: Das KZ Mittelbau-Dora* (Göttingen: Wallstein Verlag, 2001).

decisions made with regard to the V-2.[2] This picture of the Peenemünders draws too great of a distinction between Peenemünde's development employees and the production engineers who plied their trade in Mittelwerk.[3]

The following two chapters modify these assertions by showing that development engineers from Peenemünde were in fact central to decisions that deeply implicated the missile program in the crimes of the Third Reich. Chapter four shows that there was in fact an increasingly widespread collaboration between Peenemünde authorities and the two competitive institutions of the Armaments Ministry and the SS. It also examines the conditions of life for the numerous types of foreign workers on Usedom. Chapter five further develops these same issues as they played themselves out in the murderous conditions at concentration camp Dora. The relationships that crystallized while production remained at Peenemünde established a model for those at Dora, except that those at Dora took place in an environment of constantly increasing radicalization, desperation, and ferocity. Former Peenemünde engineers had an important part to play in this tragic period leading up to the end of the war. Indeed, as early as the middle of 1943, Peenemünde, with its deeply ingrained institutional culture of self-interest, unavoidable National Socialist ideological messages, and steadily increasing cooperation with some of the regime's most barbaric elements, had embarked on a path that would eventually involve it in some of the regime worst criminal atrocities.

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[2] See, for example, Michael Thad Allen, *The Business of Genocide: The SS, Slave Labor, and the Concentration Camps* (Chapel Hill: University of North Carolina Press, 2002), 208-239, Neufeld, *The Rocket and the Reich*, 167‑238, Sellier, *A History of the Dora Camp*, and Wagner, *Produktion des Todes*.

Strong Arms: The Armaments Ministry and the SS

As the Peenemünders slowly began to overcome the technical difficulties of missile development in the summer and fall of 1942, the issue of mass production began to loom ever larger. For the specialists at the facility, the missile program had always been carried out on a crash basis, but Dornberger's and the Army leadership's incessant demands that the missile be operational as soon as possible only increased the pressure to usher in mass production with absolutely no delays. Once the missile had been successfully launched in October 1942 and began to show, at least to regime authorities, its promise as a "wonder weapon," Peenemünde's nominal independence as an Army program quickly began to wane. The Armaments Ministry and SS both began to take an interest in subsuming it under their large and powerful umbrellas.[4] Nevertheless, even though both organizations would, with varying degrees of success, compete with each other to exert increased control over the program, Peenemünde missile specialists proved themselves to be perfectly willing to cooperate with individuals in either organization in order to solved the complex issues of mass production and labor procurement. The reason for this lies in the fact that those engineers from both the Armaments Ministry and the SS who were detailed to work in the program held many of the same institutional goals that bound the Peenemünders together as a dynamic technological community.

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[4] Michael Allen has successfully argued that these battles over large and important projects by such influential organizations were not merely efforts to gain increasing power in the polycratic National Socialist system. Rather, in the second half of the war, these organizations, especially the SS, were motivated to remake the state on the model provided by their own specific ideological vision. Michael Thad Allen, *The Business of Genocide: The SS, Slave Labor, and the Concentration Camps* (Chapel Hill: University of North Carolina Press, 2002). Karin Orth's wide-ranging study of the Nazi camp system argues less convincingly that such battles were merely a part of Himmler's "political power calculations." See Karin Orth, *Das System der Nationalsozialistischen Konzentrationslager* (Munich: Pendo Verlag, 2002), esp. 162-221.

Nearly two months after the successful launch test on October 3, 1942 (and three days after the Soviet Union began its onslaught against the Sixth Army at Stalingrad), Hitler ordered Albert Speer to begin mass producing the missile as quickly as possible. One of the dictator's primary reasons for doing so was to extract "vengeance" on England for its destructive bombing raids on German cities.[5] To bring the V-2 on line as quickly as possible, in early December, Speer organized what he called the A-4 Special Committee. This group was made up of some twenty sub-committees whose members included specialists from Peenemünde, industrial representatives, and Armaments Ministry officials. Their job was to coordinate the production and delivery of parts as well as the finished missile, organize proper transportation of raw materials, and test the mass-produced batch runs for quality control. Speer charged the famous locomotive engineer Gerhard Degenkolb with the leadership of this large and important body.[6] By January, the energetic Degenkolb began assembling his subcommittees. Of note, he made von Braun the chairman of the subcommittee for "Final Acceptance" (*Endabnahme*). Von Braun's deputies included the mercurial Thiel and several other engineers from Peenemünde.[7]

Degenkolb was an absolutely fanatical Nazi, complete with a blustering, overbearing, and even rude personality, as well as a reputation for ruthlessly completing his large projects with little regard for cost or human considerations. Dornberger's physical description of him is indicative of his personal distaste for the gifted but imperious engineer.

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[5] Neufeld, *The Rocket and the Reich*, 169-170.

[6] Stahlknecht, Protokol über Besprechung 5.12.42, RH8/v.1959, Bundesarchive/Militärarchiv (BA/MA).

[7] Von Braun to Degenkolb, 2/11/43, FE 732, National Air and Space Museum (NASM).

> He had a well-nourished appearance. In his round, sallow face, the obliquely set, keen blue eyes darted restlessly hither and thither. Prominent swellings above his eyebrows and the clearly marked veins in his temples were evidence of a hasty temper. This was Degenkolb, one of the closest associates of our greatest adversary in the Ministry of Munitions, [Karl Otto] Sauer, the all-powerful Hauptamtsleiter (Chief of the Regional Party Office) … [Degenkolb] had a completely bald and spherical head, his soft, loose cheeks, bull neck, and fleshy lips revealed a tendency toward good living and sensual pleasures, while the restlessness of his powerful hands and the vigor of his movements were evidence of vitality and mental alertness. He was never still. His reputation as the creator of the war locomotive stood high.[8]

Degenkolb did nothing to ingratiate himself with the community of missile specialists at Peenemünde. Almost immediately, he began making demands on the Peenemünders that were virtually impossible to fulfill. For example, by February 1, 1943, Degenkolb demanded the construction and installation of fifty assembly trucks per month for the production line at Peenemünde's F-1 plant. Because of bottlenecks in transportation and raw materials, only five were completed by that date. Engineer Kruck at Peenemünde, who was in charge of installation, noted that he simply did not have the resources to achieve this goal.[9] Similarly, Degenkolb demanded that by February 1, 100 steering parts should be prepared at F-1 each month. In fact, only a total of four were ready by then. Again, the engineer in charge, Kowall, noted sharply that the resources were simply not available and such a demand impossible to fulfill.[10] In addition, most of the production drawings, either of parts or assemblies,

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[8] Walter Dornberger, *V-2* (New York: Viking Press, 1955), 75.
[9] Kruck, "Fertigungsplanung Gerät A4, Sonderausschuss A4. Stand 1.2.43. Aufstellung zu Position 4b der Planungsubersicht, 1.2.43," GD638.0.17, Deutsches Museum (DM).
[10] Kowall, "Fertigungsplanung Gerät A4 (Sonderausschuss A4. Stand 1.2.43. Aufstellung zu Position 5b der Planungsubersicht, 1.2.32," GD638.0.17, DM

were not yet prepared. Those that were happened to be were in an extraordinary state of disorganization. This was not just a problem at Peenemunde, but many of the firms contracted to make sub-assemblies and parts simply did not have production drawings ready, assembly machinery installed or easily mass-producible parts made up.[11] Degenkolb could not have been pleased by this news. Nevertheless, despite these and other problems, Degenkolb aggressively streamlined subassembly, systematized communications between the Peenemünde developers, their suppliers, and other subsidiary firms, and rationalized technical innovations in mass production by ordering batch runs that set strict deadlines on the inclusion of such advances.

Even though Degenkolb took critical steps toward rationalizing mass production of the missile, Dornberger and the rest of the Peenemünders who had contact with the domineering Nazi came to despise his methods. Dornberger wrote of him that "He intervened brutally wherever he considered it necessary to do so, pulled all the strings he thought needed jerking for him to get his way, scrounged, dismissed, or interchanged executives without any special mandate on the strength of his position in the Ministry of Munitions. He dispensed insults, curses, and threats, and refused to go into detail … He acted like a burly, endlessly threatening slave driver."[12] Indeed, many Peenemünders beyond Dornberger considered him a crude barbarian who lacked any appreciation for the complexity and importance of their technological achievements.

To make matters worse, Degenkolb promulgated a production schedule in the beginning of April 1943 that made deeply onerous demands on the Peenemünders and

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[11] Fertigungsplanung Gerät A4, Sonderausschuss A4. Stand 1.2.43. A4 Gerät. Aufträge für Fertigteile, 25.1.43," GD638.0.17, DM.
[12] Ibid., 89.

was well nigh impossible to fulfill. His schedule envisioned a monthly output of thirty missiles by July 1943, a number that would be ramped up to 450 by November and a preposterous 900 missiles per month by December.[13] These missiles were to be produced at three sites: the F-1 production plant at Peenemünde, Luftschiffbau Zeppelin in Friederichshafen, and Rax Werke in Wiener Neustadt. A previous production schedule, devised by Detmar Stahlknecht, an Armaments Ministry expert who worked closely with the Peenemünders beginning in mid-1942, called for a maximum of three hundred missiles per month at Friederichshafen and Peenemünde by September 1944.[14] Degenkolb brusquely shoved this schedule aside in favor of his more ambitious and unrealistic plan. A number of problems remained to be ironed out, however. Production drawings were non-existent or totally disorganized, parts lists were at best half completed, the assembly plants would not be ready on time, and Peenemünde developers were still struggling to get consistent results from their test launches.[15] Even as Degenkolb disciplined production planning, his schedule for final assembly was a fantasy because it simply ignored the realities of raw materials availability and the state of the V-2's technological development. Worse, the ambitious schedule caused a great deal of unhappiness and dissatisfaction among the missile specialists, who felt acutely the additional strain that it placed on them.

Nevertheless, Degenkolb quickly moved to impress upon the Peenemünders his unwillingness to brook any opposition to his schedule. On April 15, less than two

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[13] Degenkolb, Fertigungsprogramm A4, 4/2/43, FE 732, NASM.

[14] Stahlknecht to von Braun, 2/24/43, FE 358, NASM. Arthur Rudolph, the production chief at Peenemünde, was less optimistic. He felt that the Peenemünde production plant would be able to produce approximately 250 missiles per month, or about 3000 per year. Rudolph, "Vortrag Dir. Rudolph vor den Mitgliedern des A4-Ausschusses ahnlässlich ihres Besuches am 10.3.43 in Peenemünde," FE 833, NASM.

[15] Neufeld, *The Rocket and the Reich*, 175.

weeks after he published his desired production numbers, the steely engineer convened a meeting at the headquarters of the A-4 Special Committee in the "Locomotive House" in Berlin. Present, along with Degenkolb and his deputy, Heinz Kunze, were Dornberger, Zanssen, von Braun, Rudolph, and several other important representatives from Peenemünde. Degenkolb immediately reiterated to his audience in no uncertain terms that his production schedule stood as ordered. Among other things, he also directed that every subcommittee leader was to send a bi-weekly report on the status of their work directly to him, and that all work not related to the missile was to cease immediately so that all available energy could be focused on rapidly completing the V-2.[16] Two weeks later, Degenkolb delivered a circular to Peenemünde that emphasized these points, ordering development on all other projects to stop "until the development of this instrument is tirelessly brought to a conclusion." Furthermore, he ordered that once production began, "any impairment of production will not under any circumstances be tolerated."[17] All of this sent many Peenemünders into a fury. According to Rudolph, Thiel was so angry that he threatened to quit Peenemünde and teach at a university.[18] He had already complained to von Braun that this was no simple piece of equipment that could be moved into mass production on a whim and made it clear that he felt Degenkolb had no appreciation for the engine's technical complexity.[19] Georg von Tiesenhausen stated that Degenkolb's demands created a "colossal strain."[20] The pressure to

[16] Degenkolb, Aktennotiz Nr. T-9/43, FE 833, NASM.
[17] Degenkolb, Anordnung Nr. 3/43g, FE 732, NASM.
[18] Rudolph OHI, NASM. Dornberger noted that Thiel threatened this on a number of occasions, but in this case, he was struck by the meteoric developer's sincerity. Dornberger, *V-2*, 148-152.
[19] Thiel to von Braun, 3/16/43, RH8/v.1960, BA/MA.
[20] Georg von Tiesenhausen OHI, NASM.

successfully complete development at Peenemünde, already nearly overwhelming, became unbearable under Degenkolb's demands. His impossible production schedule and ceaseless haranguing only increased the tension under which the Peenemünders had to complete their work.

Even so, despite their personal distaste for Degenkolb and the increased pressure that he placed on the Peenemünders, the leadership of the Baltic facility demonstrated a willingness to do their best by the A4 Special Committee's Chairman. They certainly blanched at his personality and gnashed their teeth at his orders, but they nevertheless committed themselves to his schedule. In the first place, Dornberger, probably sensing that the chickens of his earlier overly-optimistic salesmanship had come home to roost, gave the Peenemünders a direct order to follow Degenkolb's demands.[21] However, once again, von Braun was the central figure in the enlistment of their support for Degenkolb's schedule. The brilliant development engineer set an example by laboring mightily to fulfill Degenkolb's orders, working on his own initiative to help open up production bottlenecks, shorten delivery delays, and improve quality control.[22] He also used his authority to coax, chide, and push his flagging subordinates back into line.

For example, in a circular that he sent to all of his deputies at Peenemünde and to his "Final Acceptance" subcommittee at the end of April, von Braun made it clear that they were to put forth their best efforts to meet Degenkolb's schedule. He stated flatly that "The published production program of A-4 Special Committee Director Degenkolb is to be seen as the only valid one for future production planning."

[21] Dornberger, Aktennotiz, 6/6/42, RH8/v1210, BA/MA.
[22] Von Braun to Degenkolb, 3/6/43, FE 732, NASM.

Sensing the dissatisfaction among many Peenemünders, he required "All employees of the [development office], the Special Committee, and the Work Committees to support the standing precepts with all means and to take up a healthy collaboration with this position."[23] Von Braun clearly sensed the displeasure with the Degenkolb numbers and sought to make sure that the Peenemünders did their best to support the Degenkolb program. When the specialists' identification with their institutional goals began to break down in the face of an overbearing ideologue who seemingly had no idea of the difficulties involved in the missile's development, von Braun, the most influential and inspiring leader in the entire effort, was able to bring their support for the program back into line by deploying his powerful managerial and symbolic authority. To be sure, everyone at Peenemünde had no choice but to accept Degenkolb's program or perhaps face the end of their work, but this only explains part of the dynamic at the facility in early 1943. A fatalistic acceptance of the inflated and premature production numbers would hardly help to rapidly overcome the myriad of technical problems still facing the developers. Instead, when an opportunity arose for the engineers to delay, equivocate, or simply slow the pace of their work for lack of enthusiasm, von Braun intervened, explaining to them that the Degenkolb schedule would stand, but also successfully appealing to them to redouble their efforts, despite the untoward demands placed upon them. In the end, this was one of the secrets of the success of the V-2 development and production programs. Von Braun's dynamic leadership was a key to the rapid development of such radically new technology. It not only helped to restore the flagging enthusiasm of many at Peenemünde, but it also encouraged them to make even greater efforts on

[23] Von Braun Rundschreiben, 4/30/43, FE 732, NASM.

behalf of the program. Many of them wavered in the face of Degenkolb's often outrageous orders, but their shared dedication to his ultimate goal, propped up by von Braun's energetic interventionism, drove them to accelerate the already breakneck pace of their work in line with the demands placed upon them by powerful regime officials.

Even though Degenkolb's schedule was never met, by early August, the Peenemünders had managed to iron out many of the prickly development and supply issues and came to an uneasy, but permanent truce with the fiery and bullying Special Committee Chairman. At a meeting on August 4, Degenkolb and his deputy Kunze met with Dornberger and Zanssen in an effort to specifically lay out the terms cooperation between the Army missile program and the Armaments Ministry representatives under Degenkolb. They agreed on a number of important points. Albin Sawatzki, a Degenkolb appointee who formerly worked for Henschel to produce Tiger tanks (and an engineer who would figure prominently in production at Mittelwerk), was given the responsibility for overall production planning. However, Degenkolb compromised by making Sawatzki and production managers whom he assigned to the Rax Werke in Wiener Neustadt formally subordinate to Zanssen, the Army's base commander at Peenemünde. Importantly, production planning at Peenemünde fell to von Braun's deputy in development, Eberhard Rees. Dornberger and Degenkolb agreed to give Rees "full dictatorial powers," and he was fully responsible for the completion of the Degenkolb program at Peenemünde. Further, they ordered Rees to confer with Rudolph, Sawatzki, and Thiel in order to come up with a final plan for labor demands in production. The minutes for this meeting formalized the plan to carry out production using concentration camp slaves, and Rees had the responsibility of providing accommodations for these “convicts,” as Dornberger would erroneously label them.[24] Thus, despite initial, widespread disagreement and personal dislike on the part of many Peenemünders for Degenkolb, they were able to look past their differences in the interests of moving the program forward as quickly as possible. Peenemünde specialists forged a cooperative relationship with clearly defined spheres of influence and control between themselves and representatives of the Armaments Ministry. In addition, by clarifying these spheres of competence and control, their plans further involved the Peenemünde specialists in an increasingly brutal National Socialist labor policy. In one stroke, they granted a *civilian* engineer full authority over all aspects of production at Peenemünde while legitimizing the use of slave labor to carry it out by granting it an additional official seal of approval. Peenemünde specialists fully accepted the utilization of slave labor to complete their work, and indeed, had very few qualms about doing so in a regime that made high virtues out of service to the state and the exploitation of foreign enemies.[25]

Bringing in the Blackshirts

At the same time that the Peenemünders were grappling with the Armaments Ministry’s demands on their technology, the SS began to take a keen interest in the

[24] Niederschrift über die Besprechung am 4.8.43 beim Heimat-Artillerie-Park 11, RH8/v. 1254, BA/MA. The original decision to use concentration camp prisoners is discussed in the next section.
[25] Another factor in this truce was that in July, Karl Otto Sauer, Speer’s ruthless deputy, giddy with the possibilities of the V-2, ordered that production be ramped up to 900 in October and 1500 by January, effectively doubling Degenkolb’s program in half the allotted time. Dornberger, Aktennotiz Nr. T 21/43, FE 833, NASM. Speer recognized the absurdity of these demands and, to the relief of many Peenemünders, ordered a reversion to Degenkolb’s overblown schedule, which was reasonable by comparison. Neufeld, *The Rocket and the Reich*, p. 194-195.

events on Usedom. For both personal and ideological reasons, Himmler had long possessed a deep and abiding fascination for complex technology, though his knowledge of it and his organization's ability to produce it on a large scale was demonstrably sub-par.[26] A program that possessed the size and spectacular potential of the V-2 was bound to draw his interest eventually. Nevertheless, the first meaningful contacts between his organization and the missile producers were due largely to the prodding of Peenemünde officials themselves. In December 1942, Himmler visited the facility, where he toured the grounds and witnessed an unsuccessful launch test. Unperturbed, Dornberger calculated less than a week later that he might be able to use Himmler's recent interest to enhance the program's status within the war economy. He ordered the Army Commander of Peenemünde's Development Works, Lieutenant Colonel Gerhard Stegmaier, who was "happy as a school girl about his special greeting from the Reischführer-SS," to pass along a message to Himmler through Stegmaier's friend, Himmler crony Gottlob Berger, informing the head of the SS of Dornberger's desire to meet with Hitler in order to pitch the aims of the program directly to him one more time.[27] In the event, the meeting never materialized, but Dornberger continued to develop his connection to Himmler through Stegmaier and Berger in an effort to ensure that the program would have all of the resources it needed for rapid completion.[28]

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[26] Himmler, according to an SS business manager, "supported all inventors on principle." See Allen, *The Business of Genocide*, esp. 57-164, for the myriad of failed technological projects attempted by the SS.
[27] Berger to Himmler, 12/16/42, RG 242, T-175, reel 117, NARA. Neufeld, *The Rocket and the Reich*, 176.
[28] Neufeld, *The Rocket and the Reich,* p. 176-178.

There was also another important connection between Peenemünde and the SS. Wernher von Braun himself joined the organization in 1940, though, as Neufeld points out, did so only after a local SS Colonel, purportedly acting on Himmler's order, urged the young aristocrat to do so. After some deliberation, von Braun agreed, though was not a particularly active member. The development chief only attended meetings periodically and was known to have worn his uniform only a handful of times, supposedly surprising some who had no idea that he was a member of the dreaded blackshirts. According to Neufeld, von Braun was not particularly enamored of the SS or even of Nazi ideology, and "was motivated first and foremost by a desire to advance [himself] and [his] work, compounded perhaps by enthusiasm for the foreign and domestic 'accomplishments' of National Socialism."[29] Though he would use his SS membership when it benefited him to do so, what was truly important to von Braun were not his ideological convictions, such as they were. Rather, his career in rocketry assumed precedence over all other things. Nevertheless, the young aristocrat's membership was yet another indication that the tenets of this organization were in no way an anathema to him. At the very least, he was willing to cooperate with them as long such an activity would further his personal and professional goals. That this collaboration also benefited the SS was a secondary consequence. Even so, von Braun's membership in Himmler's organization would have important repercussions later in 1943.

Despite all of this, Himmler made a clumsy and ill-fated attempt to seize control of the missile program in the spring of 1943. The Reichsführer-SS, based on

[29] Michael Neufeld, "Wernher von Braun, the SS, and Concentration Camp Labor: Questions of Moral, Political, and Criminal Responsibility," *German Studies Review* 25/1 (2002), 61-62. Also Neufeld, *The Rocket and the Reich*, 178‑180.

a dishonest report that Berger received from Stegmaier, accused Peenemünde's commander, Leo Zanssen, of being a member of the local branch of the "Catholic Action," an anti-Nazi group largely made up of Catholic priests, and ordered him removed from his post. While it is true that Zanssen was a Catholic, he was nevertheless a loyal member of the Army who, if anything, may have been growing disillusioned with the Nazi regime, though not enough to seek its defeat. Fritz Fromm, the Chief of Army Armaments, empowered Dornberger to investigate the charges. Dornberger temporarily assumed direct control at Peenemünde and set about uncovering the affair. He eventually managed to clear his friend's name and have a shaken Zanssen returned to Peenemünde. Remarkably, Stegmaier retained his position – Dornberger could at least rely on his loyalty to the regime – and Himmler quietly backed off.[30]

Though this affair resulted in a number of charged confrontations and bruised egos, Himmler made little progress in his attempt to seize control of the program. Nevertheless, the incident could not but have shaken the Peenemünders and encouraged them to act even more strictly within what they thought were proper boundaries of behavior. It only made more apparent to them that the Gestapo may very well have been actively operating behind the scenes at Peenemünde to root out all anti-Nazi elements. If an officer as important as Zanssen could be accused of seditious activities and removed from his post, there was no telling who among the civilians might be next. Dornberger wrote that after he managed to restore Zanssen to his post in the fall, "The threat of a formidable power working behind the scenes

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[30] On the particulars of this affair, see RG 242, T-175, Roll 124, NARA. Michael Neufeld has also ably sorted out this story as well. See *The Rocket and the Reich*, 180-183; also Dornberger, *V-2*, 182-185.

remained."[31] This threat would rear its head again nearly a year later, but even then, the general would continue to show a remarkable proclivity to seek out the SS in order to fulfill the program's needs. Though the Zanssen affair was a rattling experience, it did not permanently poison the relationship between missile program administrators and the SS.

"Production By Convicts – No Objections": Forced and Slave Labor in the Army Rocket Program, 1939-1943

Despite Himmler's meddling and the near imprisonment of one of Peenemünde's key military figures, administrators at the missile base continued to remain open to the options offered by the SS. Their deeply entrenched desire to satisfy Peenemünde's institutional goals by successfully delivering on the Army's promises to the regime dictated that they should think flexibly about their remaining problems and remain open to any possible solutions. One of the most intransigent problems was finding a labor force to assemble the missile. Though many popular histories and memoirs of the period loudly proclaim that the SS forced slave labor upon the helpless Peenemünders, the truth is far more sinister. High ranking officials at Peenemünde either recommended the employment of SS-controlled concentration camp labor or enthusiastically agreed to using it once the option became available. In no way did the SS compel the Peenemünders to use slave labor.[32] Once at the facility, the uses to which these prisoners were put foreshadowed in many ways their experiences in the hell of Dora-Mittelbau. Indeed, the patterns of work for the slaves

[31] Dornberger, *V-2*, 185.

[32] Mark Spoerer has surveyed thirty-three industrial firms that used concentration camp prisoners as their labor force. He has found only one instance in which state institutions coerced factories or firms into employing slave labor against their managers' will. Mark Spoerer, "Profitierten Unternehmen von KZ-Arbeit? Eine kritische Analyse der Literatur," *Historische Zeitschrift* 268 (1999), 61-95.

on Usedom laid the very foundation for the far more terrible experience underground months later.

The use of foreign labor, either forced labor, prisoners of war, or concentration camp prisoners, in the missile program reflects the general ideas and patterns about such labor under the Nazi regime. As was the case across the country, there was no predetermined plan for its mass operation at Peenemünde. However, though the Nazis were quite chary about using it at all because of ideological considerations, construction administrators at Peenemünde recognized very early that the deadlines established by their own optimistic projections and by regime authorities could not be reached without resorting to foreign labor. Acute manpower shortages because of the large military drain on the domestic labor pool forced their hand. In the end, foreign labor proved an essential element not only in easing pressure on the labor sector in Germany generally, it was also central to the establishment, expansion and technological work that was carried out at Peenemünde.[33]

Foreign labor at Peenemünde has roots that stretch back until just before the outbreak of war in 1939. The first foreign workers in Peenemünde were voluntary

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[33] Ulrich Herbert, *Fremdarbeiter: Politik und Praxis des "Ausländer-Einsatzes" in der Kriegswirtschaft des Dritten Reiches* (Bonn: J.H.W. Dietz, 1985), translated into English as *Hitler's Foreign Workers: Enforced Foreign Labor in Germany Under the Third Reich*, transl. By William Templer, (Cambridge: Cambridge University Press, 1997). English translation cited hereafter. Though somewhat dated, Herbert's study remains essential reading on the topic. His seminal work inspired many studies that largely confirmed and strengthened his own findings. To date, historians have established a broad knowledge of how the forced labor system evolved and what dimensions it took as the Nazi period wore on. More recent scholarship expands this knowledge by investigating forced labor outside of Nazi Germany proper and also examining how systemic factors such as age, gender, and employment sector determined the conditions of forced labor. See, for example, Wolf Grüner's forthcoming work *Forced Labor of Jews: Comparative Studies on Forced Labor of German, Austrian, and Polish Jews Outside the Concentration Camps in the Third Reich* (New York: Cambridge University Press) and Mark Spoerer's ambitious and excellent study *Zwangsarbeit unter dem Hakenkreuz: Ausländische Zivilarbeiter, Kriegsgefangene und Häftlinge im Dritten Reich und im besetzten Europa* (Stuttgart: DVA, 2001).

Czech contractors. They arrived at the base to work either on the construction of the mammoth missile production plant at Peenemünde East or at Peenemünde West, the Luftwaffe facility. Indeed, all foreign workers at Peenemünde between 1939 and 1943 labored only at construction sites around the base, not on development projects. It was not until 1943 that foreign workers were allowed into the development works. Nevertheless, because of secrecy concerns after the outbreak of war, Army administrators removed these Czechs from the island.[34] The first forced foreign laborers to arrive at Peenemünde were those dragooned by the vicious occupying forces in western Poland in the middle of 1940.[35] These workers eventually numbered between 600 and 1000, depending upon the time of year, and augmented a German construction force of approximately 4800 men.[36]

In short order, however, secrecy considerations also began to impinge on the use of foreign forced labor at Peenemünde. In July 1940, the Armed Forces High Command (OKW) ordered that no foreign laborers be allowed to work in top-secret facilities.[37] The number of Polish forced laborers diminished, but did not disappear altogether. The exigencies of the demands for rapid construction dictated that they remain in place. On July 27, Heinrich Lübke, who oversaw Peenemünde construction for Baugruppe Schlempp, informed Peenemünde administrators that he would do everything he could to retain the Polish workers.[38] In this, he was relatively

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[34] Dornberger to Zanssen, 8/28/39, FE 342, NASM. Rudolph to Speer, 10/12/39, RH8/v.1206, BA/MA.
[35] Entstehungsgeschichte der Fertigungsstelle Peenemünde, 7/2-4/40, RH8/v.1207, BA/MA. Hereafter cited as Entstehungsgeschichte. Neufeld, *The Rocket and the Reich*, 185.
[36] Entstehungsgeschichte, 12/2-4/40, RH8/v.1207, BA/MA.
[37] Entstehungsgeschichte, 7/2-4/40, FE 830, NASM. Dornberger to Schlempp, 7/24/40, RH8/v. 1213, BA/MA. Hitler also feared the risks of sabotage security breaches that came with the use of foreign labor. Neufeld, *The Rocket and the Reich*, 184.

successful. By December, a total of 630 Poles worked in construction projects at Peenemünde, down from a high of approximately 1000 in August.[39] Nevertheless, throughout 1941, construction on the production plant, rail line, and other support facilities was pressed forward as quickly as possible. The only way to maintain the highest possible pace of the work was by resorting to foreign labor. For this reason, the use of foreign labor was a matter of course in construction at Peenemünde, and, outside of the demands made by OKW, there was very little discussion about its morality or disadvantages. The only questions that came up revolved around how many workers construction administrators could procure and to what purpose they would be used.[40] Despite OKW's security concerns, nearly 1000 Italian workers arrived in Peenemünde over the spring and summer of 1941 to help with construction projects for Peenemünde West. In April, Dornberger indicated that since Italians were employed by the Luftwaffe, he had no quarrel with their use at the Army facility, and Peenemünde began employing them as well.[41] In early 1942, French construction workers arrived at Peenemünde to add to the work force.[42]

The winter of 1941-'42 marked a watershed period for the use of forced labor in Germany. The collapse of the Blitzkrieg strategy and new emphasis on total war meant that the Reich's already strained labor supply was stretched to the breaking point. To help overcome serious labor shortages, Reich officials turned in part to Soviet prisoners of war and other "Eastern Workers."[43] In the second half of 1942, an

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[38] Entstehungsgeschichte, 7/27/40, FE 830, NASM.
[39] Entstehungsgeschichte, 12/2-4/40, RH8/v. 1207, BA/MA.
[40] Aktennotiz über die Besprechung in Pee am 10.-12.2.41, 2/17/41, FE 831, NASM.
[41] Entstehungsgeschichte, 4/16/41, FE 831, NASM. Baugruppe Schlempp, Bauleitung Peenemünde, Aktenvermerk, 7/28/41, NASM, FE 342.
[42] Aktennotiz, 4/2/42, RH8/v. 1209, BA/MA.

increasing number of these prisoners began arriving in the area around Peenemünde. Planners there began to consider using them not only as construction workers, but also as assembly and production personnel. Some 400 Soviet Army officers were housed in Wolgast, on the mainland approximately six miles away from the base. These men had technical backgrounds and the authorities utilized them as skilled laborers on Usedom.[44] Hundreds of other unskilled Soviet prisoners were kept at a barracks camp outside of Trassenheide, approximately one mile south of the employees' settlement. Arthur Rudolph originally hoped to use many of these prisoners in the assembly hall, but was forbidden to do so by regime authorities on secrecy grounds.[45] All told, by April 1943, Army and Armaments Ministry authorities housed more than 3000 foreign laborers and prisoners of war on the island.[46]

During this period, foreign labor also became the common solution for labor problems at subsidiary firms that manufactured parts and assemblies for the missile. Peenemünde administrators had a strong hand in decisions about the use of these workers at the plants. Perhaps the most important subsidiary firm was Luftschiffbau Zeppelin in Friederichshafen. In the middle of 1941, Peenemünde developers considered using the assembly plant there to produce small parts and fuel tanks for the missile.[47] By the end of the year, they designated it as the second mass

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[43] Ulrich Herbert, "Labor as Spoils of Conquest, 1933-1945," in David F. Crew, ed., *Nazism and German Society, 1933-1945* (New York: Routledge, 1994), 222.
[44] Middlebrook, *The Peenemünde Raid*, 32.
[45] Rudolph Aktenvermerk, 2/9/43, RH8/v. 1210, BA/MA.
[46] Neufeld, *The Rocket and the Reich*, 185.
[47] Niederschrift über die Besprechung am 3.-4.9.41 in Friederichshafen, Entwicklungsarbeiten bei Luftschiffbau Zeppelin GmbH Friederichshafen, 9/8/41, FE 728/B, NASM.

production site.[48] In April 1942, Ordnance unveiled ambitious proposals to expand this plant and equip it with engine test stands, a liquid oxygen plant, and the requisite service facilities.[49] The next month, von Braun himself traveled to Friederichshafen to assess what needed to be done to begin mass production there. His report on the trip marks the first known instance in which he directly implicated himself in the use of forced labor in the missile program.

In Friederichshafen that spring, von Braun carried out a thorough inspection of the assembly facility in order to determine its requirements for mass production of the missile. He toured the assembly halls, delivery areas, work facilities, train installations, and power supply, all while noting the labor requirements for the factory. A number of skilled workers at the plant were already available for use in the plant, but von Braun observed that they still needed to be complemented by trained workers from Peenemünde. He considered transferring a number of VkN soldiers to Friederichshafen for this task. Moreover, von Braun strengthened the links between Peenemünde and Friederichshafen by ordering the Zeppelin Works to send four work and production planners to Usedom in order to learn the best way to run a missile assembly plant. Shop floor labor was difficult to find, but notably, he recommended that "Construction of fuel tanks can be done by foreign workers and prisoners of war." Von Braun felt that approximately twenty German supervisors

[48] Neufeld, *The Rocket and the Reich*, 143.
[49] Thom, "Bauvolumen Gerät A4," FE 728/B, NASM. The test stand would eventually be constructed at Oberaderach.

would be required to work with them and that the company could work out the details of their supervision itself.[50]

Von Braun's recommendations were taken to heart. In October, Detmar Stahlknecht drew up a projected number of Soviet prisoners of war needed for labor in various subsidiary firms and sent it to Fritz Sauckel, the brutal and ruthless Gauleiter of Thuringia and General Plenipotentiary for Labor Supply in Germany. Stahlknecht requested that firms such as Klein, Schanzlin, and Becker in Frankenthal, Ardelt Werke in Eberswalde, and Friedrichs and Company in Hamburg all receive between 25 and 130 Soviet workers. Most importantly, Stahlknecht ordered 200 prisoners for work at Luftschiffbau Zeppelin. Stahlknecht had also worked out precisely which skills were necessary and the number of each set of skilled laborers that would be needed. Among other things, he requested from Sauckel one hundred mechanics, ten lathe operators, and ten tool makers for the Zeppelin Works, but provided a precise list of skills for each of the seven firms he was requesting prisoner labor for.[51] In November, the Armaments Ministry informed Stahlknecht that the prisoners he requested were unavailable, as they were urgently required for mining operations elsewhere.[52] Ultimately, it was the SS that provided the required labor for the Friederichshafen plant. In February 1943, Dachau administrators made the first

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[50] Von Braun, "Niederschrift über die Dienstreise vom 2.-5.5.42 nach Friederichshafen," RH8/v.1959, BA/MA. In his excellent history of the German missile program, Neufeld notes that the impetus for foreign labor at Friederichshafen came from Dornberger in October. See *The Rocket and the Reich*, 184.
[51] Stahlknecht to Sauckel, "Ausländischer Bedarf an russischen Fachhandwerkern für Sonderprogramm Peenemünde," 10/28/42, R41/282, Bundesarchiv Lichterfelde (BAL).
[52] Letsch to Stahlknecht, 11/12/42, R3901/20.173, BAL.

shipment of prisoner labor to the Zeppelin Works in order to begin parts assembly for the missile[53]

Thus, the transition to total war not only intensified the pressure on the Peenemünders to complete their own tasks, it also drastically cut into the available supply of German labor while increasing the compulsion with which the missile specialists would put labor to work. Well before they considered using concentration camp slave labor, managers at Peenemünde took the first steps on their own crooked road to Auschwitz by taking the initiative and reaching out to find whatever sources of labor they thought might be useful for the successful completion of their work. This enterprising, committed search for labor, coupled with the shortages even after the German economy turned to Soviet prisoners (well over half of the 3.3 million Soviets captured in 1941 perished by the end of the year), meant that it was only a matter of time before Peenemünde managers sought out what many across Germany believed to be the one last limitless supply of human reserves in the Reich – concentration camp slaves.[54]

The resort to slave labor at Peenemünde itself was not long in coming. As the onset of serial production loomed closer and closer, the question of laborers to assemble the rockets became increasingly pressing. Thus, in April 1943, Rudolph's associate, Jaeger, the head of the labor operations subcommittee of the A-4 Special Committee, recommended to the production plant chief that they use concentration

[53] Martin Weinman, ed., *Das Nationalsozialistische Lagersystem* (Frankfurt am Main: Zweitausendeins, 1990), 629.
[54] Edward Homze, *Foreign Labor in Nazi Germany* (Princeton: Princeton University Press, 1967) 83. Herbert, *Hitler's Foreign Workers*, 133-149. In late 1941-42, the SS also undertook a dramatic reorganization of its camp administration, setting up the *SS-Wirtschaftsverwaltungshauptamt* (SS-WVHA – Economic and Administrative Main Office). One of the primary tasks of this office was to provide cheap slave labor to German industry. Allen, *The Business of Genocide*, 128-164.

camp labor to assemble missiles on Usedom. On April 12, Rudolph went on a tour of the Heinkel aircraft factory in Oranienburg, which used prisoners to manufacture airplanes. Heinkel began using slave labor in this factory by requesting prisoners from Sachsenhausen in 1941. In the summer of 1942, it built a subsidiary camp of Sachsenhausen on the grounds of the factory. By April 1943, nearly 4000 detainees worked in the aircraft plant.[55]

After his inspection, Rudolph returned to Peenemünde with a glowing assessment of the possibilities of concentration camp labor for missile production. His report of the trip marks the beginning of Peenemünde's complicity in the use slave labor in the production plant on Usedom. In it, Rudolph noted that Heinkel ordered prisoners from the SS according to professional group, though he also learned that he could only count on less than a quarter of these prisoners to have formal training in the requested field. One free German civilian served as a supervisor for every ten prisoners. He also reported that much of the Heinkel prisoner labor force was crowded into a large locker room directly adjacent to the assembly hall. The SS guarded the prisoners and also provided food, clothing, and cleaning facilities for them. Importantly, ever-present secrecy and security considerations also figured largely in Rudolph's report. He noted that prisoners of different national groups were not segregated on the shop floor, but rather that Heinkel managers integrated all of the various nationalities in the factory. "This by itself is decisive for the conduct of work," he wrote. "The mixing together of nationalities has the advantage of limiting the formation of secret resistance groups." Moreover, he continued later in the report, "The operation of detainees offers considerable advantages over the earlier use of

[55] Orth, *Das System der nationalsozialistischen Konzentrationslager*, 175-176.

foreigners, since all tasks not related to work will be taken over by the SS and offer greater security in terms of the demand for secrecy." Rudolph – clearly impressed with the SS's willingness and ability to everlastingly ensure that these prisoners would never be free – closed his report by noting that prisoner labor was the most feasible way to equip the production plant at Peenemünde with workers. He would request that Jaeger contact the SS about providing prisoners. Meanwhile, the ambitious production planner noted, he would begin fencing-in the plant as well as the streets around it in order to make it secure for prisoner labor.[56]

Concerns about maintaining secrecy, therefore, drove home a conception that foreign forced labor was inadequate. Forced laborers were generally able to live and work together in groups, according to nationality. They also were eligible for vacation time and could return to their native countries during periods of leave. On the other hand, SS minders ensured that the slaves beneath them were offered no such solicitude. Their policy toward slave laborers nicely complemented the Peenemünders' secrecy considerations. The demand for absolute secrecy made it clear that one of the best ways to sustain the program's anonymity was to use concentration camp labor, which was utterly cut off from all contact with the outside world and had no hope of ever rejoining society. After their inspection of the Heinkel factory, Rudolph and Jaeger also made it clear in June 1943 that, "for reasons of secrecy and security," they wished to exchange to French foreign laborers at the production plant with prisoners who were not eligible for any vacation time. Foreign laborers who had the option of taking short trips home, they emphasized, should not

[56] Rudolph, "Besichtigung des Häftlings-Einsatzes bei den Heinkel-Werken, Oranienburg, am 12.4.43," 4/16/43, RH8/v.1210, BA/MA.

be allowed on the grounds of the facility at all. Heinz Kunze, Degenkolb's deputy on the A-4 Special Committee, agreed immediately and directed that all forced laborers, not simply the French, be exchanged for prisoners who were not eligible for vacation.[57] This left concentration camp slaves as the only option as a production labor force. Thus, Peenemünde's budding relationship with the SS emerged from the ranks of its senior management and was conditioned on one hand by the dearth of labor in wartime Germany and on the other hand by their overweening desire to maintain the absolute secrecy of their work. Rudolph recognized that he would solve two problems at once, and it was only after his positive assessment of slave labor and direct request for camp prisoners from the SS that the Armaments Ministry actually agreed to its utilization.

In addition, quite separately from Rudolph's endorsement of slave labor, Dornberger also embraced the idea of using SS prisoners in the assembly plant. At nearly the same time that Rudolph was touring the Heinkel works and giving his assessment of their its arrangement with the SS, Dornberger was inspecting the two other planned assembly facilities, the Zeppelin factory in Friederichshafen and Rax Werke in Wiener Neustadt (In July, a fourth production facility, DEMAG Fahrzeugwerke in Berlin, was added). Without having any knowledge of Rudolph's activities, Dornberger noted the possibility of "a closed operation of 2200 skilled laborers from concentration camps around Rax Werke." These prisoners, he proposed, should be housed in the direct vicinity of the factory hall. With this arrangement, he held, both the camp and factory could be fenced in and security

[57] Aktenvermerk über die Besprechung beim A4 – Auschuss (Arbeitseinsatz) am 2.6.43 in Berlin (Lokomotivhaus), FE 833, NASM.

maintained relatively easily.[58] Indeed, secrecy and security, in addition to the factory output, were key issues for Dornberger. Slave labor in the missile program meant that industrial security could be expanded, labor problems solved, and costs reigned in. All the while, projected output remained the same. The similarity to Rudolph's ideas, despite their lack of contact and discussion in the pivotal month of April 1943, was based on a strong collective understanding of the goals of their common endeavor.

Peenemünde administrators and A-4 Special Committee embraced the proposals to use slave labor and moved quickly to make arrangements with the SS. On June 17, the first 200 concentration camp prisoners, half of them German and half of them Russian, arrived with their SS guards from Buchenwald. They were housed in the cellar of the production plant, and their first task was to build a fence around the massive assembly hall in which they lived and worked.[59] By the beginning of August, 600 skilled concentration camp prisoners were in place at Peenemünde. Base administrators had plans to build a camp just outside the assembly plant that could accommodate up to 2500 slave laborers. Once this camp was complete, its commandant, "In direct cooperation with Herr Director Rudolph, will be able to call train after train of prisoners to Karlshagen."[60] The arrival of these prisoners on Usedom marks the consummation of the relationship between Peenemünde and the SS.

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[58] Heereswaffenamt, Arbeitsstab A4, Aktennotiz über Reise mit dem Sonderausschuss A4 nach Friederichshafen und Wien vom 13.-20.4.1943, 4/24/43, RH8/v. 1959, BA/MA. For the inclusion of DEMAG's facility in production plans, See Neufeld, *The Rocket and the Reich*, 193.
[59] Entstehungsgeschichte, 6/17/43, RH8/ v.1210, BA/MA.
[60] Niederschrift über die Besprechung beim HAP 11 am 4.8.43, RH8/ v. 1254, BA/MA. Quotation in Aktenvermerk über Besprechung beim Sonderausschuss A4 (Arbeitseinsatz) am 2.6.43 in Berlin (Lokomotivhaus), FE 833 NASM.

Slave labor at Peenemünde, then, emerged out of a variety of different considerations. From the earliest days of the program, pressure to show results was omnipresent. However, the era of total war had a dramatic impact on the missile program at the base, dramatically restricting the available labor pool while making missile operations an increasing priority. The failure of German conventional weaponry gave cause for many in the regime to see Germany's salvation in the new "wonder weapons." Hitler finally fast-tracked the V-2 production program early 1943, just after the major defeats in the Soviet Union and Africa.[61] Though there can be little doubt that many Peenemünders welcomed this decision, it also placed great pressure on them to finally meet their institution's goals by completing development and beginning mass production. In turn, this pressure, combined with the constant need to maintain the utter secrecy of the program and Himmler's desire to establish a presence at Peenemünde, pushed the boundaries of the possible, making the use of slave labor not only a conceivable option, but also the best one. Like the rest of the German state, Peenemünde officials sought to mobilize every last drop of labor capacity available within the Reich. The victims of their technological tunnel vision would be the unfortunate mass of starving prisoners within the slave empire of the SS.

Nevertheless, these larger considerations fail to fully explain the turn into moral abomination. Cultural dynamics within the community at Peenemünde also made its unique contribution to this shift. In the first place, the defining feature of life at Peenemünde was the ubiquitous secrecy that the facility operated under daily. This was obviously of paramount importance when it came to considering a labor force as

[61] Neufeld, *The Rocket and the Reich*, 191.

well. Slave laborers were entirely and eternally cut off from the outside world. In addition, while secrecy served to heighten the sense of community among those at the base, it also had important negative effects. Secret practices helped to forge a community of closely-knit individuals who believed in identical principles and had the same group ideals. The difficulty is that this dynamic also tended to shut out criticism and feedback within the community. Some Peenemünders feared registering their dissent, and the isolation that secrecy granted the Peenemünders also sharpened their internal focus on their own unquestioned institutional goals, fostering a climate in which an admittedly shrinking number of alternatives were a priori not even considered. According to Sissela Bok, this dynamic leads members of secret societies "to become mired down in stereotyped, unexamined, often erroneous beliefs and ways of thinking. Neither their perception of a problem nor their reasoning about it then receives the benefit of challenge and exposure."[62] This stunting of moral considerations was compounded by the general climate of racism and xenophobia that marked everyday life in the Third Reich. Moreover, the Peenemünders' relative contentment with their lives and disinclination to risk parting with the comfortable advantages to living on Usedom only helped to seal the matter. The pressures of the war, the ideological tenor of National Socialist Germany, and the internal cultural dynamics at Peenemünde utterly eradicated the conceptual possibility of alternatives to forced and slave labor while ensuring that opposition to its use was totally absent.

[62] Sissela Bok, *Secrecy: On the Ethics of Concealment and Revelation* (New York: Random House, 1983), 25. This dynamic has important contemporary examples as well. It figured largely in the 2004 controversy over the CIA's intelligence estimates regarding weapons of mass destruction in Iraq. See "Senators Assail C.I.A. Judgments on Iraq's Arms as Deeply Flawed," *New York Times*, 7/10/04. The Senate Select Committee on Intelligence labeled this dynamic "Group Think."

The practice of absolute secrecy also had an impact on a secondary level. Since the essence of secrecy is in its creation of boundaries and segregation of individuals or groups, discrimination of one form or another lies at its heart. Peenemünders identified themselves as a cohesive community with like minds and like interests. They most assuredly did not consider foreign workers of any stripe to be a part of their group. The sense of elitism imparted by secrecy gave them the opportunity to segregate themselves from the prisoners. This distinction between Peenemünders and prisoners on Usedom was also reinforced by Dornberger. According to K. Friederich Baudrexl, a VkN technical illustrator, before concentration camp prisoners began arriving at Peenemünde, the general announced to an assembly of employees that "In the near future, convicts [*Strafgefangene* – Dornberger used this term instead of the commonly employed SS term*Häftlinge* , or detainees] who are to work with everyone will appear here. I say to you now directly that they are all murderers, thieves, and criminals, and every criminal will always protest that he is innocent."[63] By drawing a distinct difference between the Peenemünders and the so-called "convicts," Dornberger's pronouncement helped to activate, reinforce, and clarify the Peenemünder's group identity as well as their perceptions of the foreign labor force on the island while establishing an environment in which the prisoners' priorities could mean virtually nothing to the civilians on Usedom. Social psychologists have argued that in order to know what (or who) a group actually is, it is helpful to know what (or who) it is not. Therefore, having an out-group with which to compare one's in-group helps to clarify the categorization

[63] K. Friederich Baudrexl, "Als Techniker in der deutschen Rüstung," in Torsten Hess and Thomas A. Seidel, eds., *Vernichtung durch Fortschritt: am Beispiel der Raketenproduktion im Konzentrationslager Mittelbau* (Berlin: Westkreuz Verlag, 1995) 17.

process. Moreover, group level categorizations become more prevalent in inter-group situations, like that on Usedom. The "elite" Peenemünders stood in stark contrast to the poorly treated, underfed, shabby, and supposedly criminal mass of foreign workers. According to social psychologists, once these types of group level categories are activated, members try to differentiate their group from the comparison group. Inevitably, they argue, most inter-group comparisons favor the in-group, and the priorities of the out-group are virtually ignored.[64] At the army's missile base, the concerns of the Peenemünders – successful development, full and rapid mass production leading to large output and the onset of operations – outweighed considerations for the foreign laborers at their disposal. Their first priority was to defend the National Socialist state. That this had to be done through the exploitation of other, less fortunate groups who were not even co-nationals, let alone "co-specialists," was simply a matter of course.

Indeed, one of the most remarkable features of the Peenemünde community is the very *lack* of contravening dissent over slave labor voiced by employees there, dissent that personnel might have expressed in petty administrative obstruction or even in simply deciding not to work as hard as they did. They were quick to raise strident objections – for which they suffered no reprisal – when they disagreed with policies they felt negatively impacted their work or made impossible demands upon them. Importantly, however, there was no great hue and cry, or even a considered debate in Peenemünde, over the use of slave labor. Nor was there a slackening of the frenzied activity there when concentration camp prisoners and their SS masters began

[64] R. Scott Tindale, Catherine Munier, Michelle Wasserman, and Christine M. Smith, "Group Processes and the Holocaust," in Leonard S. Newman, Ralph Erber, eds., *Understanding Genocide: The Social Psychology of the Holocaust* (New York: Oxford University Press, 2002), 146.

arriving. Employees at the base reflexively acquiesced to it through their absolute dedication to their deeply-knit technological community. Management automatically endorsed it, and employees, through the total passivity that emerged as a result of their concern for other priorities, gave their consent. Alternatives never weighed in the balance, and a slowdown in the work was inconceivable, both for the Peenemünders and for their military masters. Of course, most did not have access to the levers of power at the base, and it is perhaps unfair to expect an outpouring of disagreement or anger over foreign labor on Usedom. However, this does not mean that dissent could not have been registered in more subtle ways. Instead, they adhered closely to the institutional goals of their community, expressing this commitment through collective, dedicated action that rapidly moved the program through the design stage to early phases of mass production. This was a matter of their reflexive communal identity as a scientific and technological elite that had been granted a position of privilege by the Nazi state.

The Life of a Foreign Laborer at Peenemünde

An investigation into the life of foreign workers of any kind – forced labor, prisoners of war, or concentration camp labor – at Peenemünde presents a number of challenges. In the first place, the changing numbers of workers at the base makes it difficult to determine with real certainty the amount of foreign labor used there over time. The shifting priority level of the production program between 1939 and 1942 the seasonal nature of the construction work resulted in major fluctuations in the number of workers, including German civilians, assigned to Peenemünde.[65] Even more importantly, it is not easy to conceptually separate the different forms of foreign labor at Peenemünde. Forced laborers worked side by side with prisoners of war and even, for a time, concentration camp laborers, especially at construction sites on Usedom. Fewer foreign workers were employed in development areas because of secrecy considerations. This leads to the final problem involved in examining foreign labor at Peenemünde. There is, in fact, a limited amount of documentary evidence available on foreign workers involved with missile development, most of whom worked to machine tools or assemble parts. The majority of foreigners worked for Baugruppe Schlempp on construction projects around the base. They were only employed by the Army or Luftwaffe for a short period.[66] Many of the records of BGS were largely destroyed or are currently unavailable. It is therefore fairly difficult to formulate an exact picture of the conditions at the facility for a large number of foreign laborers. Nevertheless, some broad conclusions can be arrived at.

The basic fact of life for foreign labor at Peenemünde was that the conditions of life on the island varied dramatically, not by arbitrarily assigned Nazi racial categories, but rather by skill and function. This is an important counterpoint to a great deal of earlier literature on foreign labor in Nazi Germany. For example, Ulrich Herbert has argued in several different pieces that the system of forced labor in Nazi Germany adhered to a strict set of racial guidelines that, despite some adjustments,

[65] In the winter of 1939-1940, poor weather forced construction activities to shut down. They restarted work at the end of March 1940. Schubert, "Wichtige Daten bei der Durchführung des Vorhabens Peenemünde," FE 342, NASM.

[66] In September 1940, BGS took over construction management duties from the Army Construction Office. Its local manager was Erwin Mahs, who reported to Heinrich Lübke in Berlin. According to at least one report, in addition to its missile-related construction work, the BGS office in Peenemünde also helped construct the labor camps and concentration camps that served as a repository for slave labor. Max Düring Statement, AV 7/85, Bd. 25, BStU.

was never significantly altered.[67] According to the Nazi conceptions of race, prisoners from northern and western Europe, such as the Scandinavians or French, occupied the highest position in the racial hierarchy and were treated accordingly. However, according to Herbert, a procession down the racial hierarchy reveals progressively worsening living and working conditions. Below the northern and western Europeans on this scale were southern Europeans, followed by Slavs, especially Russians, and finally, the concentration camp prisoners and Jews, who received the worst treatment of the lot. For Herbert, "One's belonging to a specific *Volkstum*, a specific national ethnic background, determined to a pronounced degree the actual fate of the individual laborer."[68]

An investigation of foreign labor at Peenemünde reveals a rather different picture. Significantly, Nazi ideological conceptions regarding race were not the determining feature in the conditions endured by different foreign labor categories. Instead, a more central factor in determining the conditions of foreign labor at Peenemünde was the skill level of various groups of foreign workers. Much of the work done by foreign labor at Peenemünde was heavy construction, such as the building of dykes, laying of roads, and clearing of forests, which required the dedication of major concentrations of largely unskilled manpower to complete. The work was dirty, exhausting, and dangerous, and the risk of injury or death ran high. Unskilled labor, which was relatively plentiful and cheap, required no training before being put into operation and could thus be replaced without any decline or slowdown in productivity. Therefore, BGS construction managers at Peenemünde had very little

[67] Herbert, *Hitler's Foreign Workers*, 1-12.
[68] Herbert, "Labor as Spoils of Conquest," 241.

compunction to ensure that the conditions under which they labored were anything more than bare subsistence.

Along with the vast majority of unskilled, forced foreign laborers across Germany, those at Peenemünde found extremely difficult lives during their time at the facility. Administrators dedicated an absolute minimum of resources for their well-being. Their primary concern was the timely completion of their work. Franz Brauns, a civilian construction engineer noted that Erwin Mahs, the leader of BGS on site at Peenemünde, often met with Dornberger, Zanssen, and their deputies. According to Brauns, Mahs "only cared about building" and ignored the needs of the construction gangs on the island.[69] Construction administrators segregated unskilled forced laborers from the rest of the German population, had to live in cramped, shoddily constructed barracks, and Nazi officials often expropriated their miniscule wages. Backbreaking, twelve-hour days at the construction site were the norm, and construction managers scarcely considered safety precautions for these workers.[70] The Italians, who, as citizens of Germany's closest ally and, technically speaking, voluntary contract workers, might have expected decent conditions. Instead, they found the situation at Peenemünde unbearable. In October 1941, they staged an uprising that was rapidly quelled by Army security forces. Several of them were arrested and the rest went back to work, but shortly thereafter, construction administrators removed them from Usedom.[71] A 1942 report noted that French workers, who had arrived only earlier that year, were sick and exhausted from

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[69] Franz Brauns Statement, AV7/85, Bd. 25, BStU.
[70] Martin Middlebrook, *The Peenemünde Raid: 17-18 August 1943* (London: Cassell, 1982), 31-32.
[71] Entstehungsgeschichte, 10/16/41, FE 831, NASM.

overwork.[72] In the beginning of 1943, over three hundred Dutch laborers who had arrived only four months earlier purportedly found the conditions at Peenemünde so difficult that they refused to return from their Christmas vacation.[73] In October 1943, a typhus outbreak ravaged the foreign workers. 1300 Poles were unable to work for almost a month, pushing back deadlines for the ongoing building programs planned by Baugruppe Schlempp.[74] Without question, the furious pace of construction along with the neglectful conditions under which they lived and worked took a heavy toll on unskilled forced laborers.

Unskilled *concentration camp* laborers experienced even worse suffering at Peenemünde. Many arrived at Peenemünde in terrible condition, the victims of malnutrition and long train rides in over-stuffed railroad cars.[75] While at the facility, these workers existed under undeniably difficult conditions. According to Paul Baader, a VkN soldier who worked on materials testing in the development workshops, unskilled concentration camp prisoners always received the worst and dirtiest work.[76] Workers on the construction brigades ran an ever-present risk of serious injury or death. Werner Rottleb was a camp prisoner sent from Neuengamme to Peenemünde in 1943 and set to work on various arduous construction projects in both Peenemünde East and West. He remembers that the food in his camp was terrible and of insufficient quantity. SS captors beat and even shot several workers at

[72] Aktennotiz, 4/2/42, RH8/v. 1209, BA/MA.
[73] L.H. Jahnke Statement, "KZ Peenemünde – Bericht der VdN-Forschungskommission Rostock," AV7/85, Bd. 32, p. 2, BStU.
[74] Entstehungsgeschichte, 10/19/43, FE 873, NASM.
[75] Walter Grewe Statement, "KZ Peenemünde – Bericht der VdN-Forschungskommission Rostock," AV7/85, Bd. 32, p. 6, BStU.
[76] Paul Baader Statement, AV7/85, Bd. 33, BStU.

the worksite.[77] Many prisoners who did not work at the construction sites unloaded trains or ships in exhausting and brutal transport kommandos. Karl Krüger worked with a civilian group in Peenemünde harbor that marked and recovered test rockets in the Baltic. He saw how camp prisoners slaved to move cement sacks from ships to waiting trucks and trains. They had to carry their loads over impossible distances and SS guards beat or shot whoever could not bear the work.[78]

Indeed, SS guards, in the camps as well as in the work gangs, treated their charges in the most murderous tradition of their organization. Many unskilled laborers were killed during their time at Peenemünde, but a direct figure is nearly impossible to estimate, given the paucity of sources. Most prisoners were beaten or worked to death in the construction and transport kommandos, many others shot. According to one German witness, the prisoners were "underfed, always hungry, totally weakened."[79] The explanations of deaths given by the SS, such as being shot "for resistance," hung "on the order of the Reichsführer-SS [Himmler]," or the ubiquitous term "shot while attempting to escape," (used by camp administrators to explain away the multitude of random acts of arbitrary violence that SS tormentors engaged in daily) only obscured the truth of the matter.[80] The remains of many prisoners killed at Peenemünde were incinerated in a crematorium in nearby Greifswald.[81]

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[77] Werner Rottleb Statement, "KZ Peenemünde – Bericht der VdN-Forschungskommission Rostock," AV7/85, Bd. 32, p. 2, BStU.
[78] Karl Krüger Statement, AV7/85, Bd. 25, BStU.
[79] Karl Dachner Statement, AV7/85, Bd. 25, BStU.
[80] See the collection of death reports in AV 7/85, Bd. 26, BStU.
[81] "Auszug aus den Totenlisten des Krematoriums in Greifswald," AV 7/85, Bd. 26, BStU. Such generally vicious treatment may have inspired a resistance movement on Usedom. In 1965, Theo Franz, a former civilian construction worker at Peenemünde then living in East Germany, wrote to an SED apparatchik that a member of a prisoner resistance group told him that a group of Soviet officers

In contrast, technically proficient foreign workers often fared much better than their unskilled compatriots. Though available documents describing the conditions of skilled workers are even less common than those for unskilled laborers, some generalizations can nevertheless be made. Skilled workers largely found more comfortable accommodations as well as far easier working conditions during their time on the island. Frenchman Michel Fliecx arrived in Peenemünde from Buchenwald in the early summer 1943. On his second day at the facility, he and his fellow inmates had to line up inside the factory grounds where a civilian specialist who wore a party pin asked for their technical qualifications. According to Fliecx, the Peenemünder singled out welders, lathe operators, mechanics and other skilled laborers. Fliecx, along with many other prisoners, was a university student, but luckily managed to convince the civilian overseers that they were in fact technically skilled laborers.[82] Once given a skilled position, a German prisoner, Willy Steimel, noted that working in the factory with civilians was generally not difficult. Work allocations in the assembly facility were assigned on the basis of technical qualifications. He testified after the war that prisoners' technical skills "Forced the civilian management to value the prisoner as a specialist and also to treat him accordingly, namely as a human being. This brought about a partly bearable situation."[83] For Fliecx's group, work days were from 7:00 a.m. to 5:30 p.m., with a

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was shot in the woods around Greifswald and buried in a mass grave. The resistance group, purportedly known as the "White Guard," was made up of Belgian, Polish, and Russian prisoners. There are no other known documents beyond Franz's letter to support his claim. Theo Franz to Albert Norden, 2/5/66, AV7/85, Bd. 32, BStU.

[82] Michel Fliecx, "Wegen des Vergehens der Hoffnung – Zwei Jahre Buchenwald – Peenemünde – Dora – Belsen," AV7/85, Bd. 32, BStU.

[83] Willy Steimel Testimony, RG 242, M-1079, U.S. vs. Kurt Andrae, et al, roll 4, NARA. According to Neufeld, Steimel's testimony is not entirely trustworthy because he was probably an SS informant.

thirty minute break for lunch. At the end of the shift, prisoners even had the opportunity to clean themselves and lounge on warm evenings under the spruce trees inside the factory fence.[84]

Conditions outside of work also augered well for skilled prisoners. Fliecx considered the food "adequate, but we were nevertheless hungry."[85] Steimel, who also made the two-day journey from Buchenwald, noted that the food was much better than at his former camp.[86] The prisoners were given individual bunk beds with two blankets each, as well as their own wash basins. The sixty SS overseers, except for a sadistic Rumanian-German guard, a *Volksdeutscher*, whom the prisoners nicknamed "Moustache" generally treated them well. When "Moustache" did go hunting for victims on which to take out his frustrations, civilian managers were able to complain about him to his commanding officer and limit his chicanery.[87] Steimel also noted that SS guards "Could not use the usual methods of the concentration camp because of the fact that a lot of civilian and military workers were present and did not permit it."[88] Under these conditions, the health of the prisoners generally improved, but this only cast into more stark relief the differences between skilled and unskilled foreign workers at Peenemünde.

Administrators of the missile program expressly sought skilled laborers to fulfill their needs. In July 1943, 400 unskilled French prisoners arrived at

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See Neufeld, *The Rocket and the Reich*, 189. Nevertheless, most of his observations are confirmed by Michel Fliecx's important memoir, which was unavailable to Neufeld when his work was published.

[84] Michel Fliecx, "Wegen des Vergehens der Hoffnung ," AV7/85, Bd. 32, BStU.

[85] Ibid.

[86] Steimel Testimony, RG 242, M-1079, roll 4, NARA.

[87] Fliecx, "Wegen des Vergehens der Hoffnung," BStU.

[88] Steimel Testimony, RG 242, M-1079, roll 4, NARA. Even so, Fliecx notes that some guards did beat prisoners that they caught sleeping and sometimes made them perform physically torturous exercises during roll calls.

Peenemünde from Buchenwald, and production administrators immediately attempted to exchange them for trained workers through SS-WVHA. In the event, the exchange never took place because more prisoners arrived on the heels of this transport, and they were put to work in the necessary areas.[89] For the most part, however, the SS promptly satisfied their demands. Rudolph and Jaeger made requisitions, divided by skill, through Gerhard Maurer in the SS-WVHA,who would assign prisoners accordingly.[90] This system worked relatively efficiently, and by early August, final plans to inaugurate the missile's mass production could be laid. After years of painstaking development, the final stages of the V-2 program were in sight.

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The Peenemünde missile base began using foreign laborers before the outbreak of hostilities in 1939, but by 1943, with the war situation worsening by the day and no easy solution in sight for the missile program's desperate search for manpower, administrators voluntarily turned the SS in order to fulfill its needs.
In the years after World War II, German rocket engineers in the United States proclaimed that they in fact had no control over the decisions made to use forced and slave labor to mass-produce the missile. In truth, they were central to the effort, especially when it came to utilizing slave labor. Specialists at Peenemünde, not in the SS or Armaments Ministry, first broached the idea of using concentration camp prisoners. After taking the initiative to discover how effective such labor actually was, they then approached the SS with their proposal. Their acceptance of such a

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[89] Entstehungsgeschichte, 7/11/43, RH8/v. 1210, BA/MA.

[90] Aktenvermerk über die Besprechung beim A4 – Ausschuss (Arbeitseinsatz) am 2.6.43 in Berlin (Lokomotivhaus), FE 833, NASM. For transport lists of prisoners to Peenemünde, see National Archives Capture German Records Collection, ACC1996.A.0342, Reel 161, located at the United States Holocaust Memorial Museum (USHMM).

measure was conditioned in large part by the institutional culture of their base, which subtly remade their individual identities into a collective body whose priorities outweighed all other considerations. A combination of group self-interest, ideology, and the ever-present culture of secrecy, all exacerbated by the intensifying pressure of Germany's military situation, eliminated nearly any possibility of serious examination of the course of their work and the regime which sponsored it.

Interestingly, the most serious objections raised by Peenemünders and, therefore, one of the most serious threats to development and production, had nothing to do with slave labor. When Albert Speer's Armaments Ministry assumed an increased position of influence within the program by assigning the overbearing Degenkolb, roundly despised by all, to coordinate development and production, many Peenemünders complained noisily and, in some cases, even threatened to quit. In the end, what kept them in line was Peenemünde's institutional culture that promoted self-interest above all else, as well as a liberal amount managerial arm-twisting on the part of key figures such as von Braun. These important features of the missile program enabled Peenemünders to eventually see past the problematic demands (and Degenkolb's abrasive personality) that were imposed upon them by the Armaments Ministry. Despite the difficulties and complaints, they carried on as they always had, working feverishly to complete their work.

The Peenemünders' relationship to Degenkolb also illustrates an important point. When Degenkolb began making his influence on the program felt, Peenemünde specialists were able to register their displeasure with him without fear of reprisal or punishment. Engineers, scientists, and technicians replied to the Special

Committee Chairman's demands with vocal, strident, and often angry responses. In this case, they clearly felt comfortable registering their dissent and displeasure. Some, like Thiel, even went to the extreme of threatening to quit the project altogether. Dissent, therefore, was not out of the question at Peenemünde.

Nevertheless, internal hostility over the course of the program only surfaced when the designers' prerogatives themselves were threatened. Only when higher regime authorities imposed policies upon the Peenemünders policies that facility employees perceived as unfair, did employees act in a way that threatened to weaken the program from within. In truth, even these problems were mitigated by the deeply ingrained, automatically activated sense of loyalty to Peenemünde's mission. The acquisition of concentration camp workers promised to alleviate the program's most pressing labor problems, which cut off at the knees any concern for the moral dilemmas wrapped up in slave labor. The long-time presence of foreign forced labor probably only served to inoculate German civilians against such moral concerns. Self-interest reigned at Peenemünde, promoting and justifying cooperation with some of the regime's most fearsome elements. The victims of the Peenemünders' self-interest were inevitably the camp prisoners themselves. The full implications of this dynamic would play out in the infernal underground conditions at Dora-Mittelbau.

Chapter Five

Manufacturing the V-2 at Dora-Mittelbau

In the summer of 1943, employees at Peenemünde considered themselves extraordinarily lucky. Their work, though deeply strenuous, was as rewarding as anything they could have imagined in their professional lives. At home, they either lived the lives of happy singles, started new families, or raised their children in a small, tightly knit community that was held together by deep and durable and social bonds. The utter isolation and absolute secrecy of Peenemünde meant that their lives went untouched by the violence of the war, and they experienced its deprivations perhaps less than any other community in Nazi Germany. Though daily life on Usedom was not without its stresses, the Peenemünders had every reason to count themselves among the lucky in a nation at war.

Much of this irrevocably changed when the war finally came to Peenemünde in the middle of August 1943. Unbeknownst to the Peenemünders, the Royal Air Force had been plotting the destruction of the base since the end of June, and they conducted a terrifying, if not altogether successful raid, on the facility the following August. Despite the failure to meet many of its goals, the August raid had a profound effect on life on Usedom, scattering much of the work there to sites across the Third Reich bringing the missile specialists into increased contact with ever more ruthless elements within the regime itself. After the massive raid struck Peenemünde, its administrators showed a nimble ability to respond flexibly to the new demands from the regime that missile production be moved underground and be carried out using slave labor from the concentration camps. It would be here, in the mass production of

V-2s in the inferno of Dora-Mittelbau in central Germany, that they would work hand-in-glove with some of the most ruthless and brutal elements in the Nazi regime. Their initiation into the secretive, singular world at Peenemünde as well as the daily practices that they internalized there laid the groundwork for this cooperation by teaching them that the survival of the nation depended largely on their work and that the considerations of all other groups were of little or no consequence in comparison to their own.

Those Peenemünders who were displaced carried much as before, bending all of their effort toward successfully producing a usable weapon that could help reverse German fortunes in the war. The reasons for this lie in the deeply ingrained patterns of life and work that they learned in their time as employees of the Army research station on the Baltic Coast. The strong identification with the missile project, forged before the specialists' dispersal from Usedom, enabled their close cooperation with the SS in the exploitation of slave labor in late 1943 and beyond. Some historians have implied that a distinction between Peenemünde developers, production engineers, and the SS emerged when production moved out of the Army facility and the Armaments Ministry and SS exerted ever-increasing influence over the program. These distinctions and the varying methods by which each organization approached the project led to conflicts between the V-2 developers at Peenemünde and the V-2 producers at Dora-Mittelbau.[1] By focusing on the periodic and inevitable

[1] Michael Allen writes that immediately after the transfer of production to Dora-Mittelbau, "Tension began to mount between an axis of fanatic Nazi engineers around Degenolb and Kammler and other including Wernher von Braun and General Dornberger who were not Nazi fundamentalists." He notes the strong loyalties between the newcomers to the program, but not the old guard of Peenemünders. According to Allen, these loyalties were based almost exclusively on National Socialist ideological motives. This interpretation misses the basic professional connections between the old Peenemünders. See *The Business of Genocide: The SS, Slave Labor, and the Concentration Camps* (Chapel Hill:

administrative conflicts at the top of the program, however, they underestimate the large numbers of personnel who transferred from Peenemünde to Dora and the fundamental impact that they had on the shop floor. This approach, quite unintentionally (it seems) helps to perpetuate the postwar myth, spelled out after the war by the Peenemünders themselves, of a "clean" Peenemünde and the terrible Dora-Mittelbau, the managers of which, supposedly all SS-men, had decidedly much more blood on their hands.[2]

Instead, this chapter emphasizes the important role played by the Peenemünders, not some new group of production engineers who entered the program only when factory assembly began, in the daily functioning of the missile factory. Until now, historians have failed to thoroughly scrutinize the middle and lower management sectors at Mittelwerk. A close examination of the post war trial records and captured documents reveals that a surprisingly large number of Peenemünde specialists transferred from their homes on the Baltic to the Mittelwerk. Their important influence in Mittelwerk was based in large part on cooperation and mutual consent between themselves and the SS. It was not founded simply upon ideological grounds, but rather upon the formation of shared objectives and a deep self-interest that provided the framework within which they worked. Instead of emphasizing the

University of North Carolina Press, 2002), p. 221. Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1995), also necessarily emphasizes the struggles between individuals such as Dornberger and Kammler, but such an approach misses the fact that at the level of middle-management, where the daily grind of technical production was carried out, a thoroughgoing cooperation emerged rather quickly between Peenemünders and the SS.

[2] Jens-Christian Wagner, *Produktion des Todes: Das KZ Mittelbau-Dora* (Göttingen: Wallstein Verlag, 2001) was the first work by a historian to explicitly note this juxtaposition. In statements made at Dora war crimes trials in 1947 and 1967, former Peeneünders went to great lengths to distance themselves from Mittelwerk. Their pattern to this day is either to steadfastly maintain that they had little to do with the factory or attempt to emphasize their efforts to help prisoners imprisoned by the SS. Neither argument holds much water.

division between developers and producers and the friction that emerged because of it, it is perhaps more accurate to argue that rather than a black and white distinction between the specialists, a gray zone existed between them, a space of consent and cooperation that emerged because of their mutual identification with the same goals. The terrible success of mass production in Dora was based in part on a web of institutional forces, bonds, and loyalties inhabited by the Peenemünders that were forged in large part before slave labor at Dora and its incumbent close association with the SS became a conceivable policy option. For these reasons, when slave labor underground became a reality, most Peenemünders were able to make an easy adjustment to their new relationship with some of the regimes' most criminal elements.

The technical complexity of the V-2 made Peenemünde employees the ideal specialists for the new production plant. As production shifted from Peenemünde to the Mittelwerk factory, many Peenemünders also found themselves working as civilian specialists in the new location. After regime authorities made the decision to transfer production to this site, thousands of Peenemünders left Usedom in order to help set up the massive underground factory there. Many received important positions in the factory administration and with this, substantial pay raises. Moreover, the conduct of daily work at the factory was informed by the experiences of these people when they worked at Peenemünde. They became significant factors in the shaping of the daily technical practices performed there, and much of this was done along the lines of what they learned in their former institution. In more ways than one, the Peenemünde specialists who moved to Mittelwerk had a decisive effect on the shaping of daily life within the new and terrible phase of the Third Reich's missile program. What is more, the guidelines laid down by factory production engineers from the Armaments Ministry and SS often corresponded quite well with the Peenemünders' own vision of their work. The practices learned during their period on Usedom benefited the Peenemünders in that they enabled the specialists to cooperate automatically and without any hesitation with organizations as murderous as the SS because the overall goals, if not the methods, of the two institutions were closely aligned. Most were able to carry on as they did earlier, without any regard for the plight of the unfortunates housed in the camp just outside the factory. For those few who did stop to consider the fate of the prisoners, the deeply ingrained habits learned at Peenemünde as well as, it must be said, the increasing threat of force on the part of the regime, overrode any humanitarian concerns, forcing the civilian specialists to focus solely on the goals of their work and ignore the means by which they were realized.

Paradise Lost – The British Bombing Raid on Peenemünde

Just before mass production was scheduled to begin at Peenemünde, the war in all its fury burst in on life at the base. On the night of August 17-18, the Royal Air Force struck with nearly all of its impressive firepower at the heretofore peaceful island. The Peenemünders had grown exceedingly comfortable on Usedom, and the raid came as a profound shock to some of them. The RAF attack on Peenemünde was a pivotal event in the history of the facility as well as for its employees, whose lives had become so deeply intertwined with its existence. The most important effect of the raid was the relocation of much of the base's personnel and hardware to more distant, supposedly safer locations. Most importantly, the production plant was evacuated to the Harz Mountains in Thuringia. Much of the personnel at Peenemünde followed these divisions to their new homes, and the staff at their former base shrank considerably.

The peaceful life at Peenemünde had lulled nearly everyone there into a false sense of security. The war, such a "long, dim way off," had not yet intruded on their lives, and they had yet to be touched by any real deprivation. Though air raid warnings occurred often enough – bomber units and reconnaissance aircraft passed by Peenemünde on their way to Berlin – the frequent sirens did not concern the employees much. Even for combat veteran Peter Wegener, life was so pleasant and free of difficulty at Peenemünde that "It never occurred to me that I lived in a most attractive location for an enemy air raid ... Apparently my delight in the altered lifestyle kept me from pondering the future of the laboratory."[3] According to Huzel, virtually no one on the base took the periodic air raid warnings seriously.[4] For many, their immersion in their work and their own naiveté about the war gave them the false sense that its violence posed no danger for them.

Peenemünde authorities were woefully unprepared for the attack. Army officials at the facility only made rudimentary preparations for potential air raids, and these were well short of what was needed. The Settlement was lightly built, and in many locations on the island, the only reasonable air raid bunkers here were in fact

[3] Peter Wegener, *The Peenemünde Wind Tunnels: A Memoir* (New Haven: Yale University Press, 1996), 19, 63.
[4] Dieter Huzel, *From Peenemünde to Canaveral*(Englewood Cliffs, NJ: Prentice Hall, 1962), 51.

the cellars underneath the homes. Planners had made few considerations for protection. Elsewhere on the base, a meager number of *Splitterschutzgraben*, splinter-proof trenches, were the only air raid accommodations.[5] Nevertheless, the increasing frequency of warnings throughout the summer of 1943 forced officials to come up with some kind of plan to deal with an attack. In early August, they drew up a plan that gave mostly Army personnel, but some civilians as well, specific assignments in the event of an air raid. The base's Army authorities allocated various tasks to civilians, including fighting fires in the woods around Peenemünde and protecting sensitive missile hardware, though how this second task was to be accomplished was left up in the air. Others were responsible for relocating nonessential personnel such as wives and children into more widely dispersed (and, presumably, safer) quarters. Administrators charged the soldiers at Peenemünde, including the VkN, with ensuring that enough extra food was on hand for a three-day period and also with securing the crossing the points over the Peene River in order to maintain the facility's security. Interestingly, Army authorities assigned soldiers from the Ninth Company of the VkN to help Army and SS men guard both the prisoner of war camps and concentration camps on the island in the event of an attack.[6] Though these measures were rushed into place, they were only elementary plans that barely got off the ground in the days before the raid. On August 17, there was no respectable fire brigade at Peenemünde, virtually no large or well-organized

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[5] Middlebrook, *The Peenemünde Raid*, 133-153.

[6] Stichwortartige Zusammenstellung der bei der Befehlsausgabe am 3.8. vormittags 9 Uhr im Offizierheim ausgegebenen Richtlinien über luftschutztechnische Massnahmen, die sorfort unter Zurückstellung aller anderen Aufgaben durchführen sind, 8/4/43, FE 833, National Air and Space Museum (NASM). In the event, the scientists, engineers, and technicians of this unit never carried out this responsibility.

medical establishment that could deal with the effects of an attack, and there remained a dearth of air raid shelters and other proper measures to truly protect lives against the coming onslaught.

During the day before the raid took place, most Peenemünders carried on as usual. The development heads held a stormy meeting with Dornberger about the demands that the accelerated production program was making on their work.[7] Many others relaxed on the beach or in the ocean. Inge Holz, a secretary in the Development Works, remembered "It was a very happy evening for the girls … At about eleven p.m., we all went home. As we girls walked back to our home, we sang a little as we went, and we talked of the pleasant time we had had."[8] Despite the increasing signs of a potential raid against Peenemünde, life on the evening of August 17 carried for the most part as usual.

The first British bombers participating in "Operation Hydra" arrived at Peenemünde shortly after 1:00 a.m., while most slept. Their goal was to kill the engineers working on the project as well as destroy the important testing and industrial facilities. However, a series of targeting errors meant that many bombers missed their assigned marks. The individuals who bore the brunt of this error were the foreign workers locked up in the shacks of the Trassenheide labor camp. The camp, with its closely packed wooden barracks, barbed wire fence and single exit gate, was a death trap. Peenemünde planners did not concern themselves with constructing air raid shelters within the camp, and there was virtually no fire-fighting

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[7] According to Dornberger, Thiel, Rees, and even von Braun briefly threatened to quit over the rush into production. Though this behavior certainly fits a pattern for serially despondent Thiel, I have found no evidence that Rees or von Braun actually threatened to do so. Dornberger, *V-2*, 149-151. See also chapter four.
[8] Printed in Middlebrook, *The Peenemünde Raid*, 135.

equipment on the grounds. Tragically, several air raid trenches were located just beyond the camp's fence, and though some prisoners made it out of the camp, none of them were able to reach the trenches.[9] Between 500 and 600 foreign workers died in the attack, which lasted just under one hour.

At the Settlement, one of the primary targets, the situation was moderately better, but still terrifying. When the air raid sirens and approaching engine noises jolted them from their sleep, many employees had the chance to seek shelter. Even so, the attack was a jarring experience. Rudolph's family and their neighbors barely made the hundred-foot sprint into the shelter before the bombs began crashing around them. In the shelter, a shower of sparks from a phosphorous bomb nearly set his young daughter's hair on fire – his wife patted them out with her hands – and the outer door of the shelter was blown away by a near miss.[10] Another civilian who found shelter recollected that "I had experienced raids in Berlin, but I had never experienced such intense bombing and, this time, I felt that we really were going to die."[11] Almost three-quarters of the dwellings in the Settlement were destroyed and 178 of its inhabitants lost their lives.[12] In an area that housed nearly 4000 people, this is a surprisingly small number, but it perhaps could have been even less. A report filed after the bombing raid indicated that there was not enough firefighting equipment in the Settlement and that those in charge of air raid countermeasures had failed to fill many of the water tanks that were to be used to fight fires in case of an

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[9] Walter Reuss, Erfahrungsbericht über die Bombennacht vom 17. zum 18.8.43, 8/30/43, FE 833, NASM.
[10] Thomas Franklin, *An American in Exile: The Story of Arthur Rudolph* (Huntsville, AL: Christopher Kaylor, 1987), p. 71.
[11] Printed in Middlebrook, *The Peenemünde Raid*, 142.
[12] Ibid., 144. Dornberger, *V-2*, 168.

attack. The Peenemünders' ability to limit the extensive damage and loss of life was severely limited by this oversight.[13] In any case, from the development standpoint, the only irreplaceable loss was Thiel, the brilliant head of the propulsion group, who, along with his entire family, perished when their shelter suffered a direct hit.[14] The RAF's mission to kill as many civilian specialists as possible failed miserably.

The employee settlement was badly damaged during the British air raid of August 17/18.
Courtesy DM

The attack also had the intention of destroying Peenemünde's development and production capacity as well. However, the targeting errors, anti-aircraft measures, and the individual pilots' tendencies to "pile on" the destruction already created by earlier attack waves meant that more bombs fell on the Trassenheide camp and the Settlement. Some planes did find their mark, however. Some thirty-five buildings were either destroyed or damaged in the raid. The assembly plant received

[13] Reuss, Erfahrungsbericht, 8/30/43, FE 833, NASM.
[14] Neufeld, *The Rocket and the Reich*, 198.

only minor damage, while the Luftwaffe facility, liquid oxygen plant, and aerodynamics institute were untouched.[15]

Besides the widespread damage and substantial loss of life over the night, the attack effected life at Peenemünde in significant and varied ways. It forced many to confront the reality of their activities at the facility. Scientist Siegfried Winter stated "I began to realize that here I was, possibly sitting on the end of an English bomb, yet during the day, I was working at preparing exactly the same thing, in rocket form, to send to the English … It forced me to take stock of what I was doing in my own work – but life took over as normal the next morning."[16] This is as powerful as statement as any about the inertia that the project developed and the automatic adherence with which Peenemünders clung their institution's goals. Another result of the raid was a general unease among all of the facility's employees about the prospect of another raid. "We had been stung once," Huzel wrote. "An air of intense expectancy prevailed. The bombers would certainly be back."[17] The aesthetic beauty of the base was also obliterated, and much of the damage was left in place in an effort to convince the Allies that it was no longer functioning.[18] Administrative offices had to be relocated, and all air raid warnings were ever-after taken very seriously.[19] Along with much of the base, the naïve and carefree attitudes toward the war that were such a part of the fabric of life at Peenemünde were irrevocably destroyed.

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[15] Middlebrook, *The Peenemünde Raid*, 150-152.
[16] Ibid., 142.
[17] Huzel, *From Peenemünde to Canaveral*, 92.
[18] Neufeld, *The Rocket and the Reich*, 205.
[19] Huzel, *From Peenemünde to Canaveral*, 61-63.

From Paradise on the Baltic to Perdition in the Harz

In addition to earning the Allies a great deal of the Peenemünders' enmity, a far more important result of the bombing raid was the wide dispersal of the people and facilities at Peenemünde. Families abandoned much of the Settlement and relocated to the villages scattered on the island. However, the most fundamental change at Peenemünde was the relocation of the production facilities. There was wide agreement, both at the highest levels of the Reich government and at the level of Peenemünde management, that this must take place. Less than a week after the attack, Himmler convinced Hitler that the facilities on Usedom should be moved to more secure locations.[20] Hitler declared that development should be moved to the Waffen-SS camp at Bliszna in the General Government. More importantly, however, the production plant was to relocate to an as yet unspecified, bombproof factory. In a point similar to the one Rudolph made several months earlier in his report on slave labor in the Heinkel Works, the Reichsführer-SS argued that in order to maintain the strictest secrecy around the work, the assembly lines should be fully manned by camp prisoners who had no contact with the outside world.[21] This proved to be Himmler's most effective gambit in his efforts to assume control of Germany's most technologically advanced weapons program.

Most administrators at Peenemünde resisted the wholesale relocation of their work, but there was little major opposition to Himmler's suggestion to remove

[20] On June 21, British bombers damaged the production site at the Zeppelin factory in Friederichshafen, though they did not know that it was used for this purpose, and on August 13, the U.S. Air Force bombarded the Rax Werke in an effort to halt airplane construction there. These two attacks, combined with the one at Peenemünde, convinced Hitler and his paladins that the secret base on Usedom had been discovered. See Heinz-Dieter Hölsken, *V-Missiles of the Third Reich: The V-1 and V-2* (Sturbridge, MA: Monogram Aviation Publications, 1994) 90, and Neufeld, *The Rocket and the Reich*, 199.
[21] Hölsken, *V-Missiles of the Third Reich*, 97. Neufeld, *The Rocket and the Reich*, 200.

production to an even more secure site. At the very least, there was a growing opinion among many administrators that the program should be both restructured and relocated. On August 23, Georg Thom, undoubtedly on orders from Dornberger, sent a proposal to Friederich Fromm that Dornberger bear sole responsibility for managing the missile program. He argued that "A condition for success is the eventual centralization of all measures under the strictest military leadership. In the future, it must be reckoned that the enemy will try to destroy development and production, and therefore all protective and counter-intelligence measures must be adjusted to a new reality."[22] Despite Degenkolb's streamlining efforts, Thom argued that the twin structure of the OKH and Armaments Ministry was too cumbersome and did not move the program any closer to its goals. This measure would have effectively given Dornberger control over the querulous Degenkolb, but not eliminated his position. Dornberger clearly sensed that change was in the wind and sought to manage and direct it as much as possible. He still retained, with good reason, a proprietary interest in the missile program and was deeply convinced that it could only achieve its lofty goals with his stewardship. If change was to occur, it should do so under Army auspices.

The most important of these imminent changes was the relocation of the production facilities. Dornberger was not informed of Hitler's decision to move much of the program out of Peenemünde until August 25. It is likely, though not entirely clear, that he initially did not lend his full support such a radical change, as it ran counter to his "Everything under one roof" concept.[23] Development was the

[22] Thom to Fromm, 8/23/43, RH8/v. 1211, BA/MA.
[23] Neufeld, *The Rocket and the Reich*, 202.

sticking point. In a hastily assembled meeting on the twenty-fifth, called by Dornberger and chaired by von Braun (with several of his key deputies in attendance), Peenemünde managers decided flatly that the development work should stay on the base. The minutes of their meeting note that "The technical work, that is, operational assembly, operational testing and operational measurement, of individual parts must remain in close proximity to Peenemünde." Eventually, only the launch tests were moved to the SS camp at Bliszna. In contrast, however, they were ready to remove mass production and began laying plans for dispersing it and its prisoner labor force different sites in Germany. In an early demonstration of the Peenemünde developers' willingness to cooperate with assembly specialists in the Armaments Ministry and SS to bring about the quick onset of mass production, von Braun and others set out these concrete plans to aid the reestablishment of a manufacturing facility so that the program could continue with its work.[24] This cooperation would eventually deepen to include direct participation on the part of many Peenemünde developers in horrific crimes perpetrated with an eye toward the final success of the V-2 program.

At the same time, there was a groundswell of opinion among many other individuals in other sectors of the program that at least production should be restructured and relocated. Immediately after the raid, several employees openly wondered if the factory should not be rebuilt, but rather set up somewhere else.[25] This sentiment reached into rather high places in the administration. In his survey of

[24] Niederschrift über die Besprechung in Karlshagen am 25.8.43, FE 732, NASM.
[25] Werner Brähne, unpublished manuscript, "Die Mittelwerk GmbH. Eine Chronik über Firma und Werk," unpag., Gericht Rep. 299, Bd. 582, Hauptstadtsarchiv Düsseldorf, Zweigarchiv Kalkum (HStaD-ZA Kalkum).

the bomb damage after the raid, Arthur Rudolph, who did not participate in the August 25 meeting, also came to the conclusion that production must be moved. Though he filed his own report after Hitler's order to move production, Rudolph's language indicated that he had no doubts about the wisdom of the decision to do so, even before the Führer's decision. He wrote that "Despite [the construction design of the production plant], it appears that there is no way to guarantee production if it is located above ground. I believe that it is necessary in this case to make all facilities absolutely bomb-proof by moving them to underground locations. However, this does not apply only to the factory facilities, but rather the accommodations for all employees must also be secured against air raids so as not to disrupt the course of daily life as well as manufacturing."[26] For Rudolph, there was no question of the viability of moving everything associated with production, including the labor force, underground. He was in absolute agreement with Hitler's decision, and even wanted to go further, arguing that even civilian employees should be housed in secure underground facilities as well. Rudolph's highest priority was to ensure that production goals could be met as quickly as possible. Part of this process was the need to keep manufacturing centers safe from attack, a major concern of many regime officials. In all likelihood, his new vision included the use of the concentration camp labor already on hand at Peenemünde to help accelerate the relocation. He would become a central figure in the installation of the underground factory that began shortly thereafter.

The effort to relocate mass production introduced to the program one of the most capable, energetic, and vicious figures in Himmler's entire murderous

[26] Arthur Rudolph, Erfahrungsbericht über den Feind-Angriff vom 17. zum 18.8.43, FE 833, NASM.

organization: SS Brigadier General (*SS-Brigadeführer*) Dr. Hans Kammler. The head of Office "C" (Construction) of the SS Economic and Administrative Main Office (*SS-Wirtschaftsverwaltungshauptamt* – WVHA), Kammler was a dashing, brilliant officer who held a Ph.D. in civil engineering. Dornberger was duly impressed with Kammler's appearance: "One's first impression was of a virile, handsome, and captivating personality. He looked like some hero of the Renaissance, a *condottiere* of the civil wars of Northern Italy. The mobile features were full of expression."[27] Ideologically, Kammler was the perfect embodiment of the "reactionary modernist," combining equal doses of technological expertise with National Socialist fanaticism and romanticism.[28] Born in 1901, Kammler did not participate in the First World War, but did fight with the Freikorps in Rossbach immediately after the war. He joined the Nazi Party in 1932 and held a number of administrative posts in the Air and Agriculture Ministries, volunteering his services part time to the SS. In 1941, he joined the blackshirts full-time. Oswald Pohl, the head of the WVHA, almost immediately assigned him some of the SS's most important and secret work – constructing the gas chambers at Auschwitz-Birkenau and Majdanek.[29] His murderously effective office also seized control of the slave labor industry within the SS and deployed unfortunate prisoners in mobile construction brigades with a

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[27] Dornberger, *V-2*, 198.

[28] In 1934, Kammler co-authored a book with Edgar Hotz entitled *Grundlagen der Kostenrechnung und Organization eines Baubetriebs für den Wohnungs- und Siedlungsbau in Stadt und Land* (Berlin: Verlagsgesellschaft R. Müller, 1934) – Fundamentals of Price Calculation and of Construction Firms for Dwelling and Settlement Construction in City and State – in which he outlined a number of efficient means of organizing and operating large bureaucratic hierarchies for the purpose of settlement development. However, he also wrote that National Socialism was the key to fully harnessing the benefits of such work because its ideology was "dedicated to the firm connection of the man to the soil through hearth and home as the basic foundation of the nation and state. Therefore, the German's hereditary health and the hereditary health given by the German soil stand at the focal point of the German Reich's program of renewal." See p. 1.

[29] Allen, *The Business of Genocide*, 140-148.

ruthlessness that was unmatched in its efficiency and scope.[30] Armed with an order from Himmler to do everything possible to hasten mass production and deployment of the V-2, Kammler unleashed his limitless energy on the missile project. In so doing, he came to rely heavily upon key members of the missile program in order to meet his goals.

SS-Brigadeführer Dr. Hans Kammler
Courtesy DM

The process of transferring production to a bomb-proof facility was entirely improvised. The site selected by Kammler, Degenkolb, Dornberger, and Karl Otto Sauer, Albert Speer's ruthless deputy, was a tunnel complex in the southern Harz Mountains in Thuringia, near the town of Nordhausen. Originally, the company Ammoniak, a subsidiary of I.G. Farben, dug the tunnels into the face of a mountain known as Kohnstein and mined it for calcium sulfate. In 1938, I.G. Farben struck a deal with a government corporation named "Wifo," an acronym for *Wirtschaftliche Forschungsgesellschaft* (Economic Research Society). In exchange for paying a

[30] See Allen, ibid., 140-239.

share of the mining expenses, Wifo received large underground storage areas for strategic gasoline and oil reserves.[31] The tunnels themselves consisted of two parallel main lines which ran north to south with forty-four perpendicular galleries linking them. Each main tunnel was just over a mile long, and each gallery was a little less than 500 feet long.[32] At the end of August, the Armaments Ministry and SS took them over for the purpose of missile production. On August 28, a mere ten days after the British struck Peenemünde, the first 107 prisoners arrived from Buchenwald to begin expanding the tunnels in preparation for factory installation. The new underground camp was code-named "Dora-Mittelbau."[33]

The first priority under Kohnstein was the expansion of the tunnels so that they could accommodate the large assembly line necessary for missile production. As expansion proceeded, heavy equipment was shipped from Peenemünde and other assembly plants for installation. At Kammler's order, thousands of prisoners continually streamed in to complete this work. By the end of September, nearly 3000 prisoners labored in the tunnels, and by the end of November, there were upwards of 8000 slaves working in barbaric conditions underground. In this period, the majority of the prisoners arrived from Buchenwald, but in the middle of October, most of the slave laborers at Peenemünde departed with their SS guards to Dora, though some did remain behind.[34] When the New Year arrived, the SS had fully proven its value as a

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[31] Georg Rickhey Statement, U.S.A. vs. Kurt Andrae, et al., roll 4, M-1079, National Arichives and Records Administration (NARA).
[32] Manfred Bornemann, *Geheimprojekt Mittelbau: Vom zentralen Öllager des Deutschen Reiches zur grössten Raketenfabrik im Zweiten Weltkrieg* (Bonn: Bernard u. Graefe Verlag, 1994), 11-20.
[33] Yves Béon, *Planet Dora: A Memoir of the Holocaust and the Birth of the Space Age* (Boulder, CO: Westview Press, 1997), xii.
[34] Entstehungsgeschichte, 10/13-15/43, FE 873, NASM.

labor supplier, however murderous, as it managed to deliver a total of 10,000 prisoners to the tunnels.[35]

As the daily transports rolled in to deliver their human cargo to this genocidal mining and construction project, the SS made no effort whatsoever to care for the prisoners. The level of maltreatment engendered by the idea of extermination through work [*Vernichtung durch Arbeit*] set new standards of inhumanity. The miserable slaves used dynamite, jackhammers, and hand tools to bore into the mountain, filling the tunnels with dust and ammonia fumes that burned throats and lungs. Water seeped and dripped from the walls, helping to create a dank chill in the caverns.[36] Prisoners removed rocks and boulders by hand, a dangerous job because the SS, keen to push the work forward, drove the prisoners into the rock pile without regard for loosened, only partially collapsed parts of the wall. Falling rocks crushed many prisoners.[37] The prisoners loaded the stones onto rail carts, which they pushed outside for disposal. Kapos (prisoner functionaries who supervised small groups of internees) and SS men drove the pace of the work to breakneck speed and reigned in the tunnels with wanton brutality. Yves Béon paints a stark and terrifying picture worthy of Bosch:

> The air inside, oppressively thick with choking dust, fumes of burnt oil, and humidity, engulfs the newcomers. Here are hills of gravel, there valleys filled with water, and throughout the cave, pools of light alternate with suspicious areas of shadow. Gray beings shovel, hollow out, and tear away at surfaces. Narrow hoppers loaded with stones and trash roll through a

[35] Jens-Christian Wagner, *Produktion des Todes: Das KZ Mittelbau-Dora* (Göttingen: Wallstein Verlag, 2001), 186-187. Neufeld, *The Rocket and the Reich*, 209-210. Sellier, *A History of the Dora Camp*, 55-57.
[36] Béon, *Planet Dora*, 16.
[37] Xavier Delogne Interview, Fortunoff Video Archives (FVA), Yale University.

> narrow passageway, pushed by men in filthy rags. In the unnatural light, lines of ghostly figures carry pieces of carpentry on their shoulders. Others push, pull, and drag insane loads. Shouting and swearing, the SS, Kapos, and Vorarbeiter [foremen] rush among them, whipping and clubbing the terrified prisoners. In the distance, the sound of mine blasting adds to the chaos, and the air resounds with a thousand clamors.[38]

The work away from the mine face was no easier. Large transport kommandos made up exclusively of prisoner labor unloaded trains outside of the tunnels and carried their cargo in by hand. This commonly involved manhandling large and heavy machinery that was to be installed in the factory. Most of the time, the prisoners had no mechanical help, and their efforts were made even more difficult by their barbarous overseers, who beat them senseless if they worked too slowly or fell out of line. Even so, the transport work continued. By the end of Feb. 1944, according to one estimate, this exhausting, deadly "Warenannahme" kommando had unloaded nearly 1300 freight cars worth of material.[39]

The short time away from the murderous work offered no respite. Czech survivor Wincenty Hein estimated that the prisoners had approximately eighteen hours of activity per day and often less than six hours of rest.[40] During this short rest time, prisoners rarely emerged from the tunnel. The SS gave the construction of free-standing barracks outside of the tunnels the lowest priority. Instead, the sleeping facilities that SS allowed the prisoners were bunk beds in a cross-tunnel that was located relatively close to the mine's face. Rest and sleep were impossible, as the din

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[38] Béon, *Planet Dora*, 4.
[39] Wincenty Hein Testimony, ZM 1625, Bd. 23, Akte 35, BStU. By the end of December, most of the production equipment from Peenemünde and the Rax Werk in Wiener Neustadt had arrived at Mittelwerk. Wagner, *Produktion des Todes*, 87.
[40] Wincenty Hein, "Lebens- und Arbeitsbedingungen der Häftlinge im Konzentrationslager 'Dora'-'Mittelbau' und ihre Folgen," ZM 1625, Bd. 22, Akte 34, BStU.

from jackhammers, pickaxes, and explosions continually rang through the tunnel. Jean Michel, a French prisoner in the tunnel at Dora, wrote in his memoirs that "The noise bores into the brain and sheers the nerves … Over a thousand despairing men, at the limit of their existence and racked with thirst, lie there hoping for sleep which never comes."[41] André Rogerie, who arrived at Dora in November, recalled that the dust could be so thick that prisoners could not see from one end of the sleeping tunnel to the other.[42] Construction supervisors divided up the prisoners into two shifts of twelve hours each, meaning that the sleeping quarters were always occupied and crawled with filth, vermin, and disease. There were no cleaning facilities and only makeshift latrines, which were made out of oil drums that were cut in half and periodically sprinkled with chlorine. Brutal kapos or SS guards often pushed the already dysenteric and miserable prisoners into the barrels for sport. Outbreaks of tuberculosis and pneumonia swept mercilessly through the prisoner population, and the corpses of those who died in the night were piled up by the entrance to the sleeping tunnels.[43] One prisoner remembered laconically, "I dreamed about Buchenwald like it was Heaven when I was in Dora."[44] Indeed, Dora-Mittelbau was quite simply one of the most horrifying camps in the entire Nazi system.

Such conditions contributed to an atrocious death rate. 172 prisoners died in November. In January 1944, that number increased to 669. In March, 721 prisoners,

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[41] Jean Michel and Louis Nucera, *Dora*, Transl. By Jennifer Kidd (New York: Holt, Rhinehart, and Winston, 1979), 68.
[42] André Rogerie Interview, FVA, Yale University.
[43] Sellier, *A History of the Dora Camp*, 59-60. Rogerie Interview, FVA, Yale University.
[44] Ben Giladi Interview, FVA, Yale University.

an average of twenty-four per day, were worked to death in the tunnels.[45] To this number must also be added several outbound transports of prisoners whom the SS deemed “unfit for work,” and were therefore prime candidates to be murdered. Between the beginning January 1944 and early February 1944, two transports totaling 2000 prisoners went to Majdanek. A third transport containing 300 prisoners also left for Majdanek on January 11. On April 8, the SS sent another 1000 prisoners to Bergen-Belsen.[46] Most of those who survived the trip to these camps were, in the case of the Majdanek transports, likely gassed, or in the case of the Bergen-Belsen transports, crammed into shoddy, disease-ridden barracks and left to die. The death rate became so bad at Dora in the winter of 1943-’44 that the inbound prisoner transports from Buchenwald could barely keep pace with the catastrophe unfolding under Kohnstein. Of the 17,000 prisoners shipped to Dora between August 1943 and March 1944, 6000 died in the course of expanding the tunnels and installing the missile factory, corresponding to a death rate of well over one-third of all prisoners.[47] Only when the expansion and installation work was completed, coupled with the construction of prisoner barracks outside the tunnels in the spring of 1944, did the death rate finally begin to decline.[48]

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[45] Wagner, *Produktion des Todes*, 647. Yves Béon writes of a prisoner named Jacky whose task it was to roam the tunnels with a cart, searching for dead bodies to take to the morgue. Béon, *Planet Dora*, 11-12.

[46] On January 6, 1944, 1000 prisoners were shipped from Dora to Majdanek. Five days later, on January 11, another 300 left by rail transport for the East. On February 6, the SS also packed 1000 prisoners into freight cars for shipment to Majdanek. Camp administrators sent 1000 prisoners to Bergen-Belsen on April 8. See the collection of transport lists in RG-04.006M, Nazi Concentration Camp Records, 1939-1945, Reel 18, USHMM.

[47] Bornemann and Broszat, “Das KL Dora-Mittelbau,” 166-171. Wagner, *Produktion des Todes*, 188-190.

[48] Wagner, *Produktion des Todes*, 647.

This special brand of brutality did not take place only in Mittelwerk. SS and Army officials gave their approval for other underground facilities to accommodate the missile program as well. In September, "Papa" Riedel and Godomar Schubert surveyed a site east of Salzburg for the installation of the development works underground, which was to be supplied by prisoners from concentration camp Ebensee, a subsidiary camp of Mauthausen. Construction began in November, but this project, code-named "Zement" (Cement), suffered from conflicts between the Army and SS as well as extremely high cost.[49] The development works never relocated there, but a number of section chiefs at Peenemünde, including "Papa" Riedel, temporarily transferred there to assist in the work.[50] Other test areas were constructed at Lehesten, in central Germany, and at Redl-Zipf in the Austrian Alps, just north of Ebensee.[51] All of them used slave labor in their construction and, in the case of Zement, repeated the horrors of Mittelwerk, if only on a smaller scale and without forcing its prisoners to sleep underground.[52] However, the plant in the Harz Mountains became the focal point of the missile program until the end of the war,

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[49] See Florian Freund, *Arbeitslager "Zement:" das Konzentrationslager Ebensee und die Raketenrüstung* (Wien: Verlag für Gesellschaftskritik, 1989). In the summer of 1944, Armaments Ministry officials scrapped the plan to relocate the development works and instead drew up plans to use Zement to assemble tanks as well as house an underground oil refinery.

[50] Entstehungsgeschichte, 11/2-11/16/43 and 11/25/43, FE 833, NASM.

[51] See Dorit Gropp, *Aussenkommando Laura und Vorwerk Mitte Lehesten: Testbetrieb für V2-Triebwerke* (Bad Münstereiffel: Westkreuz Verlag, 1999) and Florian Freund and Bertrand Pertz, *Das KZ in der Serbenhalle: Zur Kriegsindustrie in Wiener Neustadt* (Wien: Verlag für Gesellschaftskritik, 1989). Lehesten, code-named "Mitte," was used to calibrate rocket engines and as a liquid oxygen facility. It was supplied with laborers from Buchenwald and its sub-camps. The Redl-Zipf facility, code-named "Schleier," was used in the same capacity, and received prisoners from Mauthausen. Originally, authorities planned to subsume them under Demag's authority, but in December 1943, they were made a part of the Mittelwerk GmbH. Niederschrift über die 1. Sitzung des Beirates der Mittelwerk GmbH am Freitag d. 10. Dezember 1943, 12/14/43, R121/405, Bundesarchiv Lichterfelde (BAL).

[52] It should be noted as well that Army officials' attempts to maintain control over the missile program meant that they themselves would be willing to manage slave labor. At the end of December 1943, Thom laid a proposal before Kammler that spelled out plans to put Zement under the control of the Army Ordnance office. Entstehungsgeschichte, 12/28/43, FE 833, NASM.

with the staff at Peenemünde dramatically shrunken and the base itself reduced to a pure research and development facility.

There can be no question that the individual who bore overall responsibility for this "empire of horror," as Michael Neufeld has called it, was Hans Kammler.[53] The SS-General had successfully mobilized concentration camp labor and brought his considerable resources to bear in order to expand the size and scope of Germany's missile program. Michael Allen has persuasively demonstrated Kammler's activism and interventionism, as well as his viciousness and unwillingness to compromise in managerial matters. His extremely competent office had skills that the war economy demanded, and he specialized in managing slave labor at far-flung locations across the Reich.[54] Dora-Mittelbau was his crowning achievement. However, on the job site, Kammler was forced to rely on like-minded individuals who, while perhaps not sharing his ideological vision, could at least come to quick agreement with him on technical matters. The engineers in the V-2 program were well-suited to this task. Their particular expertise, combined with their unique zeal for the success of the missile, perfectly complemented Kammler's own overall managerial philosophy, and they became vital cogs in the machinery of destruction under Kohnstein.

The "Factory Community:" Civilians at Dora-Mittelbau

Even while the prisoners labored furiously to expand the tunnels in the winter of 1943-'44, factory installation proceeded apace. Factory managers were able to install machinery in the tunnels so quickly that on New Year's Eve, the first missiles

[53] Neufeld, *The Rocket and the Reich*, 209.
[54] Allen, *The Business of Genocide*, 202-206.

rolled off of the assembly line. These weapons were so deeply flawed that they returned almost immediately to the factory, and serious developmental issues remained to be ironed out. Even so, it was an important and profound symbolic achievement, despite the barbarity with which it was carried out. In any case, technical problems and the transfer of production from Peenemünde to the Mittelwerk delayed the original production schedule by several months. In May 1944, the factory managed to turn out 253 missiles, but a raft of technical problems caused output to drop precipitously throughout the summer. Only in September did Mittelwerk begin to produce anything like the high numbers that were originally planned, usually between 600 and 700 per month.[55] Overcoming these major obstacles required the close cooperation of specialists in both Peenemünde and Mittelwerk.

Running the nightmarish inferno at Mittelwerk in conjunction with the SS was a company called Mittelwerk GmbH (Central Work, Ltd). At the end of September 1943, Gerhard Degenkolb had moved to streamline the production operation, which sometimes struggled under the Army's ungainly bureaucracy. Under his supervision, the A-4 Special Committee created this company to manage missile production, and the company officially came into being on October 7.[56] A state corporation that was organized in private form, Mittelwerk was financed by the Armaments Ministry and

[55] Neufeld, *The Rocket and the Reich*, 213. The most pressing and difficult of the challenges faced by the developers was the issue of "air bursts," in which inbound missiles broke up during reentry. The problem took months to solve, and it was only in late 1944 that it was finally overcome. The issue was that the outer skin of the missile, weakened by heat friction during reentry, tore off of the body, resulting in the missile's breakup. See Neufeld, 220-230.
[56] Grundungseintrag Mittelwerk GmbH, 10.7.43, Reel 12, M-1079, NARA.

placed under its umbrella firm, Rüstungskontor GmbH.[57] Originally, Degenkolb himself chaired the company's advisory board, which also had Dornberger and Heinz Kunze, Degenkolb's deputy, as members.[58] Its board of directors was made up of industry men Kurt Kettler and Otto Bersch, as well as Dora camp commandant Otto Förschner. Kammler himself directly placed Förschner on the board in an effort to maintain a prominent role for the SS in policy level factory decisions, even though the SS man spent his entire adult life as a career soldier.[59] Officially, Förschner was in charge of security and countering sabotage. In theory, he could also participate in business decisions, but in reality, his utter lack of managerial experience meant that he had no input at all in daily determinations regarding factory operation.[60] Förschner

[57] State-controlled corporations proved highly willing to use slave labor in their operations. Beginning in 1942-'43, these organizations commonly entered into slave labor contracts with the SS. Rainer Fröbe indicates that this was partially a function of the dynamic established as new managers, whose professional lives knew only the economic climate of Nazi Germany, entered positions of power. See Rainer Fröbe, "KZ Häftlinge als Reserve qualifizierte Arbeitskraft: Eine späte Entdeckung der deutschen Industrie und Ihre Folgen," in Ulrich Herbert, Karin Orth, Chrisoph Dieckmann, eds., *Die Konzentrationslager – Entwicklung und Struktur, Bd 2* (Göttingen: Walstein Verlag, 1998), 636-681. In addition, Michael Allen has pointed out that National Socialist polycracy did not just lead to internecine struggles, as is so commonly assumed. It also made possible useful business arrangements among like-minded individuals in different organizations, a necessary precondition for the use of the slave labor services offered by the SS. Allen, *The Business of Genocide*, 168-171.

[58] Vermerk über Besprechung im Reichsministerium für Rüstung und Kriegsprodiktion, Generalreferat Wirtschaft und Finanzen, betr. Mittelwerk GmbH., am 21.9.43, R121/405, BAL. Protokolle der Mittelwerk-Gesellschaftsversammlungen am 24.9.1943, R 121/544, BAL.

[59] Born in 1902, Förschner joined the Reichswehr when he was twenty years old. Immediately after leaving the Reichswehr in 1931, he entered the SS, and three years later enrolled in its officer candidate school at Bad Tolz. In late 1938, his career was marred by an incident in which he fathered a child out of wedlock with the girlfriend of a subordinate named Hugo Hochaus. Förschner, who married in 1931, paid Hochhaus twenty-five Reichsmarks per month to falsely claim paternity of the child. After a few months, Hochaus attempted to blackmail Förschner into paying him even more money. Not surprisingly, the plot unraveled when Förschner, whose drinking habit got him into this mess in the first place, drunkenly divulged the secret to an SS colleague. Förschner was demoted to the rank of private (SS-Mann) and then nearly thrown out of the SS. The SS expelled Hochaus and he spent eight months in Sachsenhausen for his trouble. However, Förschner's long service record and Hitler's aggressive war planning in 1939 saved his career, as his unit was desperately short of officers. The SS eventually restored his status, and Förschner went on to serve in the SS Death's Head Division on the Eastern Front, later acting as the chief officer in charge of the SS guards at Buchenwald before coming to Dora in 1943. See Otto Förschner Dossier, SS Officer Files, Reel SSO-214, RG 242, NARA.

[60] Heinrich Detmers Testimony, U.S.A vs. Kurt Andrae, et al, M-1079, roll 5, NARA.

also relied on his subordinates and prisoner functionaries to run daily camp operations, keeping his distance from the prisoners and usually, but not totally, refraining from abusing them while also doing very little to alleviate their situation. His generally laissez faire attitude and reliance on prisoners for many functions led to the rise of a substantial resistance organization at Dora-Mittelbau, which the Gestapo would combat in part by relying on civilian engineers in the tunnels.[61]

The most active figure behind tunnel expansion was the ruthless and driven engineer Albin Sawatzki. Born in 1909 in Danzig, Sawatzki was a young, ambitious diploma engineer with a mean streak.[62] Before coming to the missile program, Sawatzki was a production engineer at the Henschel Works, where he made a name for himself in tank production. Degenkolb brought him from Henschel to run the A-4 Special Committee's subcommittee for serial production. After the August bombing raid, he left for Thuringia to manage installation and production under Kohnstein.[63] Sawatzki was not on Mittelwerk's board of directors, nor was he a member of the SS, but Kammler gave him full authority inside the factory. Sawatzki had the power to request and assign prisoners and became Kammler's trustee for all problems

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[61] For Förschner's reliance on prisoner functionaries at Dora, see Wagner, *Produktion des Todes*, 301-307. The camp commandant also relied heavily on his SS subordinates to supply labor to the factory. See Wilhelm Simon testimony, U.S.A. vs. Kurt Andrae, et al, M-1079, roll 12, NARA. Simon worked in the SS labor allocation office in Dora, which assigned prisoners to Mittelwerk.

[62] Sawatzki Dossier, Gericht Rep. 299, Nr. 430, Hauptstadtsarchive Düsseldorf, Zweigarchiv Schloss Kalkum (HStaD-ZA Kalkum).

[63] Brähne, "Die Mittelwerk GmbH," unpag., Gericht Rep. 299, Bd. 582, HStad-ZA Kalkum. Sawatzki met Brähne shortly after Brähne was transferred from Peenemünde to Mittelwerk. Sawatzki immediately took a liking to Brähne and gave the gifted technical illustrator what he called a "Hunting Pass" (*Jagdschein*) to roam wherever he wished in the factory. Sawatzki wanted him to document "in both words and pictures" the events in Mittelwerk under his leadership. Sawatzki's self-serving vision was to publicize in the future his own role at the plant after the war was brought to a successful conclusion. To his credit, Brähne, who recognized very early the callous inhumanity of Dora-Mittelbau, did exactly that, providing to posterity some of the most stark and disturbing illustrations of life and work in the factory. Sawatzki's deep belief in the ultimate victory of Nazi Germany, even at the end of 1943, is also noteworthy.

concerning V2 production. He was fully independent of the factory hierarchy, but worked closely with it to ensure the rapid onset of production.[64] In December 1943, Kammler, probably sensing that Förschner was in over his head on the board of directors but also eager to maintain as much control as possible over Germany's crown jewel weapons system, attempted to place Sawatzki on the board.[65] He was rebuffed, but his acolyte retained his position as Kammler's special envoy to Mittelwerk. In May 1944, he would become the director of the production planning division, officially an employee of Mittelwerk.[66]

Another key civilian engineer joined the Board of Directors in April 1944, just as the frenetic pace of tunnel expansion was beginning wind down. Georg Johannes Rickhey, a purchasing specialist who previously worked at Demag Fahrzeugwerke in Berlin, was installed as the General Director of the operation, a position that gave him a decisive voice in meetings of the board of directors. At his war crimes trial in Dachau in 1947, Rickhey successfully avoided conviction at the hands of American prosecutors by convincing the court that he was merely an apolitical technocrat who had no love for Nazi ideology and who was at the mercy of political forces beyond his control. This was hardly the case. A talented diploma engineer, Rickhey was born in 1898 and joined the Nazi Party in 1931. In 1940, Rickhey worked as the chief technical advisor in the Main Office for Technology (*Hauptamt für Technik*) for the Gauleiter of Essen, SA-Lieutenant General (*Obergruppenführer*) Josef Turboven. In this position, he helped streamline the heavily industrialized Gau's war production

[64] Rickhey Report, U.S.A. vs. Kurt Andrae, et al., M-1079, roll 4, NARA.
[65] Niederschrift über die 1. Sitzung des Beirates der Mittelwerk GmbH am Freitag d. 10. Dezember 1943, 12/14/43, R121/405 BAL.
[66] Direktionsanweisung zur MW-Gesamtorganisation, 5/26/44, R121/405, BAL.

measures and inaugurate more efficient use of its labor resources. While working under Turboven, Rickhey exhibited an absolute dedication to his task and couched his work in ideological terms that mirrored what was then developing into the central axiom at Peenemünde, far away on the Baltic coast. For example, in a conference with his senior deputies in February 1940, he demanded that his colleagues across Gau Essen turn all of their resources to the war effort, telling them that "All tools, machines, and the laborers necessary for them must, from the smallest workshop to the largest W- [weapons] and Rü [armaments] operations, be engaged one hundred percent in production. It is the task of the representatives of the Gau's Office of Technology, and, therefore, the Party, to make exact [technical] recommendations and to uncover additional suitable areas in which machinery can be set up and brought into operation as quickly as possible … Total war [sic!] demands the utmost exploitation of all means of production on hand and the strenuous effort of all available workers." He informed his deputies that since his office alone could not effect an increase in manufacturing productivity in the entire Gau by itself, it would be choosing "Factory managers, engineers, technicians, and work Meisters *who at the same time are members of the Party or are political leaders* ... to examine the suitability of factory facilities on hand and to make proposals, either on their own or in cooperation with the Gau and Kreis representatives, about Armaments Kommandos or [factory] conversion" [emphasis in original].[67]

[67] Bericht über Besprechung auf dem Gauamt für Technik in Frankfurt/M. Friedenstrasse 2 am 20.2.40, Rickhey Dossier, Gericht Rep. 299, Nr. 411, HStaD-ZA Kalkum. At his trial, prosecutors also raised the possibility that Rickhey might have been a central figure in the removal of the Jewish head of a local, private technical society called Haus der Technik in Essen in 1933, but they were unable to verify the claim. Heinz Kunze statement, U.S.A. vs. Kurt Andrae, et al., M-1079, roll 10, NARA.

Even as early as the beginning of 1940, when the Nazi regime was still making strident efforts to shield the country's population from the hardships of war and had not yet conceived of embarking the nation on a policy of total war, Rickhey was already embracing the idea. He saw clearly that despite the Wehrmacht's overwhelming success, the war had the potential to drag on for many years and require every last drop of productive energy that the nation could muster. On his own, the engineer pushed for those under him to prepare for the full mobilization of his Gau's resources for the war effort. Moreover, this monumental task was not to be left to specialists who did not show evidence of ideological adherence and fervor. Rather, Rickhey clearly felt that only those whose political beliefs marched in lockstep with the regime were capable of successfully carrying out this work. Technical professionals in local party cadres were the ones best equipped and best motivated to carry out the difficult tasks ahead. For him, ideology was the primary motivating factor in the work that he assigned. The Nazi party was to be the vanguard in his early efforts to bend Germany's industrial might entirely to the service of the war effort.

At Mittelwerk, purchasing had proven to be one of the most difficult problems in completing the set-up of the factory. In addition to his duties as General Director, Rickhey took over these functions as well as responsibility for personnel issues, quickly introducing a number of reforms that were designed to improve the purchasing and production processes. Rickhey's arrival also signified a reorganization of the corporate administration. The primary result was that Förschner's duties became limited to counter-espionage. Though he remained on the board of directors, this was in effect a demotion for the camp commander.[68] He eventually transferred to Kaufering to assume command of the camp there, and his position on the board of directors remained unfilled, leaving the SS without a formal representative on that body. Though there would be minor adjustments in the structure of the corporation, there were no further major reorganization or additions to its board of directors. Civilian managers, therefore, not the SS, set forth the directives and guided the policies of the Mittelwerk GmbH. The SS, of course, ran camp Dora, but its influence on the policy decisions and much of the daily operation of the factory was strictly limited. Though the overall conditions at Mittelwerk were set by Kammler, he relied on civilian managers to carry out the tasks necessary to establish a mass production facility for the V-2 under Kohnstein. Civilians alone were responsible for employment and handling of prisoners inside the factory itself. They were supported by a large bureaucracy of civilian engineers on the various administrative levels below them.

Although no one from Peenemünde served on the Mittelwerk board of directors, many development and production engineers from Usedom received positions in upper and middle management in the factory. The most important of these men was Arthur Rudolph. As the individual responsible for erecting the production facility at Peenemünde, Rudolph naturally was heavily involved in the disassembly of the factory and its relocation to the Harz Mountains. His official title with the Mittelwerk GmbH, as at Peenemünde, was Factory Director, and he was responsible for missile assembly and production, but his first task was managing the

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[68] MW-Direktionsanweisung zur Gesamtsorganisation der Mittelwerk, G.m.b.H," 5/26/44, BAL NS-4, Anhang, Nr. 16.

transfer and installation of machinery. He arrived in Dora-Mittelbau in September 1943, and in this capacity, worked hand-in-glove with Sawatzki.[69]

A number of Rudolph's deputies and lower level managers from Peenemünde left the facility on the Baltic to assist Rudolph with this work, and the production engineer relied heavily on them to complete many of the major tasks. Many arrived with Rudolph in September.[70] They were among the thousands of people who left Usedom for Dora-Mittelbau that autumn. On November 16, for example, Albert Speer himself directed that Peenemünde had to give up at least twenty percent of its skilled personnel, or approximately 1145 people, by Armaments Ministry estimates, for the project in the Mittelwerk. Engineers, technicians, master craftsmen, secretaries, and other skilled laborers, such as joiners, electricians, and welders streamed out of Peenemünde and into Mittelwerk.[71] By December 1, 1943, 386 people had been transferred, including 128 engineers, technicians, and craftsmen. Two weeks later an additional 347 people were transferred to MW, 97 of them engineers and high-level technicians. Hundreds more would follow them in the weeks after.[72]

This major relocation of personnel generally proceeded smoothly and with only minor problems. Walther Riedel (Riedel III), von Braun, and Sawatzki directed much of the transfer process. Cooperation between administrators at Peenemünde and the Mittelwerk again ruled the day. The only delays were caused by organizations outside the circle of missile specialists. For example, to ease the strain

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[69] Entstehungsgeschichte, 9/8/43, FE 833, NASM.
[70] Arthur Rudolph Office of Special Investigation (OSI) Interrogation, printed in Thomas Franklin, *An American in Exile* 221.
[71] Entstehungsgeschichte, 10/13/43, 10/19/43, 10/20/43; also 11/11/43 and 11/16/43, FE 833, NASM.
[72] Undated Reisinger Report, FE 694, NASM.

on the German rail system, OKW forbade any unauthorized travel for all Germans between December 19 and January 7. All rail passengers had to obtain special exemption passes in order to use railroad transport. The order caused moderate delays in personnel transfer, but they were shortly overcome after the Peenemünders were able to use their influence to acquire these passes from military authorities.[73] There were also some conflicts over where certain important specialists should work, either at Peenemünde or at Mittelwerk (which lasted in to the spring of '44), but in general, the transfer of skilled personnel from Usedom to the Harz Mountains was very smooth, and by the middle of November, the staff at the missile base had shrunk to just over 7200 employees.[74] In April 1944, Sawatzki was able to determine that all of the positions needed for civilian labor had been filled, but that another 1850 prisoners still needed to be placed in the plant.[75] Once the underground missile factory had been completed and steady operations began, approximately 3000 German civilians found themselves working there alongside some 5000 concentration camp slaves. This number would multiply almost exponentially as more and more of Germany's armaments industries began shifting their operations underground.[76]

Security at the new production facility was extremely tight, but also increased dramatically as the tunnels expanded and were filled. The SD and Gestapo operated

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[73] Von Braun to Lindenberg, 12/20/43, FE694/A, NASM.

[74] Von Braun labored mightily to ensure that the division of personnel between Peenemünde and Mittelwerk was equitable. Von Braun to Kettler, FE 694/a, Von Braun to Sawatzki, 4/12/44, FE 694/a, NASM. Neufeld, *The Rocket and the Reich*, 206.

[75] Sawatzki, Fertigungsumfang und –aufwand A4 Mittelwerksanteil Stand 1.5.1944, FE 694/B, NASM. The list of recipients of this memorandum is also indicative of the links between administrators at Peenemünde and Mittelwerk. Of the twelve recipients, five, including von Braun and Rudolph, were Peenemünders. Others addressees included Kammler, Rickhey, and Bersch.

[76] Wagner, *Produktion des Todes*, 549. Major corporations such as Junkers and Askania opened operations in the tunnels in 1944. The Mittelwerk GmbH also received contracts to produce the V-1 cruise missile and the Heinkel He-162 "People's Fighter" [*Volksjaeger*].

offices in Nordhausen (near Dora-Mittelbau) and other towns around Kohnstein in addition to establishing a strong presence in Mittelwerk itself. Their activities were coordinated by the vicious head of security for the A-4 program, SS Lieutenant-Colonel (*Obersturmmbahnführer*) Helmut Bischoff, who received his orders directly from Kammler himself.[77] At the end of May, 1944, the Armaments Ministry declared that the area within a thirty kilometre radius of Dora-Mittelbau would be a relocation zone for heavy industry that was being bombed to rubble in the cities. This region was known as “Sperrgebiet Mittelbau” and Bischoff, in yet another example of institutional cooperation within the Nazi regime, also assumed responsibility for security for the entire area. Those who did not work or live in the area needed special permission from the Gestapo to enter it.[78] A large motorized police unit operated out of Nordhausen, and a tank battalion was also assigned to help secure the area around the factory.[79] In addition to the military units stationed in Nordhausen, the factory officials established a security detail [*Werkschutz*] which served as the guard troop for Mittelwerk. Its members patrolled the entrances to the tunnels and maintained security checkpoints inside the factory.[80] Security in the factory was maintained by other organizations in addition to the *Werkschutz*. The Sicherheitsdienst and the Gestapo also held themselves responsible for ensuring the safety of Mittelwerk. Both groups divided their tasks based on different types of cases. For example, they maintained separate offices for combating sabotage and “terror actions,” espionage,

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[77] Michael Allen, in his otherwise thoughtful book *The Business of Genocide*, mistakenly writes that Kammler placed Bischoff in this position because of Bischoff’s supposed engineering background. In truth, Bischoff had no technical training and was a lifetime SS police official. See Allen, p. 226. For a more accurate picture of Bischoff, see Wagner, *Produktion des Todes*, 524-528.

[78] Wernher Haack Statement, ZM 1625 Bd. 40, Akte 168, BStU. How strictly this could be enforced is questionable.

[79] Heinrich Detmers Testimony, U.S.A. vs. Kurt Andrae, et al., M-1079, roll 5, NARA.

[80] Helmut Bischoff Testimony, Gericht Rep. 299, Nr. 23, HStaD-ZA Kalkum.

and offenses by civilian workers. They also ran a network of informants in the factory whose activities were coordinated by the SD office in Niedersachswerfen, near the north entrance to the tunnels.[81] With all of this in place, civilian employees faced a dizzying array of security measures in their daily activities at Mittelwerk.

For the first several months at Mittelwerk, personnel transferred to the factory from Peenemünde were first ordered to Ilfeld, the seat of the Mittelwerk GmbH's local headquarters. There, they received instructions and several days' worth of training regarding the factory's secrecy regulations, espionage, and how to handle incidents of sabotage. When they departed Ilfeld and arrived at their new temporary residences (often barracks – the area lacked enough proper accommodations to absorb such a large influx of personnel), members of the SD met with them, photographed them, issued them passes into the tunnels, and eventually led them into the mountain.[82] As at Peenemünde, this introduction to the Mittelwerk served several functions. It recalled their initiation into the world of secrecy shrouding the project, gave them entry into this exclusive world, and also brought them face to face with the oppressive mechanism of the Nazi state. I will return to the issue of coercion shortly, but certainly the Mittelwerk employees felt nothing if not self-conscious in the knowledge that the notorious SD now had a file on them which included their name, address, and a photograph. The sense of coercion around the project only grew, but it

[81] Adolf Häser Statement, Gericht Rep. 299, Nr. 253, HStaD-ZA Kalkum. Häser was the Chief of the Gestapo in Niedersachserfen and Nordhausen.

[82] Werner Haack Dossier, ZM 1625, Bd. 40, Akte 168, BStU. Haack lived near Woffleben, a camp on opposite side of Kohnstein from Dora. When he arrived in the tunnels in December 1943, he remembered that there was not much light underground, no air circulation, and the air reeked of sulfur and ammonia.

was still a secondary factor in ensuring the dedication of the civilians to missile effort.

More positive considerations also helped maintain their loyalty. The engineers, technicians, and craftsmen who moved into the area around Dora-Mittelbau in late 1943 and 1944 found a factory system in place that emphasized their importance to the German nation in both word and deed. The articles of incorporation for the Mittelwerk GmbH, written by Degenkolb himself, attempted to manufacture a sense of community that was based both on the tasks ahead of them as well as Degenkolb's own vision as to how the operation should run. The articles recall Dornberger's speech delivered to the Peenemünders just a few months earlier, if only cast through an increasingly warped ideological prism. Consciously attempting to maintain a sense of communal interest around the work and referring to the Mittelwerk's employees as "work comrades," Degenkolb began by noting that "[Factory] Operations will be carried out in the spirit of a factory community [*Betriebsgemeinschaft*]." Employees of Mittelwerk all had equal stake in the project, and all of the firm's managers as well as each employee on the shop floor made up a strong, productive community of common interest. Degenkolb held that this common interest flowed explicitly from a sense of being a part of the national community [*Volksgemeinschaft*]. Accordingly, Degenkolb maintained that only "Those who possess German blood can be a member of the factory community." For him, the Nazi *Volksgemeinschaft*, based as it was in large part along racial lines and on the common welfare of all Germans regardless of station, was both a model and wellspring of the community of missile specialists in the tunnels. Like the Nazi

Volksgemeinschaft, Degenkolb envisioned a factory community that was to be bound together by “a spiritual commitment and reciprocal feeling of responsibility.” He wrote that “The destiny of the whole operation is the destiny of the entire factory community. This destiny is therefore the communal task of all work comrades, who must uphold operations with their last reserves of strength and productivity ... The supreme principle of the National Socialist Party, ‘Communal interest before personal interest,’ is the highest goal of the factory community.”[83] As at Peenemünde, the success of one of Germany’s most modern factory production lines was to be based not simply on the skill of its laborers, its speed, or its efficiency, but also on the active identification of its workers with the goals for which it was put to use. The sense of involvement in a project that was somehow larger than the sum of its parts was an important factor at both locations. The only thing different for Degenkolb was the motivation. His ideas embodied reactionary modernism in its penultimate form, embracing anti-modern notions of race and the German spirit as the central factors in the success of one of the world’s most advanced weapons. Though his rhetoric differed sharply than that espoused at Peenemünde, his message was similar. Personal interests should be set aside and communal interests embraced so that the work of defending the nation could be completed. Every workers’ last effort should be bent toward achieving this goal.

[83] Betriebsordnung Mittelwerk GmbH, 12/23/43, R121/405, BAL. Michael Allen labels this effort to manufacture not only technology, but also the National Socialist spirit – an act that supposedly would “yield up the German soul” (and relegated profit to secondary status) – “productivism.” There is little reason to doubt that this could be true, but Allen fails to note how easily such rhetoric could correspond with the less-ideologically inclined efforts to manufacture a sense of common interest among factory employees. See Allen, *The Business of Genocide*, esp. 165-239.

Degenkolb then went on to discuss the means by which it could be realized. After his resounding call to adhere to the tenets of a racially defined factory community centered on common national interest, most of these directives were mundane by comparison. Nevertheless, they were important for emphasis they laid upon factors that defined the Peenemünde community of specialists. For example, he ordered that every employee receive a copy of the articles of incorporation and give his or her signature to confirm that they would abide by the rules it contained. Such a signature would officially mark an individual's entry into the community of missile production specialists in Mittelwerk and signified a commitment to its goals. In addition, Degenkolb demanded that employees behave according to the strictest rules of secrecy regarding the plant's operation. Moreover, he encouraged all employees, no matter what rank, to proactively seek out improvements that could be made in their individual sectors and for management to be flexible in responding to these suggestions. Factory managers received full authority to hire or requisition the necessary workers for their individual section. Degenkolb also noted that employees could be summarily fired for such transgressions as "Offenses against National Socialist principles," "Serious offenses against the laws of the Reich," and "Disrupting ongoing work." Depending on the transgression, punishment ranged from an administrative wrist slapping to the passing of the case to the Security Service (SD).[84] However, most of these specific orders were not so different from the rules employees had to live under at Peenemünde, and the transition to a different style of management in Mittelwerk was minimal.

[84] Betriebsordnung Mittelwerk GmbH, 12/23/43, R121/405, BAL.

This is evident in a letter written to Degenkolb in January 1944 by purchasing expert Heinz Schmid-Lossburg. After reading Degenkolb's missive, he noted a number of concerns and questions that it brought up. He opened by stating dryly that "The section concerning the factory community is somewhat unclear," and laid out a number of concerns about compensating employees, issues pertaining to overtime pay, and other financial questions. However, Schmid-Lossburg also went on to state, among other things, that much of what Degenkolb emphasized in the articles of incorporation was not necessary. Most employees had long been living and working under such rules and were still bound by them. He informed Degenkolb that the statements he made concerning secrecy were unnecessary because nearly all of the employees of Mittelwerk were already obligated to follow the strictest secrecy guidelines. Moreover, most managers already understood that the task of looking after the employees belonged "fundamentally to the factory managers." Their roles as facilitators of improvement were clear, and they had always been open to suggestions from a range of employees. According to Schmid-Lossburg, factory managers already understood that the importance of the project required that they have confidence in their (civilian) workers. They had learned to take care of these issues during their time at Peenemünde.[85] Degenkolb's call to bring together the factory community, while not falling on deaf ears, had, for reasons other than those put forward A-4 Special Committee Chairman, already been widely embraced by many new employees at Mittelwerk.

Those civilians who came to Mittelwerk to join Degenkolb's "somewhat unclear" concept of a factory community received substantial compensation for

[85] Schmidt-Lossburg to Degenkolb, 1/5/44, R121/544, BAL.

relocating their homes, workplaces, and often their families. The Mittelwerk GmbH agreed to give its senior managers the handsome amount of up to six hundred Reichsmarks to cover moving expenses. Other indispensable members of upper and middle management received up to five hundred Reichsmarks to cover expenses.[86] Because of the hasty and fully improvised transfer of production, many employees were also unable to find suitable accommodations immediately. To help overcome the difficulties associated with such a rapid move, the Mittelwerk GmbH paid employees an extra per diem of RM 2.50 for the first six months they were in the area. Benefits provided by the corporation were also quite generous. Employees who worked overtime were eligible to earn up to one and a half times their normal salary for those hours. The board of directors also recognized that working in the factory created a special strain on civilians in the tunnels. Tellingly, every three months, employees received a generous "allowance for difficult working conditions" [*Erschwerniszulage*], which amounted one quarter of the monthly payment rate, calculated assuming a seventy-two hour work week. This benefit was available to employees only after they had been in the factory for two months.[87] Karl Otto Saur, Albert Speer's ambitious and ruthless subordinate, also showed an important interest in the well-being of Mittelwerk's civilian employees, insisting that they were "especially burdened," and should receive extra vacation time "in view of the difficult working conditions."[88]

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[86] Niederschrift über die 1. Sitzung des Beirates der Mittelwerk GmbH, 12/14/43, NS4 Anh., Nr. 3, BAL.
[87] Bericht Dr. Kettler, 12/10/43, R121/405, BAL.
[88] Niederschrift über die 1. Sitzung des Beirates der Mittelwerk GmbH, 12/14/43, NS4 Anh., Nr. 3, BAL.

The employees' social welfare was also a central consideration for members of the board of directors. Married workers received an allowance for family-related expenses [*Unterhalts-Beihilfe*]. Single employees also received a similar allowance, though it was about half of what the married workers collected. However, if a single employee got married, he and his wife received a one-time gift of RM 150 from the corporation. The Mittelwerk GmbH also did its part in seeking to increase Germany's birth rate. On top of the family allowance, it awarded a one-time payment of RM 100 for the first child and a one-time payment of RM 50 for the second. Moreover, the company offered a subsidy of ten Reichsmarks per month for each child that married couples had past their second. This would be in effect until the child was sixteen. Life insurance, no small matter in a country being steadily and systematically razed, was also a staple benefit.[89] In the end, the Mittelwerk board of directors proved eager to look after the social welfare of its employees, an official concern that could only have helped enlist and maintain employees' willingness to put forth their best efforts on the program's behalf.

In addition, and perhaps more importantly, individual employees' salaries rose markedly upon transfer to the Mittelwerk GmbH. Generally speaking, engineers and technicians who occupied positions in the middle and upper-middle management levels at Peenemünde earned between 10,000 and 12,000 Reichsmarks per year, depending upon education, experience, and seniority. These numbers rose dramatically when civilian managers transferred to Mittelwerk. For example, Erich Ball, an assembly specialist at Peenemünde who earned approximately 10,000 Reichsmarks per year between 1937 and 1943 (though no records exist for individual

[89] Bericht Dr. Kettler, 12/10/43, R121/405, BAL.

years, one should assume that his salary was somewhat higher in 1943 than in 1937 because of periodic raises and cost of living adjustments), earned a salary of 18,000 Reichsmarks in his position as assembly line manager at Mittelwerk. Technician Günther Haukohl's salary numbers are nearly identical. Rudolf Schlidt, a technician who worked in materials testing at Peenemünde and helped assemble exhaust jet vanes in Mittelwerk, saw his salary increase from RM 6000 to RM 10,000 per year. Perhaps the most dramatic salary increase was Arthur Rudolph's. The talented production supervisor, who held a two-year degree from a vocational school and who once had to subsist on just over seven Reichsmarks per week, earned a whopping RM 29,900 in his position with the Mittelwerk GmbH, up from his salary of just over RM 10,000 at Peenemünde. The once impoverished technician had done very well for himself under the Nazi regime.[90] Unfortunately, it is impossible to conduct a thorough, systematic review of the specific salaries offered to any large percentage of Peenemünders who happened to be transferred to Mittelwerk. There is simply of dearth of documents that might allow for such a large-scale examination. However, though the evidence is too scanty to come to any final, solid conclusions about the salary increases offered by the Mittelwerk GmbH, based on the numbers that are available, one can plausibly argue that most employees who transferred from Peenemünde likely received pay raises of between thirty and forty percent – a substantial increase by any standard.

Increased material awards, then, were used to buttress the civilians' personal dedication to the program's success and to help override any lingering personal

[90] Erich Ball, Günther Haukohl, Rudolf Schlidt, and Arthur Rudolph Basic Personnel Records, RG 165, Box 703, File "Boston," NARA.

reservations about the exploitation of slave labor in the concentration camp system. Those who came from Peenemünde and elsewhere received a generous amount of money to help overcome relocation expenses as well as several different types of inducements to work efficiently in Mittelwerk. They were well-compensated for their work and they could be certain that their families would be looked after by the state-owned corporation, even if they should suffer an accident or death. In addition, the handsome benefits package offered by the Mittelwerk GmbH showed its administrators' keen awareness of the arduous nature of employment in the factory. It was not an easy place to work, and conditions were "difficult," to say the least. Management consciously attempted to alleviate the stress of working underground in a high-pressure environment in which they daily were confronted with the concrete reality of slavery under the Nazi regime. By offering generous pay, excellent benefits, and increased vacation time, even during the most radical period of the regime's existence, the company hoped to mitigate the strains that it knew existed in a place that must have been as difficult to work in as Peenemünde was exciting. The rupture from their comfortable lives on the Baltic was no doubt unpleasant, but missile program administrators did their best to overcome any remaining sense of dislocation. Even the bombastic Degenkolb, with his bizarre articles of incorporation, got into the act. Though his missive may have been opaque to many employees, the tangible material benefits of working and living around Dora-Mittelbau were perfectly clear. Even if life there was not as rewarding as in Peenemünde, employment under Kohnstein offered other advantages, such as higher salaries and excellent social welfare benefits.

In addition, another major advantage was the potential for professional advancement. Personnel who had previously been employed at Peenemünde often assumed positions in the Mittelwerk factory that were essential to its successful operation. For many of these people, transfer to the underground facility meant a great deal of upward professional mobility. Many employees who were deputies and assistants in Peenemünde became section chiefs and division managers in Mittelwerk. According to Dornberger himself, nearly every working group in the factory was headed by an engineer who had originally been employed at Peenemünde.[91] Sensibly, engineers at Peenemünde who had experience in a particular area at their former base went on to become the experts in this same field in Mittelwerk. Several individual cases as well as entire factory divisions within the Mittelwerk factory serve as useful examples of the importance of the Peenemünders to the efficient functioning of the operation. For example, engineer Erich Ball, who helped plan assembly at the F-1 plant in Peenemünde, arrived from Usedom in September 1943 and assumed the position of assembly line chief at Mittelwerk. Gunther Haukohl, a skilled technician at Peenemünde who worked on the installation of the assembly line, helped plan extended manufacturing facilities and a repair shop in Mittelwerk.[92] Engineer Firnrohr, a deputy group leader in the assembly plant at Peenemünde, became the division head of the department responsible for assembly of the center section of the missile at Mittelwerk. Engineer Busselt, a deputy leader in the division responsible for testing the wiring in experimental missiles at Peenemünde, became the head of the

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[91] Dornberger Statement, ZM 1625, Bd. 44, Akte 189, BStU.

[92] U.S.A. vs. Kurt Andrae et al., M-1079, roll 4, NARA. The notoriously brutal kapo "Big Georg" Finkenzeller worked under Haukohl.

group responsible for testing the missile's wiring at Mittelwerk.[93] Many other engineers from Peenemünde followed this career arc, which established direct connections between the research and development station on the Baltic and the assembly plant in the Harz Mountains.

Perhaps the most important section in this regard was the factory labor operations division (Betriebsarbeitseinsatz), which allocated both civilian and prisoner labor inside the assembly halls. As Factory Director, Rudolph ultimately was in charge of this division, but former Peenemünde specialists supervised its daily activities. The two engineers in charge of this section, Broszat and Weckbrodt, were former Peenemünders who worked closely with Rudolph in designing the production plant there. In the Mittelwerk factory, they worked with the SS labor allocation office in concentration camp Dora in order to assign semi-skilled prisoners to the proper assembly and transport details. Starting in the autumn of 1943 and continuing through March 1945, civilian managers in factory labor operations received daily prisoner strength reports that detailed how many slave laborers came into Dora, how many had died, and how many total prisoners worked in the tunnels. These reports made the staggering death rate in the tunnels abundantly clear, and from them, Broszat and Weckbrodt were able to request and allocate more prisoners as needed.[94] In addition, engineer Raschdorf, Broszat's deputy in this division, also previously worked at Peenemünde. Finally, the factory labor division was the civilian agency in charge of supervision and control. Engineer Stuhlfauth, who ran this section, was not

[93] My sincere thanks to Torsten Hess of the KZ Gedenkstätte Dora-Mittelbau for his help in working through a number of the connections that individual engineers had between Peenemünde and Dora-Mittelbau.
[94] For examples of these strength reports, see Veränderungsmeldungen, ZM 1625 Bd. 69, Akte 348, BStU.

a Peenemünder, but his deputy, an engineer Kuhlmann, had transferred from Usedom in November.[95]

A second important example of the centrality of civilian experts from Peenemünde in daily factory operations was in the production quality control division (*Fertigungsaufsicht*). This division was created before the August air raid and subsequent dispersal of the base's facilities and personnel. It remained under the administrative control of the development group at Peenemünde even after its main office relocated to Mittelwerk in May 1944. The quality control division represented the embodiment and institutionalization of cooperation between missile specialists both in development and production. Von Braun and Sawatzki worked very closely to ensure that this division functioned smoothly at Mittelwerk. In April 1944, Von Braun traveled to the factory in order to discuss with Sawatzki how to improve and simplify the work of its staff members. Both men agreed that one of the major problems confronting them was the difficulty of creating easily mass-produced, readily installed assemblies out of the often custom-made pieces of equipment made for test firings at Peenemünde. The experience of mass production had shown both of them that "the questions still that remain to be solved must be worked out by cooperation between development, subsidiary firms, and assembly." These questions would be tackled by the quality control group, which would function as a technical "stormtroop" [*Stosstrupp*] in attacking problems as they came up, while also

[95] Mittelwerk GmbH Betriebsabteilungen, 12/12/43, NS-4 Anh., Nr. 16, BAL.

coordinating the functions of all Army developers, production specialists, and private industry.[96]

The group was made up of approximately fifty people from Peenemünde, engineers who both supervised the incorporation of design changes in subsidiary firms and tested assemblies and sub-assemblies in the factory. These civilian engineers also employed skilled prisoners as assistants. The chief of this very important group, an engineer named Hans Lindenberg, was a deputy of von Braun's when he worked at Peenemünde. For his tasks at Mittelwerk, he cooperated directly with Sawatzki on questions of development and production, but was technically still directly subordinate to von Braun.[97] Even though he lived and worked in Ilfeld, not far from Mittelwerk, Lindenberg often sought out von Braun's support on numerous production and design questions. Moreover, in addition to coordinating development and production, the quality control group was also charged with "removal of specialists (foreigners) [from the assembly line] who are not particularly qualified"[98] [parenthesis in original]. The fate of prisoners who were not on the factory assembly line was common knowledge. Most were literally worked to death in the myriad of SS-managed construction projects in the Nordhausen area in 1944 and 1945.[99]

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[96] Sawatzki, Aktenvermerk über die Besprechung am 12.4.1944 im Mittelwerk, 4/16/44, FE 694/A, NASM.
[97] Ibid.
[98] Dienstanweisung für die Fertigungsaufsicht, 5/15/44, NS-4 Anh., Nr. 23, BAL.
[99] See Wagner, *Produktion des Todes*, 359-367 and Allen, *The Business of Genocide*, 222-232.

Civilian engineers inspect a V-2, without its warhead, in the Mittelwerk factory.
Courtesy of Michael Neufeld

Interestingly, Werner von Braun helped write the service instructions for the quality control group and was central in the set up of this office.[100] Throughout the early part of 1944, while the tunnels were still being expanded and more parts of the factory were being brought on line, he remained tremendously important in defining the mission of the quality control group. In February, he wrote a stern circular to all of the members of the quality control group in which he attempted to elaborate on and clarify the importance of their work. In von Braun's typical carrot and stick approach, he wrote to his subordinates that he would unerringly support any specialist who rejected useless or flawed items even if such rejections set back production quotas. However, he also pointed out that he would call to account those members of

[100] Wernher von Braun Statement, 2/7/69, ZM 1625, Bd. 60, Akte 268, BStU.

the group who frivolously ignored the demands of production or who could not clearly justify why production numbers were not being met. All members of the group were to give their forthright cooperation to all of the firms involved in the manufacture of the V-2 so that high volume, steady output could be achieved. "I don't need to mention to you," he wrote, "that attaining a high output of instruments as soon as possible is everyone's dearest wish." Von Braun reminded the old Peenemünders that in order to produce this high volume of serviceable missiles, developers and producers had to closely coordinate their activities. For him, this was an overriding concern: "We have no time to lose! The fastest possible introduction and adaptation of [test] results in the [office responsible for coordinating technical changes] is the decisive demand upon which the success or failure of our entire project depends."[101] Cooperation, then, was to be the watchword for this group, as indeed it was for all Peenemünders who came to work at Mittelwerk. As at Peenemünde, the fate of the entire project depended on the positive interaction of a motivated, cooperative German workforce. The quality control group, made up almost exclusively of Peenemünders, was a lynchpin to this success.

The links between engineers at the distant locations were founded on more than professional grounds. Away from the shop floor and in higher management echelons, the social bonds between leading development and production engineers were close. For example, Rickhey hosted a number of parties for Mittelwerk and Peenemünde managers, complete with cognac and cigars.[102] Other occasions go so far as to reveal the level of the Peenemünders' indifference to the crimes committed

[101] Von Braun, Rundschreiben an sämtliche Angehörigen der Fertigungsaufsicht, 2/17/44, RH8/v. 1980, BA/MA.
[102] Julius Bouda Testimony, U.S.A. vs. Kurt Andrae, roll 7, M-1079, NARA.

in the name of missile assembly. For example, in December 1944, von Braun, Dornberger, and Heinz Kunze (Degenkolb's deputy) won the War Service Cross for their efforts to develop and produce the V-2. That month, they held a small celebration at Peenemünde that revealed a great deal about the leading engineers' attitudes toward each other as well as toward slave labor. A number of leading Peenemünders and production engineers, Rickhey and Sawatzki, were invited to the celebration, which was organized by Riedel III.[103] Photographs of the event reveal a pleasant, relaxed atmosphere, drink flowing and the conversation lively. During the happy occasion, places around the dinner table were kept by illustrated cards that not only poked fun at each other's foibles, but also revealed a callous attitude toward the fate of the prisoners at Dora. Dornberger's card depicts the general on the hunt for a buck, his favorite pastime, reckoning a five meter dispersal on his shot and declaring wistfully, "Those were the days!" [*Das waren noch Zeiten!*]. Von Braun's card shows the young engineer reclining in an armchair while using a solar reflector to cook his breakfast. More troubling was Sawatzki's card. On it, a mass of prisoners struggles to pull his car out of ditch while a kapo looks on. On Rickhey's card, inmates labor to pull an A-4 out of a tunnel, observed at a distance by a man in a crisp suit, presumably Rickhey himself.[104] These illustrations were created no doubt to add a further air of levity to this occasion, but in this effort, they also revealed a thoroughgoing indifference to the struggles of the prisoners who labored in the tunnels of Mittelwerk. Illustrations aside, these social occasions also helped to reaffirm the engineers' identification with each other and their willingness to

[103] Riedel III to Kunze, 12/11/44, FE 372, NASM.
[104] Dinner card draft illustrations, FE 855, NASM.

cooperate in the project. Such events were important for maintaining an efficient, collegial, relationship between developers and producers. In short, they reinforced the highly developed sense of solidarity among the stressed and beleaguered missile specialists.

The division, therefore, between specialists at Peenemünde and production engineers at Dora was not sharply defined. While some historians and many rocketry enthusiasts have, for very different reasons, implied that one group had little to do with the other (except for the occasional exchanges of correspondence or odd meeting or that they only had periodic contacts at high levels), the truth is somewhat more

The place-keeping cards used at a dinner in Dornberger and von Braun's honor, December 1944.
Courtesy NASM

complex. A weapon as radical and advanced as the V-2 dictated that the developers remain in close contact with production engineers in order to iron out the inevitable wrinkles that would appear not only in a weapon that was being rushed into operational use, but also in the transition from experimental to mass production. The transplanting of final assembly from Peenemünde only served to complicate this transition. Moreover, many Peenemünders, who had internalized the missile center's central axiom of service to the nation in time of war as well as, it should be noted, its deeply ingrained culture of group self-interest, moved into the Mittelwerk factory and became central in the management missile production. Indeed, this line between the two groups was not a solid barrier at all, but rather a semi-permeable membrane in which people and information could be easily moved back and forth. Former Peenemünders inhabited the middle and upper-level management strata of the Mittelwerk GmbH, in precisely the positions in which their decisions would have the most impact upon the daily lives of concentration camp prisoners forced to work in the service of the missile program. Every day at work, they were confronted with the reality of slave labor. The decisions that they made from moment to moment on the shop floor reflected the deeply internalized culture of their former institution as well as the increasingly radicalized political climate in the last eighteen months of the National Socialist regime.

Dornberger and von Braun, December 1944.
Courtesy DM

Slave Labor and the Civilian Workforce at Dora-Mittelbau

German civilian specialists were a fundamental part of the systematic persecution of slave laborers in Mittelwerk. However, direct individual involvement in the crimes associated with slavery under Kohnstein varied widely. Essentially, the missile specialists' behaviour was clustered around two main groupings. Around one pole were the passive facilitators who competently did their duty or enthusiastically supported the war effort in their daily lives at work. In this dedication, which in practice translated into support for the regime itself, these men created the essential precondition for more radical policies. Their collective outlook at least tolerated Nazi brutality either by failing to protest against it or, worse, by turning it to their own advantage. Around the second pole were those engineers, such as Sawatzki, who wholeheartedly exploited slave laborers in missile production and showed an astonishing combination of ideology and rationality that served the twin goals of producing weapons while also subjugating those perceived to be enemies of the Nazi state. These men were more heavily involved in Nazi crimes, though their numbers were smaller. The direct and more fatal participation in the harsh excesses of the Nazi regime by individuals in the missile community, while admittedly less common, was itself one of the results of the atmosphere of dedication and cooperation that so many important specialists encouraged. It is the most direct indication of the continued narrowing of the missile specialists' ethical outlook to service to the state. The final consequence of this was an uncaring attitude, or at least obliviousness, toward the tremendous human suffering that they caused.

The period of factory installation described above was certainly the most brutal and terrifying for the prisoners at Dora. Civilians who worked among these prisoners treated them in a wide variety of ways. Most of the civilians involved in setting up the factory came from Peenemünde or were sub-contracted employees of subsidiary firms. Some of these civilian engineers physically mistreated the prisoners in the tunnels despite an SS order forbidding the practice. In December, Förschner circulated an order that prohibited civilians from having any contact with prisoners except for the purposes of detailing their tasks. He attempted to make it clear that the SS was to be the only group responsible for disciplining the prisoners.[105] Most complied, but some civilians outright ignored this order. Sawatzki himself was perhaps the worst offender in this regard. Eddie Verheyn, a French prisoner, recalled after the war that Sawatzki would roam the tunnels in the morning, "calling us French swine and kicking several of us here and there."[106] Gerhard Hobert recalled clearly that civilians beat prisoners, accusing in particular Sawatzki, as well as an engineer named Siegel and section director Seidenstucker, a section chief on the assembly line. "It is not only true that the directors were bandits," he stated, "but the section leaders were just as bad."[107] Finally, engineer Jakob, a former Peenemünder who helped run the portion of the production line that completed tail assembly, was also accused of abusing prisoners. According to one prisoner, he purportedly "… took pleasure in beating people and having people beaten."[108] Both Seidenstucker, who was described

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[105] Förschner Aktennotiz, 12/30/43, NS4 Anh., Nr. 3, BAL.
[106] Eddie Verheyn Testimony, U.S.A. vs. Kurt Andrae, et al, roll 4, M-1079, NARA.
[107] Gerhard Hobert Testimony, U.S.A. vs. Kurt Andrae, et al, roll 4, M-1079, NARA. Willi Burgdorf, a prisoner who worked directly for Seidenstucker, offered that the engineer "was a bad fellow."
[108] Verheyn Testimony, U.S.A. vs. Kurt Andrae, et al, roll 4, M-1079, NARA; Willi Steimel Testimony, U.S.A. vs. Kurt Andrae, et al, roll 5, M-1079, NARA.

by one prisoner as a "sadist," and Jakob were two of Rudolph's deputies.[109] In any case, despite these examples and the fact that many prisoners clearly recalled the instances in which they witnessed civilians directly abusing the prisoners, the number of engineers who directly mistreated camp inmates remained relatively low.

For the most part, civilian specialists in the tunnels left the disciplining of prisoners to the Kapos and SS.[110] However, this does not mean that they overtly sympathized with the plight of the prisoners who suffered through their troglodyte existence. In truth, the majority of civilians betrayed a callous indifference to the suffering around them in the terrible winter months of 1943-'44. Yves Béon remembers civilians who guided factory installation "continually measuring the galleries according to the plans they carry. They move about, climbing the piles of rubble, going around machines and reels of cable, past turning concrete mixers, but never looking at the tattered men around them, nor even hearing the shouts, the vicious clubbings, or screams of pain. Quietly, they indicate location points desired for machines, for junctions, for joints and fixing points for the electrical and pneumatic air ducts."[111] Installation of the factory, not care for the fate of the prisoners working to prepare the tunnels, was the first priority for most civilian specialists in the winter of 1943-'44. Dr. Karl Kahr, the SS physician at Dora, testified in 1947 that the tempo of the work was one of the primary causes of fatigue and accidents. He placed equal blame for this on civilian employees, kapos, and the

[109] Tadeusz Kahl Testimony, 28/83 USA, BStU.
[110] Sellier, *A History of the Dora Camp*, 87. Sellier also notes that of the thousands of deaths in this period, very few were because of outright executions.
[111] Béon, *Planet Dora*, 24.

SS.[112] Those prisoners who did not or could not contribute their full energy to achieving the goal of quickly installing the factory were easily expendable and readily replaced. A steady drumbeat of instructions from above reinforced these ideas, warning against sabotage and delays while pointing out, for example, that "The fast and programmatic execution of our work of production and the guarantee of the working reliability of our plants and manufacturing equipment are at present our first requirements."[113] No mention was ever made of the care of the prisoners.

Though most civilians abstained from direct abuse of the sort Sawatzki and others doled out, they could still be directly implicated in the *system* of maltreatment in Mittelwerk. Clement van Hamme, a Dutch prisoner, explained that "The civilians who were with us did nothing but watch the work and command. They beat us little or not, but denounced the men who did not work to the SS."[114] At worst, then, in the early stages of tunnel expansion and factory construction, there is concrete evidence that some German specialists blatantly, (and, it must be said, illegally, even in the Nazi context) mistreated prisoners whom they deemed too lazy or too slow. Most, however, betrayed little more than indifference to the prisoners' deep suffering. In the course of doing their jobs properly, however, they became involved in the structure of abuse in the factory by reporting misbehaving workers, replacing those who could no longer function efficiently, and utterly failing to look out for their well-being.

Slave labor in the tunnels under Kohnstein began to take on a new aspect in the late spring and early summer of 1944. As the expansion of the galleries was

[112] Karl Kahr Testimony, U.S.A. vs. Kurt Andrae et al, M-1079, roll 8, NARA.
[113] Kettler Sonderdirektionsanweisung D, 1/8/44, NS4 Anh, Nr. 3, BAL.
[114] Clement van Hamme Testimony, U.S.A vs. Kurt Andrae, Roll 2, M-1079, NARA.

completed and the installation of the missile factory's assembly line began receiving its finishing touches, the ferocious pace of the work as well as the catastrophic death rate under the mountain began to abate. By April 1, the primary tunneling work had completed, the tunnels were cleaned, air conditioning was installed, and machines were ready for operation.[115] In addition, the SS finally began constructing barracks outside of the tunnels in January 1944 and began moving the prisoners into them shortly afterward. The last of the prisoners emerged from the tunnels to take their places in the barracks in June.[116] Camp Dora would eventually be made up of over fifty barracks and also contain its own crematorium as well as a gallows and separate prison that came to be known as "The Bunker." Almost all of the barracks were equipped with wash rooms and latrines, which limited the opportunity for diseases to spread.[117] At the same time, a medical barracks was constructed so that the SS made the possibility of medical care for the prisoners available, and the food situation for prisoners improved as well. Those fortunate enough to have the requisite skills to work on the assembly line experienced a drastic improvement in conditions, and the death rate dropped dramatically from April '44.[118] The accommodations above ground, while not ideal, were nonetheless a monumental improvement over the cold, wet, and disease-ridden sleeping tunnels in the mountain.

Attitudes toward the prisoner labor force also changed fundamentally. Until the end of March, 1944, around eighty percent of the prisoners in the Dora-Mittelbau

[115] Wincenty Hein Testimony, ZM 1625, Bd. 23, Akte 35, BStU.
[116] Monatsbericht, 5/23/44, Gericht Rep. 299, Bd. 562, HStaD-ZA Kalkum.
[117] Wagner, *Produktion des Todes*, 192-194. Wagner also points out that the lowered death rate at Dora was also the result of shipping several thousand prisoners who were no longer able to work to Dora's growing network of subsidiary camps.
[118] Monatsbericht, Häftlingskrankenbau Dora, 5/23/44, Gericht Rep. 299/562, HStaD-ZA Kalkum.

complex worked at the tunnel face, blasting the rock and transporting it out. About fifteen percent worked in so-called "Fachkommandos" as joiners, electricians, handworkers, and other skilled positions, and approximately five percent were employed as secretaries, clerks, and stenographers in the business offices.[119] However, as the work in the tunnels required fewer high concentrations of unskilled manpower for digging, transport, and construction work, the job sites underground began to be populated increasingly by skilled laborers who were viewed as a much more valuable commodity, not only by the camp's SS officials, but by civilian managers as well. Assembling the missiles required a highly competent work force that was at least moderately familiar with the technical demands of such a task. Electricians, welders, metalworkers, and mechanics were especially valuable professions for prisoners. Most often, the SS housed these skilled workers in the main camp of Dora itself, where the skilled labor pool could be most easily accessed and prisoners could move relatively easily to and from work.[120] Skilled inmates in the main camp generally received better treatment as well.

For example, in May 1944, an outbreak of typhus struck Dora and threatened to devastate the camp. The SS medical staff ordered that "skilled prisoners who are important for the factory" receive inoculations against the disease so that they could continue their work.[121] Starting in July, prisoner doctors conducted twice-weekly health inspections, especially with the aim of limiting the spread of fleas. The availability of food and water improved as well. Nevertheless, these improvements

[119] Anklageschrift gegen Bischoff, Busta, Sander, Konzentrationslager Mittelbau/Dora, ZM1625, Bd. 5, Akte 15, BStU. Wincenty Hein Testimony, ZM 1625, Bd. 23, Akte 35, BStU.
[120] Wagner, *Produktion des Todes*, 367-368; Neufeld, *The Rocket and the Reich*, 225; Sellier, *A History of the Dora Camp*, 149.
[121] Monatsbericht, 5/23/44, Gericht Rep. 299, Bd. 562, HStaD-ZA Kalkum.

did not come about out of humanitarian concern, but rather the camp administrators' narrow technical self-interest. Unskilled prisoners were often banished to Dora's increasingly dense network of subsidiary camps, where conditions were much worse. They had to live with other, often fatal, disadvantages that skilled workers sometimes did not have to face. For example, many prisoners lacked adequate shoes. This was especially true among the unskilled laborers in the transport kommandos, where "abrasions [on the feet] are a consequence of the work performed."[122] Such considerations are seemingly mundane, but Primo Levi wrote powerfully of the necessity of proper footwear in the camps, reminding his readers that "Death begins with the shoes; for most of us, they show themselves to be instruments of torture, which after a few hours of marching cause painful sores which become fatally infected … To enter the hospital with a diagnosis of 'swollen feet' is extremely dangerous, because it is well-known to all, but especially to the SS, that there is no cure for that complaint."[123] Prisoners who could not be cured were no longer considered of any value to the SS, and were murdered. To be sure, those skilled prisoners imprisoned at Dora and who worked in the factory dealt with some of these same risks because of problems with shoe supply. However, these were mitigated by Förschner's move in the early summer of 1944 to provide leather shoes for prisoners who worked in the assembly shops as well as a number of other efforts by camp officials and medical personnel to improve their access to better clothing.[124] Those who labored in positions requiring less skill but more physical exertion, and who,

[122] Mrugorsky to Kammler, 7/4/44, Roll 1, M-1079, NARA.
[123] Primo Levi, *Survival in Auschwitz*, (New York: Simon and Schuster, 1996), 34-35.
[124] Mrugorsky to Kammler, 7/4/44, Roll 1, M-1079, NARA.

consequently, were most in need of proper shoes and better access to new clothes, received nothing.

Civilian specialists had virtually no contact with the prisoners in the camp, but worked side by side with them in the factory every day. The pattern of behavior at Peenemünde, in which prisoners who were perceived to have more value because of their technical skills received better treatment, also took shape at Mittelwerk. Factory administrators, for example, instituted a premium system in which prisoners could be rewarded with extra rations and cigarettes from the camp in exchange for excellent work.[125] Those slaves who could help contribute to the goals of the program, therefore, had a much better chance of survival at the factory. Interestingly, Nazi conceptions of race remained of little or no importance in determinations about who might be useful in achieving the factory's ends. The functional criteria of technical skill was in the end, the single most important factor in determining an individual prisoner's chances of survival at Dora-Mittelbau.

Technical considerations were the dominant factor in decisions made about the treatment of prisoners. The mass production of the V-2 required permanent and trained groups of workers. Arthur Rudolph admitted that all of the civilians who worked in the factory were keenly aware of the V-2s importance to the war effort and that the primary objective at Mittelwerk was to mass-produce missiles quickly and efficiently.[126] Continuous training of new workers was expensive and hampered the pace of production, as did a never-ending stream of prisoner abuse. It was far easier and made much more technical sense to keep skilled workers alive and in the

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[125] Wagner, *Produktion des Todes*, 393-394.
[126] Rudolph OSI interrogation, Franklin, *An American in Exile*, 218.

workshops than it was to train a new one every time a worker died or suffered injuries requiring his removal from the assembly line. Former prisoner Wincenty Hein pointed out that "Since qualified work groups were more valuable [than unskilled labor], the treatment of the prisoners during their work time in the factory improved."[127] The better conditions for the prisoners, then, had little to do with the engineers' humanitarian concerns and much more to do with their own narrow self-interest. Because it was in the interest of this deeply self-serving group of missile specialists to keep skilled labor alive or uninjured, technically trained prisoners stood a much better chance of survival. Engineer Willibald Feier, who worked at Peenemünde from 1941 until his transfer to Mittelwerk in 1943, remarked coldly that "Since a huge death rate ruled among the prisoners at this time, we civilians appealed to the SS guards with the goal to reduce the death rate. This was necessary for us, since we were concerned about having unskilled workers and it took a long time for us to train them."[128] Feier's candid statement indicates not only his keen awareness of the horrors of working in the tunnels, but also the sharp narrowing of the civilians' ethical sensibilities when it came to considerations of the prisoners' conditions. The technically skilled had value, the unskilled did not. Such considerations categorized prisoners according to function and assigned no worth to those unlucky enough to be without the requisite skills. Without question, the engineers' active identification with the goal of mass production, combined with pressure from above, manifested itself in a stunning ability to think not in terms of the human cost of their work, but rather the potential output of human labor.

[127] Hein Testimony, ZM 1625, Bd. 23, Akte 35, BStU.
[128] Willibald Feier Statement, Gericht Rep. 299, Bd. 600, HstaD-ZA Kalkum.

The circumstances created by wartime events also cast the engineers' considerations in a revealing light. In the spring and summer of 1944, allied air attacks increasingly began to create major problems for firms that manufactured parts and assemblies for the V-2. Many of the production sites were relocated to Mittelwerk so that by the end of the summer, the entire tail assembly, the rudder machinery, and central section of the missile was being assembled in the tunnels.[129] The decision to move rudder machinery into Mittelwerk is an important example of the missile program's managers' narrow, but strong identification with the goals of their work. Rudder machinery had been manufactured by the firm Boverei and Cie at locations in Saarbrucken and outside of Paris. Because of the intensity of allied air attacks, the program's directors, including Dornberger, von Braun, Rudolph, Sawatzki, and Rickhey, agreed to move the production sites to Mittelwerk. However, camp Dora did not have the requisite numbers of skilled workers necessary to man the assembly positions in the tunnels. The program's administrators understood that they had to relocate the workforce as well. In the case of the French producers, they were absolutely clear on the idea that only way to make the French workers come to Mittelwerk was in fact by arresting them, transporting them to Dora, and enslaving them as concentration camp prisoners under Kohnstein.[130] In short, V-2 administrators made it quite clear through their actions that successful production, not

[129] Prüfbericht Mittelwerk GmbH zum 30.9.44, R 121/303, BAL.
[130] Protokoll der Besprechung im Büro Rickhey am 6.5.44, FE 694/b, NASM. Whether or not these workers were actually arrested and brought to Dora is unclear. In von Braun's defense, the young engineer had himself been arrested by the Gestapo and released only two months earlier. He lived with the threat of re-arrest for the rest of the war, and it is unreasonable to expect him to explicitly protest against slave labor after this episode. Neufeld, *The Rocket and the Reich*, 213-220. I examine this incident in further detail in the next chapter.

compassion, governed the actions they took on behalf of the laborers tasked with assembling the missile.

However, the general improvement in working conditions does not necessarily mean that prisoners who labored in the tunnels were free from abuse at the hands of the SS, kapos, or even civilian specialists. An SS guard named Erwin Busta roamed the halls of the factory, viciously abusing prisoners on a whim. Busta, whom the prisoners nicknamed “Horsehead” [*Pferdekopf*] because of his elongated features, was a sadist who dispensed ferocious beatings to skilled and unskilled prisoners alike. He was often seen hunting for prisoners that he felt were not working hard enough or fast enough. Among the tragic litany of brutalities he committed in the tunnels, Busta whipped a prisoner to the point of unconsciousness and then shot him in the head (August 1944), shot two Russian lathe operators at their work stations for no apparent reason (December 1944), and beat another prisoner to death with an electric cable (winter 1945).[131] At least one civilian who worked in the tunnels recalled after the war that even Germans in Mittelwerk feared Busta.[132] However, they were not above using the SS man for their own ends. For example, Vadim Bykadorov, a Russian engineer who arrived at Dora in the summer of 1944, testified in 1967 that “German civilians who tested the quality of the work intimidated the prisoners with the threat that they would report cases in which the quality of work was not high to ‘Pferdekopf.’ ... The results of such reports were that the prisoners were beaten or

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[131] Anklageschrift gegen Bischoff, Busta, Sander, Konzentrationslager Mittelbau/Dora, ZM1625, Bd. 5, Akte 15, BStU. Neumann Testimony, “Verläufiges Ergebnis der Ermittlungen,” BstU ZM 1625, Bd. 4, Akte 14, BStU.
[132] Luise Speiss Statement, ZM 1625, Bd. 34, Akte 19, BStU.

taken out of the kommando and never seen again."[133] Many kapos also vented their frustrations on the prisoners whom they supervised on the shop floor.[134] Skilled or not, few prisoners were completely exempt from every form of arbitrary abuse, though the pace and number of incidents slackened considerably.

One of the principle reasons for this was that technical considerations forced the SS to defer to the authority of civilian engineers and administrators. Though the SS did indeed set up the framework in which the factory functioned, civilian engineers were fundamentally entrusted with production.[135] Ernst Dutzmann, the former head of the Army Acceptance Office [*Heeresabnahmestelle* – responsible for testing and delivering finished missiles and other materials to the missile battalions], stated that "I did not see prisoners who were employed in assembly get mistreated by SS guards while they worked. The German expert employees were their direct supervisors during work."[136] Another civilian engineer remarked that "I myself only saw a few SS men in the underground factory. They were occasionally in the long tunnels. I never saw SS men in the side tunnels [where sub-assemblies were put together]."[137] On the shop floor, civilians could, within their areas of expertise, exert authority even over SS men. Some were even able to keep the vicious "Pferdekopf" in check.[138] The conversion from construction to mass production enhanced the authority of the civilian missile specialists in the factory while weakening the power of the SS.

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133 Vadim Bykadorov Testimony, Gericht Rep. 299, Nr. 171, HStAD-ZA Kalkum.
134 Heinz Hilgenböcker Statement, Gericht Rep. 299, Nr. 274, HStAD-ZA Kalkum.
135 Hubert Tacke Dossier, ZM 1625, Bd. 35, Akte 131, BStU.
136 Ernst Dutzmann Testimony, Gerichte Rep. 299, Nr. 210, HStaD-ZA Kalkum.
137 Heinz Krause Statement, Gericht Rep. 299, Nr. 188, HStaD-ZA Kalkum.
138 Sellier, *A History of the Dora Camp*, 139.

However, the civilians, who were under tremendous pressure to produce results, still witnessed scenes of arbitrary brutality. Even worse, they sometimes participated in the mistreatment of prisoners. According to one former prisoner, approximately eighty percent of the civilians treated the prisoners normally and did not abuse them, but the other twenty percent had no qualms about slapping, kicking, or otherwise harming prisoner labor.[139] The civilian board of directors was acutely aware of this behavior and under no circumstances condoned it. In a memorandum circulated through the Mittelwerk factory in the early summer of 1944, factory management pointed out that "The camp doctor has repeatedly determined that detainees who work in the offices or on the factory floor have been beaten by company employees because of this or that offense, or have even been stabbed with sharp instruments to the point that they must be given medical treatment. Such interference with the camp commanders' authority on the part of Mittelwerk employees must cease under all circumstances. If a prisoner is guilty of a punishable offense … a written report must be submitted to camp commandant Förschner … A copy of the report is to be sent to executive factory management. Further punishment will then be undertaken by the commander against the prisoner."[140] Despite an order previously circulated by Förschner in his position as individual responsible for factory security, some civilian specialists saw fit to beat those working under them. Nevertheless, even though abuse of skilled prisoners on the shop floor certainly took place in this middle period, most incidents were relatively isolated. In a factory of over 3000 civilians and 5000 prisoner laborers, incidents of direct maltreatment were

[139] Josef Klaes Testimony, U.S.A. vs. Kurt Andrae, et al, Roll 5, M-1079, NARA.
[140] Rickhey and Kettler, Sonderdirektionsanweisung, 6/22/44, NS4, Anh. Nr. 3, BAL.

the exception rather than the rule. The majority of civilian workers behaved less violently, though their reasons for this had less to do with humanitarian considerations than they did with technical reasons.

Importantly, some civilians sympathized with the prisoners and treated them as well as they could, given the circumstances. Many prisoners went to great lengths after the war to recognize the foreman or engineer who gave them a piece of bread or helped shield them from the SS.[141] For example, French prisoner Georg Soubirous recalled that "For a short time I was in an electrician's kommando named "König." At the head of this kommando was a German engineer named König who did everything to make our lives easier. He did his utmost to make sure that we did not become 'Strafhäftlinge.' [prisoners who were punished in the 'bunker' in Dora]."[142] After the war, many civilians who were employed in Mittelwerk claimed to have done everything they could to improve the lot of the prisoners, giving rise to what Jens Wagner has dubbed the "Myth of the Bread Givers."[143] Most of this testimony, offered during war crimes trials, lacks all corroboration and documentation. There is no evidence that most civilians on the shop floor actually attempted to pass food to prisoners. It is clear, however, that a bare minority of civilian workers were willing to take such risks in order to help individuals in the small groups of laborers under their control.

It is tempting to argue that the decent and moderately humane treatment accorded by some civilians to the prisoners is indicative of the presence of some

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[141] Sellier, *A History of the Dora Camp*, 137-138.
[142] Georges Soubirous Testimony, Gericht Rep. 299, Nr. 590, HStaD-ZA Kalkum.
[143] See, for example, Werner Haack Statement, ZM 1625, Bd. 40, Akte 168, BStU; Indrak Statement, Gericht Rep. 299, Nr. 599, HStaD-ZA Kalkum, and Walter Kash Dossier, ZM 1625, Bd. 30, Akte 88, BStU. Also Wagner, *Produktion des Todes*, 552.

deeper and stronger moral fiber on the part of the missile specialists. For most of those who did give aid, this may very well be the case. However, their help for the prisoners throws the utter inaction on the part of the vast majority of civilians into stark relief. Free Germans who helped the prisoners illustrate the fact that there was indeed a choice to be made in the tunnels of Mittelwerk. Civilian missile specialists were not totally constrained by fear and repression, as so many would like posterity to think. There were alternatives to simply going along with the orders of the SS. Instead, individual engineers and technicians were able to make decisions within their own spheres of individual responsibility that had a profound impact on the conditions of the prisoners working under them.[144] The vast majority of them chose to be indifferent to and neglect the difficulties faced by the prisoner population, while some even elected on their own accord to mistreat the prisoners, despite strict orders from the SS to avoid this at all costs. This willing indifference pervaded the Mittelwerk and helped condone the wider actions that the SS saw fit to carry out against supposed enemies of the state in an ever-radicalizing political environment.

Moreover, the enhanced authority of civilian managers on the shop floor at Mittelwerk may have signified on one hand a slackening of the number of incidents of abuse, but it also meant that individual specialists were more deeply implicated in the structure of abuse in the factory. For example, the civilian factory managers, rather than the SS, had direct influence over prisoner allocation. Specialists on the shop floor requested allocations of prisoners or made changes in the staffing of individual prisoners.[145] These requests were sent to Rudolph's factory labor

[144] Wagner, *Produktion des Todes*, 553.
[145] Hubert Tacke Statement, ZM 1625, Bd. 55, Akte 264, BStU.

operations office and then on to Dora administrators, who acted upon them.[146] When allocation problems arose, these civilians sometimes even had recourse to the SS officials in the camps that assigned labor to the factory. One floor manager wrote directly to the labor office in Klein-Bodungen, a subsidiary camp of Dora that supplied skilled laborers, informing the office that the prisoners assigned to him "are unusable for 'Dora assembly.' I intend to exchange them with the following prisoners [numbers given]. These prisoners are skilled people and work in the transport section. According to the [prisoner] foreman 02708 in 'Dora Assembly,' they are industrious workers. I ask your permission that these three prisoners be trained in Dora Assembly."[147] It is worth recalling that unskilled laborers who were deemed "unusable for Dora assembly" faced the prospect of slaving to death in the construction kommandos dotting the area around the Mittelwerk.

Civilians in Mittelwerk also had a substantial amount of the responsibility for recognizing and reporting incidents of sabotage. There is no question that sabotage occurred in Mittelwerk. The V-2 was a rather delicate weapon, and even simple acts could prove fatal to its performance. Most commonly, prisoners purposely soldered weak welds, tightened nuts too much or too little, or engaged in surreptitious work slowdowns [*Arbeitsbummelei*]. One of the most common stories, possibly apocryphal, has many Russian prisoners randomly urinating in the missiles' engine blocks or instrumentation.[148] Civilians had strict orders to be on the lookout for such

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[146] See, for example, Herbst to Stärfl, 11/17/44, Gericht Rep. 299, Nr. 561, HStaD-ZA Kalkum.
[147] Büttner to SS-Arbeitseinsatz, Klein-Bodungen, 10/16/44, Gericht Rep. 299, Nr. 561, HStaD-ZA, Kalkum.
[148] A resistance group operated briefly in Dora-Mittelbau as well, before it was brutally smashed by the SD and its leaders murdered. For a full accounting of the resistance organization and sabotage activites at Mittelwerk, see Manfred Bornemann, *Aktiver und Passiver Widerstand im KZ Dora und im Mittelwerk: Eine Studie über den Widerstand im KZ Mittelbau-Dora*, (Berlin: Westkreuz Verlag,

activity. In January 1944, Förschner and Kettler ordered factory managers to take concrete measures to detect and deter sabotage.[149] The lack of technical experts among the various security elements in the factory required the vigilance of trained civilians. In addition, it has already been noted above that upon their introduction to the factory, civilians were instructed by the SD to be on the lookout for incidents of espionage and sabotage.[150] It is very likely that the factory labor division [*Betriebsarbeitseinsatz*], under Rudolph and run by his two deputies, both Peenemünders, was one of the civilian bodies that was directly implicated in the effort to eliminate such acts in the factory, an endeavor that only led to the torture and murder of slave laborers in Dora. In its capacity as the section responsible for the supervision of labor operations, numerous sabotage reports filed by lower level civilian managers against prisoners most likely flowed through this office and into the hands of the SS camp administration or SD, which would see to it that prisoners were severely punished, often killed. However, one must be very careful with this claim, simply because sabotage reports have not been located in the archives. Historians are left with the testimony of those who were probably in a position to actually see such reports or claimed to handle them personally. One such person was twenty-eight year old Honnelore Bannasch, Sawatzki's secretary in Mittelwerk (the well-connected Bannasch also worked as von Braun's secretary at Peenemünde). In her testimony at the Dora war crimes trial in 1947, Bannasch related that she often heard individuals verbally report instances of sabotage to Sawatzki, but more importantly, she also

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1994), Peter Hochmuth, *Der illegale Widerstand der Häftlinge des KZ Mittelbau-Dora: Dokumentation* (Schkeuditz: GNN Verlag, 2000). For a first-hand account of the resistance in Dora, see Béon, *Planet Dora*.

149 Kettler and Förschner, Sonderdirektionsanweisung, 1/8/44, NS4/Anh. 3, BAL.

150 See also Karczewski Testimony, Gericht Rep. 299, Nr. 589, HStaD-ZA Kalkum.

stated that she saw a number of paper reports. She recalled that "These reports were handled by the factory management and Mr. Sawatzki heard of them only as they were passed on by the factory management [Rudolph] … If anybody had signed [a sabotage report] at the Werke, it would have been Mr. Rudolph."[151] In addition, Otto Förschner's secretary revealed after the war that production managers, the factory's security detail [*Werkschutz*], and even mid-level managers all submitted sabotage reports to the SS. The reports, sometimes counter-signed by civilian division heads (*Abteilungsleiter*), came to the kommandant's office, who then forwarded them to the SD for disposal of the case.[152] Another civilian engineer confirmed that factory management often gave sabotage reports to factory security, who then delivered them to the Security Service.[153] Despite all of this testimony, these statements must be treated very carefully, given the paucity of documents that can directly attest to them. Even so, within the authority structure in Mittelwerk, they make logical sense. The retreat of the SS from the shop floor meant that civilians were the first line of defense against sabotage, and many understood their importance in this matter. However, the civilians were also forbidden from punishing prisoners directly and therefore had to report these incidents to up the chain of command until they reached suitable authorities. Former Peenemünder Willibald Feier stated that "Our most serious responsibility was to immediately report it [sabotage] to the SS."[154] Most civilians in

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[151] Bannasch Testimony, U.S.A. vs. Kurt Andrae, et al, M-1079, roll 10, NARA.
[152] Soddemann Testimony, Gericht Rep. 299, Nr. 589, HStaD-ZA Kalkum. This practice likely began some time in the middle of 1944.
[153] Molsen Testimony, Gericht Rep. 299, Nr. 589, HStaD-ZA Kalkum.
[154] Feier Testimony, Gericht Rep. 299, Nr. 600, HStaD-ZA Kalkum. Actual punishment for sabotage was most often meted out by the powerful and ruthless SD office that Kammler assigned to the Mittelwerk. SD officials either murdered the prisoners outright in the "Bunker" in Dora or tortured their victims before hanging them. Public hangings in the camp began in the autumn of 1944 after the SD uncovered the communist-led resistance movement. In March 1945, they ordered mass hangings

Mittelwerk were aware of sabotage, understood their duties to avert it, and took action when they discovered it.

Of course, the question still remains that, given the absence of documentation in the archives, did civilian engineers actually file sabotage reports at all? To be sure, there is no reason to think they would not have. Given the intense radicalization of the home front in the closing eighteen months of the war, it would be a mistake to assume that most engineers in Mittelwerk were more concerned about the fate of the prisoners in the tunnels than they were about the fate of their nation, which was taking a savage pounding at the hands of the Allied strategic bombing campaign. Even if many engineers doubted that the missile was literally a bolt from the blue that would save Germany (as the Propaganda Ministry insisted), there can be no doubt that they did agree on the paramount importance of mass producing it and bringing it into operation against Allied targets. Concern for the prisoners would simply not have been given equal measure to defending their country (or for that matter, keeping their jobs and their freedom). As a group, missile specialists had consistently shown that all other factors were secondary to the success of their endeavor and its corresponding military contribution to their country at war. Once at Mittelwerk and on the brink of success, there is no reason to suspect that other considerations would rise like a Phoenix from the ashes to trump their deeply ingrained and intensifying patriotism, nationalism, xenophobia, or even petty self-interest. Industrial sabotage was a fact at Mittelwerk. Failure to pass along sabotage reports, thereby abetting the

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from a crane inside the Mittelwerk tunnels as an intimidation tactic against saboteurs. See Wagner, *Produktion des Todes*, 350-357.

undermining of the V-2 project, not only put the missile program in jeopardy, but also systematically placed their nation in ever increasing danger.

The primary method by which civilians in Mittelwerk guarded against sabotage first became a staple of their existence in Peenemünde and is indeed a part of engineering's basic professional principles: Equipment tests. In addition to serving a quality control function, the testing process was designed to limit and discover potential cases of sabotage at several stages of the assembly process. Civilian groups tested parts and subassemblies a number of times before they were handed off to the Army Acceptance Office [*Heeresabnahme*] for further testing.[155] The Army Acceptance Office was staffed primarily by former Peenemünders, many of whom were members of the *Versuchskommando Nord*, but it also incorporated officials from Rax Werke and Luftschiffbau Zeppelin. The office was originally composed of 120 scientists and engineers, but grew later to nearly 200 men, and its members tested parts, sub-assemblies, and large assemblies once they were complete.[156] At each stage, quality control supervisors had to sign a certificate indicating that the part or assembly passed inspection, then put a stamp on the equipment.[157] Every part, subassembly, and general assembly had a specific portion of the factory where it was put together. If there was a problem with a particular assembly, test engineers knew ahead of time precisely where that assembly was mounted and who was doing the

[155] Heinz Kraus Statement, Gericht Rep. 299, Nr. 188, HStaD-ZA Kalkum. Hubert Tacke Statement, ZM 1625, Bd. 55, Akte 264.
[156] Three prisoners performed secretarial duties. Von Braun to Kettler, 1/20/44, FE 694/a, NASM. Von Braun to Heereswaffenamt Amtsgruppe für Endabnahme, 11/26/43, FE 694/a, NASM. Ernst Dutzmann Testimony, Gericht Rep. 299, Nr. 210, HStaD-ZA Kalkum. Heinz Hilgenöcker Statement, Gericht Rep. 299, Nr. 174, HStaD-ZA Kalkum. Hilgenöcker was himself a former VkN member who worked in the engine testing section at Mittelwerk.
[157] Kraus Statement, Gericht Rep. 299, Nr. 188, HStaD-ZA Kalkum.

work.[158] In this way, quality control could be carefully monitored at every step of the process so that if sabotage was suspected, it could be more easily traced back its source. Finally, completed missiles were tested by the Army at its firing range at Bliszna in Poland.[159] The first line of defense against sabotage was not the SS or SD, but was made up of the civilian missile specialists, most of whom had been transferred from Peenemünde, where they inculcated the institutional culture and learned the skills that would help them combat prisoners' efforts to impair their work.

In the end, civilian engineers, technicians, craftsmen and mechanics worked very closely every day with prisoners who had been enslaved by the SS. Though some behaved abominably toward these slaves, most carried on in a way that made virtually no acknowledgement of the difficulties faced by the prisoners. Many acted with the utmost professionalism, carrying out their work efficiently while restraining themselves from abusing their prisoners and even shielding them from beatings at the hands of others. However, professional behavior in the Nazi context also meant removing prisoners they deemed unfit for work, requesting more slave labor as needed, and passing along reports of sabotage to higher authorities. Most were given to an overriding indifference to the suffering around them. A substantial part of this indifference was activated by the handsome pay and benefits offered to employees in the tunnels as well as the professional opportunities that working under Kohnstein offered. However, other, less tangible factors were also at work. The institutional inertia that was a result of their indoctrination at Peenemünde played a large part in

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[158] Fritz Kunig Testimony, Gericht Rep. 299, Nr. 589, HStaD-ZA Kalkum. Hans Joucks Testimony, ZM 1625, Bd. 55, Akte 264, BStU.
[159] Neufeld, *The Rocket and the Reich*, 220-222.

narrowing the missile specialists' focus to their own priorities and ignoring those of others.

Civilian Motivation in Mittelwerk

Employees who came to Mittelwerk from Peenemünde carried on much the same way as they had in previous years. There is no question that the atmosphere in which they lived and worked every day was far more radicalized, but the intense work that they carried out in the unique institutional culture at Peenemünde prepared the specialists for what they would discover at Mittelwerk and helped overcome any lingering dislocation. Many of the factors that had direct bearing on the work in the tunnels were very similar to those that they had dealt with on Usedom and which had come to define them as elite missile specialists.

Secrecy practices, which formed the bedrock of the culture upon which their identity was founded at Peenemünde, were very similar, if not more intensely practiced, at Mittelwerk. In 1947, Georg Rickhey recalled that upon the move to Dora-Mittelbau, "The top secret rules, which were extremely strict anyway, were made even stricter."[160] When they arrived in "Sperrgebiet Mittelbau," the Peenemünders had their photos taken and assignments noted by the SD. To enter the factory itself, they had to possess a special pass (*Werkausweis*) to get past security. Rather than a unique badge, as was the case at Peenemünde, the factory passes had a picture of the employee on the front of it as well as a special mark indicating where in the factory the individual worked.[161] Only individuals with special permission were

[160] Rickhey Statement, U.S.A vs. Kurt Andrae, et al., M-1079, Roll 4, NARA.
[161] Erich Dänicke Factory Pass, Dänicke Dossier, Gericht Rep. 299, Nr. 186, HStaD-ZA Kalkum.

able to obtain the "Hunting Pass" (*Jagdschein*) that gave them permission to go anywhere in the factory.[162] The Werkschutz checked the passes once at the tunnel entrance and several times again inside tunnel.[163] Strict rules also governed the treatment of documents in the factory. All correspondence was labeled "Secret" or "Top Secret," and all documents were to be locked in safes when not in use. There was to be no mark on any document that indicated the location of the Mittelwerk factory. Incoming and outgoing letters all bore a generic address in Halle.

The effect of these measures was quite the same as at Peenemünde. Entrance became a symbol of privilege and hierarchy, while the ability to enter the factory also meant that the full force of state security squarely confronted individual employees inside and outside the tunnels. While at work, this security also contributed to a strong sense of isolation from the larger society in which employees existed outside of the tunnels. As Wernher Brähne recalled, "The V-Weapon factory was like a state within a state, and it was totally shut off from the outside world."[164] Again, employees found themselves adhering automatically to the rules governing secrecy. Many refused to walk to places in the factory that their pass did not give them entrance to, and others complained vociferously when secrecy regulations were broken.[165] Civilian engineers assiduously made sure that document and correspondence secrecy was maintained at Mittelwerk. No marks of origin, except

[162] Werner Brähne Statement, Gericht Rep. 299, Nr. 158, HStaD-ZA Kalkum. These passes were easily recognizable by security personnel, as they had three large brown buttons affixed to their face.
[163] Heinz Krause Statement, Gericht Rep. 299, Nr. 588, HStaD-ZA Kalkum.
[164] Brähne Statement, Gericht Rep. 299, Nr. 158, HStaD-ZA Kalkum.
[165] Ewald Wenzel Testimony, Ewald Wenzel Dossier, ZM 1625, Bd. 51, Akte 259, BStU. Wenzel worked as a plumber and truck driver in Peenemünde from 1941 until 1944, when he relocated to Mittelwerk.

those in code, appeared on letters and delivery crates.[166] They commonly reported to security officials the concerns that they had about transgressions against secrecy considerations. Most often, the transgressions came in the form of correspondence from outside companies that used the Mittelwerk address directly, rather than its generic address in Halle, or other such lapses that would expose the location of the factory. One engineer who a received a letter addressed as "Elektromechanische Werk Ilfeld/Harz" (Elektromechansiche Werk was the corporate name given the Peenemünde in 1944. This is addressed in the next chapter) wrote to the factory security that "Since such a designation totally contradicts the rules for secret correspondence, we request that the necessary measures be employed to deal with this problem."[167] Again, as in Peenemünde, civilian employees remained strict custodians of official secrecy.

Observation activities also increased in scope and intensity, sharpening an already present sense of coercion in the atmosphere around Mittelwerk. SS, SD, and Gestapo officials regularly intercepted mail and screened it for content. For example, the *Werkschutz* intercepted two post cards written a civilian mechanic named Johannes Mrosek on which Mrosek gave his family directions indicating how he could be reached directly in Ilfeld, site of the factory headquarters. Security officials

[166] Unknown Prisoner of War Testimony, File "V-2 (A-4) Missile (Germany, WWII), Intelligence Interrogations," NASM.

[167] Heinemann to Abwehrbeauftragten, 3/9/45; NS4 Anh, Nr. 4, BAL. Officials commonly sent letters to both Bischoff and Förschner (who left Dora in January 1945 and was replaced by former Auschwitz kommandant Richard Baer) that they had collected from Mittelwerk employees complaining about insecure correspondence practices. Bischoff had been attempting to straighten out this issue since early 1944. Bischoff Rundschreiben, 3/7/44, RH8/v.1265, BA/MA.

gave him a stern warning never to do this again.[168] The SD also searched the accommodations of factory employees. In some cases, it discovered major offenses, such as in the case of engineer Fritz Schweinberger, formerly of the Rax-Werke, who was caught with a number of secret and top secret documents in his apartment.[169] In another case, an employee left secret documents out on a work station instead of locking them up in the safe when he left there. He was arrested by the Gestapo and spent two weeks in the Nordhausen prison.[170] Moreover, from its office in Niedersachswerfen, the SD operated a dense network of informants in the factory.[171] Both civilian and prisoner informants were ubiquitous, leading to increased tension, especially between civilians and prisoners. Willy Steimel, himself likely a prisoner informant, stated in 1947 that "A higher grade of mistrust of the prisoners [than there was at Peenemünde] existed and went like a red thread through all of the happenings of the plant from the beginning to the end of the camp. The reasons for must be found in the appearance of the SD and the Gestapo."[172]

The methods and practices of concealment, then, received even greater emphasis at Mittelwerk. "If secrecy was emphasized with all means in Peenemünde, then it was handled even more sharply in the tunnels," recalled one former employee of both facilities. "Secrecy went on ad absurdum."[173] Nevertheless, former Peenemünders had already been equipped to deal with such a situation and adjusted

[168] Schwohn to Bischoff, date unclear, NS-4 Anh, Nr. 4, BAL. Schwohn sometimes asked Bischoff to discipline the offender, which was often a far worse fate. Schwohn to Bischoff, 3/22/45, NS-4, Anh., Nr. 4 BAL.
[169] Bischoff to Kammler, Series 2, Folder 2, RG 10.228.0002, USHMM. Schweinberger's fate is unknown.
[170] Rickhey Statement, Gericht Rep. 299, Nr. 411, HStaD-ZA Kalkum.
[171] Häser Statement, Gericht Rep. 299, Nr. 253, HStaD-ZA Kalkum.
[172] Steimel Testimony, U.S.A. vs. Kurt Andrae, et al., M-1079, Roll 4, NARA.
[173] Bericht eines nicht genannten "Peenemünder," veröffentlicht in der Wochenzeitung "Christ un Welt" im Juni 1950, Gericht Rep. 299, Bd. 158, HStaD-ZA Kalkum.

quickly. They almost automatically adhered to the regulations and often proved willing to enforce the rules themselves by referring infringements to the authorities, just as they had done at Peenemünde. Within this framework, other factors influenced their behavior so that they continued their unequivocal support for their work. One was simple institutional inertia. Many Mittelwerk employees had cut their teeth at Peenemünde and were thoroughly imbued with its central goal of developing and mass producing an effective missile. Moving from Usedom to the Harz Mountains did not alter this feeling. They had embraced the institutional culture of the missile program, and the steadily intensifying atmosphere in which its daily activities were carried out were all taken in stride. Another factor was the fact that most employees were compensated handsomely for their work in the tunnel. As their salaries grew, so too did their professional and social status. Their families, at least in an economic sense, were well-cared for and would remain so as long as they did their jobs quickly and well.

More problematically, Nazi ideology, which arguably experienced the full flowering of its political and cultural ramifications as well as a deepening popular radicalization in the last eighteen months of the war, began to play an ever-increasing role in the world populated by the missile specialists.[174] Years of intense propagandizing against Germany's enemies had resulted in a population that was at least deeply xenophobic, if not radically nationalistic. The German populace, which was perfectly aware of the atrocities committed by the Nazis in their name, feared the

[174] See Norbert Frei, "People's Community and War: Hitler's Popular Support," 59-78, and Hans Mommsen, "The Indian Summer and the Collapse of the Third Reich: The Last Act," 109-127, both in Mommsen, ed., *The Third Reich Between Vision and Reality: New Perspectives on German History, 1918-1945* (New York: Berg, 2001).

concentration camp prisoners in their midst and sought ever more fervently to impose some kind of order on their slowly disintegrating society. According to Jens Wagner, the quest for public security drew them closer and closer to the only organ that could successfully impose it – the Nazi police apparatus.[175] In the missile program itself, indoctrination, both into the regime's ideology and into the program's central ideals, only increased the willingness to do violence. Once the moral proscription against violence had been broken, abuse of the prisoners in one form or another became a more conceivable act and easier to carry out again and again. Once the act was done, there could be no going back.

The dense veil of secrecy in the underground tunnels of Dora-Mittelbau only worsened this situation. The utter isolation produced by the tunnels increased the chances that mistreatment of the prisoner labor force would occur. Secrecy had a powerful binding effect, but it also exerted a corrupting influence. Sissela Bok has argued that one of the most insidious effects of deep secrecy is that it debilitates character and judgment. "[Secrecy] can also lower resistance to the irrational and the pathological," she writes. "It then poses great difficulties for individuals whose controls go awry." Secrecy carries some risk of corruption for everyone, but when it is combined with extraordinary powers over others, with no accountability to those whom it affects, the temptation for abuse is great.[176] When power was joined to secrecy in the tunnels of Mittelwerk, the danger of immorality and abuse increased

[175] Wagner, *Produktion des Todes*, 554-559. Robert Gellately also shows that support for the regime remained strong, even late in the war, because of the balance that the police apparatus struck between order and oppression. See *Backing Hitler: Consent and Coercion in Nazi Germany* (New York: Oxford University Press, 2001).
[176] Sissela Bok, *Secrecy: On the Ethics of Concealment and Revelation* (New York: Random House, 1983), 25, 110.

exponentially. Pressure, power, professionalism, fear, and secrecy all coalesced in the tunnels under Kohnstein, with disastrous results for prisoner labor force. Ironically, as Wagner points out, after the war, secrecy enabled individuals in the missile program, especially those who had worked at Peenemünde, to argue that they had no idea of the criminal activities going on at Dora-Mittelbau.[177] Secrecy served as the ultimate enabler, erecting a framework in which the crimes could be committed, and subsequently creating a plausible basis for deniability after the acts had been uncovered. The actual activities of those left behind at Peenemünde proves otherwise.

[177] Wagner, *Produktion des Todes*, 562.

Chapter Six

Götterdämmerung: The End of the V-2 Program

The last eighteen months of the war continued to present huge challenges to the missile specialists at Peenemünde. In addition to ironing out the technical bugs that remained in the V-2 (even as mass production commenced at Mittelwerk), they worked feverishly to improve the missile's performance and capabilities, attempted to develop anti-aircraft missile systems, and even engaged in several farcical attempts to expand the V-2's operational versatility. As the war situation became progressively worse for Nazi Germany, the Peenemünders responded with prodigious activity that, while unsuccessful, exposed their level of commitment to both their work and the regime, while making important contributions to the conceptualization of future weapon systems, including the surface to air missile and the submarine launched ballistic missile. Much of this furious work required their continued cooperation with Kammler and the SS, and they proved capable of striking a mutually accommodating relationship with Himmler's men. This was true even at the upper levels of the program's administration, where there were a number of personal clashes, but also a conscious effort to overcome any acrimony between individuals for the good of the program and, therefore, National Socialist Germany. The last eighteen months of Nazi Germany's V-2 program are best characterized not by dissension and collapse, but rather by technical creativity and administrative cooperation.

After the war, the story told by Peenemünders and their supporters about this period was dominated by themes of resistance, dissent, and distrust of Hitler and his regime. They painted the SS as an unstoppable marauder, plundering and subjugating all projects that were not yet in their purview. The Peenemünders feared Himmler's and Kammler's machinations, and had no love for the regime. All of the work that they did in this period, according to them, was done purely in the name of spaceflight.[1] Such sentiments echoed and reflected the post-war mythmaking conducted by Albert Speer, who claimed that the SS conspired to infiltrate Armaments Ministry projects and that he actually never embraced a cooperative relationship with the blackshirts.[2] Assertions such as these ignore the reality of the tasks carried out by the Peenemünders and their associates every day. Worse, they insult the memories of the victims of this work.

Clearly, the claims of the Peenemünders fail unequivocally to stand up to the historical record. Michael Neufeld's examination of this period in the program makes clear that there were indeed serious conflicts at the highest levels of the Reich over administering the program. At the same time, however, he notes that at Peenemünde, developers continued to work on various projects as he further investigates technical issues such as design and construction. In his approach, which focuses explicitly on the technological work that went forward, it is clear that the Peenemünders continued to do their duty. However, it does not help to explain the level of the Peenemünders' commitment to completing their duty. This chapter expands the story of Peenemünde by examining the rewards and the penalties, the prestige and the punishment, that came along with working in the last few months of the program, and how these influenced the intensity of the work. In addition, Neufeld necessarily focuses on the

[1] See Wernher von Braun, "Reminiscences of German Rocketry," *Journal of the British Interplanetary Society* 15 (May-June 1956), 125-145; Walter Dornberger, *V-2* (New York: Viking Press, 1955); Dieter K. Huzel, *Peenemünde to Canaveral* (Englewood Cliffs, NJ: Prentice-Hall, 1962).
[2] See esp. Albert Speer, *Infiltration*, Transl. By Joachim Neugroschel (New York: Macmillan, 1981).

specialists' accomplishments as purely technological achievements, as ends themselves. This chapter examines the Peenemünders' accomplishments not as technological statements, but as political and military ones. Such an approach changes the conception of missiles from ends themselves to means to an end, precisely what a weapon of war is. The Peenemünders did not work as hard as they did just to see if they could build a rocket. The intense effort put forth *after* the fundamental work was completed and missiles were successfully launched was done to help win the war for Nazi Germany. There are few statements of political adherence and personal belief as strong as this one.

Karl-Heinz Ludwig, in his seminal work *Technik und Ingenieure im Dritten Reich*, coined the term self-mobilization (*Selbstmobilisierung*) to describe the activities of technical specialists in the years of Hitler's regime.[3] In the Nazi context, self-mobilization is best described as the voluntary involvement of individuals who went far beyond the call of duty to advance the objectives of the regime. This term is particularly well-suited to understanding the commitment of the Peenemünders during the entire war, but it is particularly so between 1943 and 1945. At Peenemünde, missile specialists showed an extraordinary willingness to invest all of their time and creative energies, to the point of transcending liberal, "Enlightened" standards of behavior, in order to fulfill their wartime work. This last spasm of activity drove them to design weapons that were well beyond their own technological capabilities while also resorting to technologies that were of limited value and had questionable chances for success. The Peenemünders did not, as they and their

[3] Karl-Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Düsseldorf: Droste Verlag, 1974). Ludwig's book has fundamentally shaped the study of the history of science and technology in Nazi Germany. It remains an indispensable work of scholarship in this field.

enthusiastic supporters so often assert, merely satisfy the demands of the State and SS in the last year and a half of the war. Nor did they carry out their projects because they were forced to do so, yet another common assertion. Rather, their feverish activities during this period point to a strong willingness to defend the Third Reich from its steadily gaining enemies. In their own way, they contributed to the atmosphere of increasing desperation and radicalization that characterized the last year of the Nazi regime.

This chapter shifts the focus away from Mittelwerk and back to Peenemünde. The underground factory is never far from events, however, as missile specialists at Peenemünde struggled and finally were able to closely coordinate their activities with their colleagues in production. The final stages of the V-2 program at Peenemünde and the efforts that the missile experts made to improve their weapon and to usher in what Nazi propagandists called “Final Victory” (*Endsieg*) receive the most emphasis here. Though some important individuals began to feel disillusioned by the regime, most Peenemünders expended all of their effort and more to see the work through. Peenemünde engineers were activist developers, eager to keep making improvements in the performance of their weapon. If they were only interested in seeing a rocket fly successfully, they would not have gone to the strenuous efforts that they did after V-2 went into high-volume, steady output mass production. Of course, this does not make them responsible for the crimes of the Nazi regime, but it does tend to run against their own master narrative that they were only interested in building space ships. It also demonstrates that they were willing defenders of Nazi Germany and freely collaborated with the regime’s worst elements in order to do so. Peenemünde specialists were fully imbued with the Nazi rhetoric of victimization and the need for national self-defense, and they demonstrated this by forth all of their effort in a final attempt to fend off their nation's enemies. If consenting to the use of slave labor to mass produce missiles while constantly seeking new technical advances in their work were the ways that they could do this, then they were only too happy to comply.

Crisis and Reorganization: From Conflict to Cooperation

The years 1944 and 1945 proved to be tumultuous ones for the group of Peenemünders who remained on Usedom, and they struggled on many fronts to see their operation through to completion. Administrators had to cope with the departure of thousands of experts to Mittelwerk and elsewhere. Those who stayed lived in fear of more air raids like the one of August 17/18, 1943. In addition, technical problems with the missile were not ironed out in any acceptable way until late 1944. Finally, the program itself was buffeted by external conflicts between the Army, Armaments Ministry, and the SS over who would manage it, resulting in fundamental changes in the facility's administration and leadership.

Without question, a great deal of strain had been growing between the various organizations involved in the V-2 program in the first half of 1944. As the Army, Armaments Ministry, and SS all jostled to assume control of various parts of the premier weapons program in the Reich, the areas of authority for each organization became increasingly hazy. The first nine months of 1944 were marked by no small amount of personal and administrative friction at the highest levels of the program. However, this friction was attenuated by the general cooperation at the middle and lower levels of the program and made little impact on the activities occurring on the shop floor. The compromise solution struck at the highest levels – more through necessity than by desire – reflected the cooperative realities of the work going on at the level of mid-level and shop floor management. Despite the steadily worsening wartime pressure, by the beginning of autumn 1944, the three organizations had come to an uneasy truce just in time for the onset of mass operations against Allied targets in the West.

Heinrich Himmler's long-time desire to see the V-2 program put under his leadership was the catalyst to the conflicts of early 1944 and led to several dramatic battles over personnel. Perhaps the most worrisome of these, from the Peenemünders' perspective, was the arrest of Wernher von Braun, his brother Magnus (a chemist who arrived in Peenemünde in 1943), Klaus Riedel (the chief of ground equipment development for the V-2), and Helmut Gröttrup (Fritz Steinhoff's deputy and liaison to Dornberger). The documentary record of this incident is incomplete and unclear, but Michael Neufeld has made sense of what probably happened to the young development chief and his colleagues. In February 1944, von Braun, a major in the SS, received an order to report to Himmler's headquarters of Hochwald, near Grossgarten (Pozezdrze) in East Prussia. During their meeting, Himmler offered von Braun all of the resources at his disposal to speed up progress on the V-2. Sensing that Himmler, whose fascination with technology bordered on manic, sought to subsume the program under the aegis of his organization, von Braun rebuffed the SS Chief. Von Braun was supremely loyal to Dornberger and likely felt little compunction to abandon Army control for the SS. His rejection of Himmler's offer forced the Reichsführer's hand. Some time in late March, the Gestapo arrested both von Braun brothers, Riedel, and Gröttrup for allegedly claiming that their main task was to build a spaceship, not a weapon to be used in the war. This, in no uncertain terms, was construed as an act of high treason. All four men sat in jail in Stettin for some two weeks while Dornberger unsuccessfully attempted to work through Field Marshall Wilhelm Keitel and Gestapo Chief Heinrich Müller to secure their release. Finally, he was able have the engineers freed, likely because of Albert Speer's intervention on their behalf.[4]

After the war, von Braun's arrest proved to be a major boon for those Peenemünders who were in the United States. They held it up as direct evidence that they fundamentally disagreed with the regime's motives and attempted to resist intrusions SS at all cost. Of course, this conveniently ignores the documentary record, which makes it clear that the program's administrators *sought out* cooperation with the SS. Their regular and meticulous deception in this regard was done to conceal any evidence of their own identification with the objectives of Himmler's organization and with the regime itself. It is true that Von Braun had a long history of fascination with civilian space travel and that he probably engaged in surreptitious idle chatter with his colleagues at Peenemünde about the idea. However, there is no evidence that he failed to put forth his best effort to build a missile that could be used in wartime. Throughout his time at Peenemünde, he made it clear to his administrators that he expected their utmost effort to make their instrument work reliably (including improving its accuracy), and he demonstrated that he would accept

[4] For a complete account, see Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge: Harvard University Press, 1995), 213-220.

nothing less. Moreover, he showed no evidence of being troubled by the introduction of slave labor to the program in the early summer of 1943, and was long an advocate of the use of forced labor to help development and production achieve its goals.[5] The pace and intensity of his work did not slacken when these practices became common. Even so, there can also be little doubt that the arrest caused a great deal of worry for von Braun and his colleagues at Peenemünde. According to Dornberger, they discovered later that they were arrested because of reports filed by Gestapo informants in the nearby town of Zinnowitz.[6] The engineers' brief incarceration made it even more readily apparent that the state had an eye fixed on their activities and was not afraid to thrust its power into their midst, even if it meant arresting the program's most important individual on questionable charges. As with the Zanssen affair, it became plain to the Peenemünders that the Gestapo could strike any time and anywhere it chose, and that none of them were safe from its reach. The sense of observation and coercion around their work on Usedom could only have increased dramatically. Nearly all of von Braun's activities for the rest of the war, and indeed those of all of the Peenemünders, must be viewed in this light.

The administrative threat from the SS did not abate after von Braun and the others were freed in early April. Himmler, confident that his ideological shock troops were the best equipped to deal with the growing threat to the Reich, continued to expand his administrative empire and had his sites set squarely on the missile program. The presence of the Army, Armaments Ministry, and the SS, with their multiple, overlapping responsibilities for administering different sectors of the

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[5] See chapter four.
[6] Walter Dornberger, *V-2* (New York: Viking Press, 1955), 207.

program created fertile grounds for confusion and conflict at the uppermost levels of the program. In May, Speer attempted to clear up this confusion in a circular to the titular chief technical administrators of the project. He stated unambiguously that technical research, development, and testing was the bailiwick of Army Ordnance, as it had been since the inception of the program. He charged the A-4 Special Committee, which was responsible to the Armaments Ministry, with managing production contracts and guaranteeing production. The Mittelwerk GmbH, also nominally an Armaments Ministry organization, managed the actual production. Speer also attempted to clearly delineate the duties of the SS, noting that they were responsible for the expansion of the industrial facilities under Kohnstein and for the ongoing construction projects in Sperrgebiet Mittelbau, as well as serving as the chief labor provider for all of the production effort.[7] This seemed to be an arrangement that everyone involved could live with. Dornberger would have been especially pleased. At the end of the same month, the general attended a meeting in Mittelwerk along with nearly all of the key program members, including von Braun, Sawatzki, Rickhey. In the meeting, the administrators held a productive discussion of development, deployment of slave labor, and missile production numbers. Dornberger, happy with the results of their discussions, closed the meeting by stating that it was a model of cooperation between the different branches involved in the program, and he encouraged them to continue their work in this light. "Not one against the other," he urged, "but everyone together!"[8]

[7] Speer to Leeb, Kammler, Degenkolb, Rickhey, and Mittelwerk Board of Directors, 5/12/44, R121 Bd. 405, Bundesarchiv Lichterfelde (BAL).
[8] Niederschrift über die Besprechung am 6.5.44 im Büro Gernaldirektor Rickhey, 5/6/44, FE 694/b, National Air and Space Museum (NASM).

Speer's effort and Dornberger's hopeful maxim, however, did not satisfy the rapacious Himmler, whose aggressive empire building knew few limitations. In this regard, Hans Kammler was one of Himmler's most important paladins. In late 1943, with Himmler's blessing, Kammler set about seizing military operational control of the program. This meant a head-on confrontation with Dornberger. When the program began its shift to mass production the previous autumn, it appeared that operations were imminent, and Dornberger received tactical command of the V-2 in September-October 1943. However, this arrangement meant that Dornberger had to give up his formal control at Peenemünde.[9] In December 1943, Dornberger was forced from this position by the commander of the interservice missile corps that was ordered into creation by Hitler and dedicated to firing V-1 cruise missiles as well as the V-2.[10] In May 1944, he attempted to have himself placed in command of the program again, but failed.[11] Dornberger's memoir blames Kammler for quietly and methodically working behind the scenes to expand his own influence and restrict the long-time administrator of the missile program.[12] After the July 20, 1944 attempt on Hitler's life, in which several high-ranking Army officials had taken part, Himmler and Kammler again made their move. After missile enthusiast General Erich Fromm, Commander-in-Chief of the Reserve Army, was arrested for alleged cowardice, Dornberger lost one of his most influential patrons. Himmler, who took over command of the Reserve Army from Fromm, placed Kammler in command of the V-

[9] Entstehungsgeschichte, 9/28/43, RH8/v.1210, Bundesarchiv/Militärarchiv (BA/MA).
[10] Neufeld, *The Rocket and the Reich*, 204.
[11] Dornberger to Fromm, 5/31/44, RH8/v.3730, BA/MA.
[12] Dornberger, *V-2*, 210-211.

2 program and Dornberger was virtually left out in the cold, serving in only a supervisory capacity for technical improvements.[13]

Even though the leading Peenemünders were fairly ambivalent toward the administrative challenge posed by Himmler's organization, civilian managers and the SS were eager collaborators on the shop floor.[14] Upper management welcomed the labor and resource support offered by the SS, but they resented the organization's intrusion into a project that they rightfully felt a proprietary interest in. The Army's influence over the program had been on the wane since late 1943, but the Armaments Ministry had proven to be a helpful, if somewhat overbearing, ally. However, the July 20 plot thrust the SS squarely into the forefront of the missile program. In order to stave off the full control of the SS, the Armaments Ministry officially reorganized Peenemünde development into a state-owned private corporation and christened it "Elektromechanishewerk, GmbH" [Electromechanical Industries – EMW]. The idea had been circulating since the early summer of 1944, but the July plot made it a necessity if Peenemünde was to remain nominally independent of the SS. The base was to be dedicated specifically to development and testing. It would serve as a research and training center for various state and industry projects relating to rocketry, and its primary task was to continue the development of reliable, mass-produced missiles. The day-to-day business activities, such as purchasing and financing, would be managed by the state.[15]

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[13] Neufeld, *The Rocket and the Reich*, 239-240. Hitler was furious with Fromm's peremptory action in executing the July conspirators. Fromm had also failed to successfully distance himself from the conspirators in the coup's aftermath. He was arrested shortly afterwards and executed in March 1945. See Ian Kershaw, *Hitler, 1936-1945: Hubris* (New York: W.W. Norton, 2001), 680-682, 689.
[14] See chapter five.
[15] Die Aufgaben der Elektromechanischen Werke G.m.b.H, 6/28/44, RH8/v.1960, BA/MA.

This transition took place on August 1 and proceeded rather smoothly, even if it set up a clumsy managerial situation.[16] Essentially, the company was government-owned and staffed. The EMW operated, but did not own, the equipment at Peenemünde. Rather, it was a possession of the Army's, which administered the base's facilities. The Army also continued its tasks in transportation, maintenance, and security. At the middle and lower levels, the technical organization went largely unchanged, but at the top, development and testing were no longer exclusively under von Braun's direct control.[17] The Chief Executive of EMW, technically von Braun's boss, was Paul Storch, a Siemen's engineer who had previously served as the head of the subcommittee for electrical equipment on the A-4 Special Committee. Storch was an advocate of slave labor to help solve the problems in the V-2 production program and had few major problems cooperating with either the Army or SS bureaucracy.[18] By the end of August, he helped oversee just over 4000 German employees, both civilian and Army, who staffed the base on Usedom.[19] Though this arrangement was somewhat ungainly, the actual practice of work at Peenemünde changed very little.[20]

The transition to state-owned private industry succeeded in limiting SS influence at Peenemünde, but throughout the summer and early autumn of 1944, Dornberger still had to fight Kammler for his professional life. The SS general had been attempting to fully isolate Dornberger by seizing direct control of the newly formed operational missile batteries and cutting him out of any administrative

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[16] Eberhard Rees OHI, NASM.
[17] Dieter Huzel, *Peenemünde to Canaveral* (Englewood Cliffs, NJ: Prentice-Hall, 1962), 106.
[18] In May 1944, Storch had solved the bottleneck in the production of electrical instruments by bringing slave labor to bear. He also introduced the idea of enslaving the French workers engaged in rudder production by transferring them to Mittelwerk. Niederschrift über die Besprechung am 6.5.44 im Büro Generaldirektor Rickhey, 5/6/44, FE 694/b, NASM.
[19] Storch to Kammler, 8/21/44, FE 692/f, NASM.
[20] Huzel, *Peenemünde to Canaveral*, 106.

decisions. In the end, however, Kammler overreached, receiving an upbraiding from his superiors for his shabby treatment of Dornberger. The SS General had to strike a compromise with Dornberger. The Army general's long service and expertise made him too important of a figure to be isolated from the program, and he was placed in charge of training and equipping the new missile troops.[21] The two men eventually hit upon a compromise that was focused on mutual cooperation rather than interminable bureaucratic conflict. It reflected the realities of the development and production situation already in place at the middle and lower levels of the development and production programs.

The personal acrimony that no doubt existed between Kammler and Dornberger as a result of Kammler's aggressive moves was a reflection of the general friction between their two organizations. However, their personal distaste for each other faded in the face of larger technical and wartime considerations and the two settled on a compromise solution that functioned relatively well. Kammler understood that he could not manage the missile program without the willing participation and expertise of its members. Dornberger possessed that expertise as well as years of experience. Despite their mutual disdain, they could at least see eye-to-eye on the fact that speeding the missile into operations was of paramount importance, and their technical backgrounds ensured that they could come to a common understanding on technological and bureaucratic issues. In November, Dornberger drew up a set of proposals that clearly articulated and coordinated the spheres of activity for the different personnel in the various bureaucracies. His goal

[21] For a full description of Kammler's efforts to seize control of the program from Dornberger, see Neufeld, *The Rocket and the Reich*, 241-246.

was, as he put it, “the smooth cooperation of all offices in the military and civilian sectors in order to achieve the best possible result without considerations of questions about prestige or competency.” Dornberger made it clear that he accepted – however grudgingly – Kammler’s leadership “in making decisions about the fundamental questions regarding the A-4.” He immediately followed this by proposing himself as Kammler’s deputy “in all A-4 matters.” Dornberger’s tasks, as he outlined them, would be to coordinate the work of the civilian and military offices in the program. If they could not come to an agreement under his supervision, then he consented to seeking out Kammler’s authority for a final decision. However, Dornberger had clearly set himself up as the day-to-day arbiter for the program. He would work with Army Ordnance, the EMW, and Mittelwerk to ensure their smooth functioning and coordination, as well as guide the training of the missile battalions. All technical questions were to be referred to him, and he would delegate them accordingly.[22]

If not on paper, Kammler had already agreed in practice to Dornberger’s ideas. He deferred many of the technical decisions to Dornberger and tended to follow the General’s suggestions regarding manpower questions. For example, when Dornberger opined to Kammler at the end of August that the Raderach test facility, near Luftschiffbau Zeppelin in Friederichshafen, had a staff of civilian specialists that was far larger than necessary, Kammler immediately agreed. He ordered, “in agreement with Dr. Dornberger,” that the staff should be trimmed and many sent to work at Peenemünde.[23] This type of arrangement between the two generals, with Dornberger the key administrator and Kammler the individual who had final say in all

[22] Dornberger, Abgrenzung der Arbeitsgebiete und Verantwortlichkeiten auf dem Gebiet des A4-Programmes, 11/11/44, RH8/v.1265, BA/MA.
[23] Von Braun to Justrow, 8/29/44, RH8/v.1960.

decisions, was, if not totally satisfactory to either one, at least serviceable. In December, it was officially agreed upon, formalized, and confirmed by the SS.[24]

In the face of organizational conflict and personal abhorrence, the two men managed to form a consensus. The basis for agreement between Dornberger and Kammler was twofold. Both men were equally committed to the goals of the missile project and understood its importance to their nation. Moreover, Dornberger and Kammler, both Ph.D. engineers, proved able to come to common ground because of their mutual technical expertise. They agreed closely on technical, managerial, and manpower issues that needed imminent solutions, while also understanding that each had something the other needed to resolve these important issues. Technical necessity drove them into each other's arms and provided a foundation upon which they could move forward. These considerations were mirrored at various levels of the program's administrative hierarchy as Peenemünde specialists frantically sought to fulfill their institution's goals.

Von Braun, for example, had struck up a suitable working relationship with production managers and slave labor officials well before Dornberger and Kammler found themselves at loggerheads in 1944 over who would be the final arbiter over the program's decisions. The Technical Director began involving himself in decisions about handling slave labor just after the British bombing raid in 1943 when he discussed evacuating production to sites in the Saar region.[25] As 1943 wore on, he became more and more intimately involved in the planning and deployment of

[24] Dornberger, Aktenvermerk über die Besprechung am 24. Oktober 1944 bei Generallt. d. Waffen-SS Kammler in Berlin, 10/25/44;. Dornberger, Aktenvermerk über die Besprechung am 3.11.44 bei Generallt. d. Waffen-SS Kammler in Berlin, 11/4/44, RH8/v.1960, BA/MA. Jüttner to Kammler, 12/31/44, RH8/v.1265, BA/MA.
[25] Neufeld, *The Rocket and the Reich*, 202.

concentration camp labor. In November, when the shortage of skilled German labor was increasingly threatening the Peenemünde work force, von Braun sent a letter to Degenkolb in which he suggested using slave laborers in the place of some German civilians from Peenemünde who were scheduled to depart to the test sites at Lehesten and Redl-Zipf. He thought that a ratio of two prisoners for every one German would be appropriate to operate the facilities.[26] Von Braun did not concern himself with the moral questions around the use of slave labor, only with the issue of how to advance the goals of the missile program. This practice helped bring him into agreement with more ideologically motivated managers of the project who also were deeply concerned, for different reasons, with the missile's success. Of course, it is asking too much of him to stand up in protest of National Socialist labor policies, but his behavior throughout 1943-'44 reveals a relentless pattern of narrow-minded self-interest and technocratic thinking, which in practice also lent the use of concentration camp labor a certain legitimacy by embracing it as a viable solution to manpower problems. Another option open to von Braun would have been to do nothing at all, even to delay or equivocate, but he cared too deeply about the success of his work to jeopardize its progress or chances for success by making a moral stand against slave labor.

Von Braun involved himself in several important decisions about slave labor, even at Mittelwerk, later in 1943 and in 1944. He visited the factory itself in August and October 1943, as well as in January and May 1944.[27] The January meeting offers an important example of how the need for further technological development outlined

[26] Von Braun to Degenkolb, 11/12/43, FE 732, NASM.
[27] Michael Neufeld, "Wernher von Braun, the SS, and Concentration Camp Labor: Questions of Moral, Political, and Criminal Responsibility," *German Studies Review* 25/1 (2002), 65.

by Peenemünders could lead to the increased demand for concentration camp prisoners to work in the factory tunnel. One of the technical details that became clear earlier in the year was that the jet vane assembly, which helped direct the thrust to steer the missile, needed to be strengthened. After Peenemünde engineers developed a method to manufacture improved versions, von Braun presented this information to Rudolph at a conference in Mittelwerk. Accordingly, Rudolph set aside more work space in the factory to install the necessary machinery. After a delay caused by unknown reasons, Rudolph wrote to von Braun to inform him that the work would begin in January 1944. He reported that "the necessary prisoners [to work in the transport kommando] and guards have been ordered from KL Dora."[28] Rudolph anticipated that the arduous transport and set-up tasks would take a total of three months to complete.

In May – after his arrest – von Braun attended a meeting at the factory (among others present were Dornberger and Rudolph) in which Sawatzki informed them that he would request an additional 1800 prisoners for tunnel work to replace those lost during the winter of 1943-'44.[29] Von Braun behaved guardedly at this meeting and said little, but his narrow-minded drive returned to full form by August. That month, he wrote to Sawatzki about a French physics professor, Charles Sadron, who was a prisoner in Buchenwald and whom von Braun hoped to bring to Mittelwerk. Von Braun had actually traveled to the camp himself in order to evaluate the skilled labor there, were he met Sadron. While at Buchenwald, von Braun informed Sawatzki that he had arranged for the transport of prisoner labor to Mittelwerk. He also requested

[28] Rudolph to von Braun, 1/21/44, FE 694/a, NASM.
[29] Niederschrift über die Besprechung am 6.5.44 im Büro Generaldirektor Rickhey, FE 694/b, NASM. Also Neufeld, "Wernher von Braun, the SS, and Concentration Camp Labor," 66.

that Sadron be given special privileges in Mittelwerk, such as permission to wear civilian clothing to encourage his willingness to perform the necessary work, as von Braun put it.[30] Von Braun, who spoke perfect French, may indeed have felt a certain identification with the physics expert and had every good intention in attempting to secure some level of humanity for Sadron. However, it was also clear that Sadron possessed certain skills that would help push the program forward, and von Braun recognized this. Von Braun's request to Sawatzki was not based on purely humanitarian considerations. Utilitarian motives also played an important part.[31] In any case, von Braun's actions show that he had come to a willing acceptance of slave labor and an agreement on the importance of the SS as a labor supplier.

In coming to a grudging acceptance of this role and their own places in relationship to the SS, Dornberger and von Braun reflected the more readily achieved relationship between lower-ranking Peenemünders and Himmler's representatives. Dornberger's position was impacted much more forcefully and directly by the growing strength of the SS, but he eventually settled into an uneasy, but sensible relationship with Kammler. Von Braun's work was affected much less by the SS, and his narrow, self-interested technical vision enabled him to readily adapt to the challenges and benefits of the SS' strong presence in the missile program. Both men, as well as all of the Peenemünders beneath them, continued to work exceptionally hard on behalf of the Nazi regime.

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[30] Von Braun to Sawatzki, 8/15/44, FE 694/a, NASM. André Sellier, *A History of the Dora Camp: The Story of the Nazi slave Labor Camp that Secretly Manufactured V-2 Rockets* (Chicago: Ivan R. Dee, 2003), 105-106.

[31] Neufeld has also noted that if von Braun had arranged transports of slave labor, this "would at least in theory put him in violation of the Nuremberg standard applied to Albert Speer." Neufeld, "Wernher von Braun, the SS, and Concentration Camp Labor," 69.

Work at Peenemünde, 1944-1945

Despite the challenges and conflicts posed by the SS' assertion of power into the V-2 program, missile specialists remained committed to the success of their work and defense of their nation. Their time at Peenemünde, with all of its rewarding communal experiences, outstanding facilities, and fulfilling technical work, activated a deep connection to the missile base's central mission of building a functional ballistic missile to serve in the defense of their nation. In late 1943 and 1944, when concentration camp prisoners were dying by the thousands in the service of their work, they remained deeply committed to the goals of their project. The program's managers, engineers, technicians, and other specialists all labored mightily to iron out seemingly intransigent technical problems, searched for improvements that would boost performance, and created new weapons out of missile technology. This was a period of phenomenal technological creativity that is evidence of the Peenemünders' continued deep connection to their work. The areas of fuel consumption, accuracy, range, speed, destructive capability, and even raw materials consumption experienced major theoretical, if not concrete advancements. Peenemünde managers were activist, interventionist, and eager to keep making improvements in all technical fields related to the missile. If they were only interested in seeing a rocket fly, as so many claimed in the decades after the war, they presumably would not have been so interested in eliminating production bottlenecks, reducing raw material consumption, or increasing the accuracy and power of the missile. Their activities in this period help to disprove their own post-war master narrative that they only wished to build space vehicles and not weapons of war. To be sure, some Peenemünders were interested in space travel. However, if this was all they sought, then once they had manufactured a consistently performing V-2, then they would not have devoted as much energy as they did to improving its war fighting capability. Their loyalty to their institution and through it, to the regime, was second to none. Moreover, their willingness to look past the crimes at Dora shored up support for the Nazi regime by utterly failing to act against it or even to engage in passive resistance. In this way, the actions of the missile specialists in the last year of the war are evidence of their strong and continued backing for the Nazi regime.

Indeed, as Germany's wartime situation became increasingly precarious during this time, the work of the Peenemünde specialists became increasingly desperate and their ideas ever more absurd, especially given the capabilities and materials availability in late wartime Germany. New projects that they designed, while foreshadowing the technical advances in missile technology that would be made later in the century, were fantasies born of nationalism, xenophobia, and keen sense of self-interest. Like many armaments specialists in Germany, the Peenemünders worked desperately hard until circumstances forced them to shut down their work in the last months of the war. Their behavior is a powerful indicator of their profound and durable hold that Peenemünde's central mission held over them.

Their attitudes toward work in this period reflected a confrontation with the realities of war that had not existed before the August 1943 bombing raid. A year after this raid, the American Eighth Air Force attacked Peenemünde on three separate occasions, heavily damaging test stands and killing a few dozen people.[32] No longer were the Peenemünders blissfully ignorant of the war's effects. Many feared for their

[32] Neufeld, *The Rocket and the Reich,* 247-248.

safety, as the bombing raids jarred their sense of isolation and security. The increasing shortage of raw materials slowed the pace of development and production, never mind the construction of necessary bomb shelters and the repair of important buildings. Dieter Huzel recounted that this was a source of frequent discussion and more than a little trepidation among the employees.[33] A sense of urgency began to pervade the station, and many Peenemünders naturally responded to the increased privation with anger and even a renewed dedication. Paul Figge, a production specialist with a number of ties to the personnel at Peenemünde, stated after the war with some exaggeration that "The bombings hardly affected progress on the A4 program, because our enthusiasm still remained high to accomplish the goal. So actually, the more difficult the conditions became, the more the enthusiasm grew to finish what we had begun."[34] Figge's comment likely overstates the attitudes of most Peenemünders ("Enthusiastic" was probably not how they would have described themselves after suffering multiple bombing raids), but the employees at the base certainly were determined to complete their work in the face of enormous difficulties. Their impressive efforts over the last year of the war bear this out.

Much of the frenetic activity involved in the willy-nilly transfer of production to underground sites caused major headaches for producers. Initially, a major lack of coordination between developers, subsidiary firms, and the producers gave rise to a troublesome level of friction among these groups. The administrative response to these problems is further evidence of the program's managers' deep sense of importance of their work. For instance, the harried move to Mittelwerk created a

[33] Huzel, *From Peenemünde to Canaveral*, 110.
[34] Quoted in Donald E. Tartar, "Peenemünde and Los Alamos: Two Studies," *History of Technology*, 14 (1992), 163.

confused administrative situation in which some offices were staffed but the equipment necessary for their work was not yet installed. In early 1944, the Army Acceptance Office in Mittelwerk, responsible for final checkout of the parts, assemblies, and the finished product, had trouble fully carrying out its tasks because not all of its necessary equipment had yet been installed in the factory, leading to the impression among some production managers that it was bloated with personnel who had little to do. This office was a key to coordinating production and development. Von Braun, concerned that the impression of bloat may lead to a reduction in the number of specialists in this very important office and, consequently, major delays in technical improvements, fought hard to maintain the size of this office. He wrote to Kettler asking him to intervene with the production managers to explain to them why the work of the Army Acceptance Office was so important and why it was staffed the way it was. He wanted to have this situation settled as quickly as possible because he did not want anyone getting the false impression that the Army Acceptance Office had a surplus of employees who were not all essential to the work they were to carry out. He wrote that "You can be sure … that the tasking of 120 men for the Army Acceptance Office has not been so easily carried out." If their numbers were reduced, he argued, the time between final development work and assembly would lengthen dramatically, and if they did lose the services of some of these men, "I don't know how they could be replaced."[35] A reduction in this office ran the risk of crippling the production of reliable missiles. Von Braun was not only concerned with the development sector. He worked strenuously to increase the efficiency and effectiveness of key offices within the project as a whole in an effort to improve the

[35] Von Braun to Kettler, 1/21/44, FE 694/a, NASM.

entire endeavor's overall chances for success. In this case, he was able to maintain the Army Acceptance Office's strength at 120, and it went on to successfully play a key part in coordinating development and assembly work. The technical director proved to be a foresighted and effective manager in other areas of work in the missile program as well, even after his arrest.

After Dornberger secured his freedom, von Braun tackled his work with nearly limitless energy. He needed all of his technical know-how and administrative expertise because developers at Peenemünde made hundreds of changes of to the design of the V-2 over the course of 1944. Not all of the missile's technical bugs had been worked out before mass production began at Mittelwerk, and during the spring and summer of 1944, developers struggled to solve a number of problems that still plagued the complete assemblies. Nevertheless, 1944 proved to be an extraordinarily creative year in the missile program. Even late into the year, Peenemünde specialists systematically and painstakingly made great efforts to improve the performance of the missile. Developers had to work extremely hard to overcome the lingering difficulties in missile technology, but at the same time, they also aggressively sought to improve the value of the V-2 as a weapon. This improvement effort took place on two fronts. In the first place, engineers and scientists continually honed and modified the missile's design in order to lower its fuel consumption and improve its range, accuracy, and destructive power, all while attempting to curb its massive consumption of raw materials. On the other hand, they also attempted to increase its operational flexibility, designing different methods of deployment that ran from the practical to the preposterous. Even though Kammler continually urged the development specialists to make advancements with the V-2, particularly its range, by and large, they needed no coercion from the SS, OKH, or OKW to press on with improvements in the missile itself or the equipment associated with it. Given the broad range of attempts to advance the technology, it is fair to say that Peenemünders took the initiative themselves in order to continue its development and utility as a weapon system.

The spring through autumn of 1944 was a period of intense testing of parts and assemblies manufactured by subsidiary firms as well as mass-produced missiles coming out of Mittelwerk. Launch problems had mostly been solved by the spring of 1944, but missiles continued to go awry or break up in flight. Guide-beam receptors, turbopumps, electrical systems, valves, fittings, tail assemblies, and steering machinery all went through extensive testing and modification. Most often, these parts were not tested independently of other instruments, but rather in actual launch tests.[36] The intense testing continued from late 1944 and into 1945. Test engineers at Peenemünde carried out over sixty launch tests between the end of August and December 1944. They furiously continued their efforts to make improvements in instrumentation, guidance capabilities, and examined the missile's performance using alternate fuels.[37] Between December 1944 and January 1945, missile specialists were making design changes as many as three times per day.[38] Tinkering with the missile was an ongoing process. Although the V-2 was seeing heavy military use by that point in the war, in the Peenemünders' view, it was far from a perfected weapon. All

[36] See collection of test reports, April to June 1944, FE 695.
[37] See collection of test reports, August to December 1944, FE 723, NASM.
[38] Bauanweisungen für A-4 Gerät 12/W, Dez. '44 – Jan. '45, GD638.0.018, DM.

of these changes began to pile up, and by the end of the war, Peenemünde engineers had made approximately 65,000 modifications to the V-2's design.[39]

However, the missile was an incredibly complex and revolutionary piece of technology. It did not lend itself to easy transfer from experimental production to serial production because the experimental designs were far too complicated for mass production purposes. Moreover, alterations were not easily incorporated into work on the assembly line. The process for making changes in design details was phenomenally confused in late 1943 and well into 1944, and there were no coherent processes for making modifications either in subsidiary firms or in general assembly. Development workers, many of whom were unfamiliar with the demands inherent in switching from experimental production to mass production, who labored under great pressure, and who were also eager to complete the work, were contacting subsidiary firms and ordering changes to parts without informing production engineers.[40] Changes ordered by developers were coming at such a pace that many subsidiary firms had trouble meeting orders for new parts. Worse, when new parts from subsidiary firms arrived at Mittelwerk, they were sometimes incompatible with each other or the larger assemblies because of failed coordination between the three groups, causing no small amount of problems between developers and their colleagues in production.[41] Making matters worse was the fact that throughout early and mid-1944, efforts to design simplified parts were often unsuccessful because, according to one explanation, the development workers had unique skills that

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[39] Neufeld, *The Rocket and the Reich*, 224.
[40] Lindenberg to Riedel III, 5/14/44, FE 732, NASM.
[41] Friederich to Neuhaus, 8/1/44, FE 694/a, NASM.

employees of subsidiary firms had a great deal of trouble matching.[42] The effort to manufacture the V-2 was becoming chaotic.

Von Braun thrust himself squarely into this fray in an effort to coordinate the frenetic development activity with mass production, a task that became more complicated with every change made to the missile's design. He worked hard to increase efficiency in development, in the manufacture of new batch runs, and in the delivery of the proper materials to various factories as well as the Mittelwerk. Von Braun also traveled to many subsidiary firms to examine production, harangued other engineers about the best way to go about making changes in production drawings, and tried to improve and standardize the ways in which developers, engineers in subsidiary firms, and production people communicated.[43] He expressly forbade development people from making changes in parts without first making corresponding changes in production drawings and sending them to his office for approval before they went to the subsidiary firms.[44] If parts producers failed to keep up with the necessary changes, Storch and von Braun interceded forcefully to bring them back into line and remained involved until they were sure that the firm could

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[42] Dannenberg OHI, NASM. According to Dannenberg, the reason for this lay in the unique skills that many Peenemünders possessed. During the research and development stages, technical specialists used a number of tricks that they had learned over their time at Peenemünde in order to develop something completely new. These informal tricks could were not easily transferred to the impersonal production drawings. This was in fact a fundamental problem with the Peenemünders, who in many ways were akin to master craftsmen in that they tinkered and experimented on parts built in their particular area and that they were intimately familiar with. Such an approach causes fundamental problems in a mass production environment.

[43] Part of the effort at standardization were forms, developed by von Braun's office, that proposed changes in parts that were manufactured at subsidiary firms. The part to be changed would be assigned a particular cataloging number and the priority grade of the part would be indicated on the form. In addition, the new form also had a box in which the firm, work group, and engineer who proposed the changes would be indicated, providing a measure of accountability for the work in addition to facilitating communication between the correct people. Finally, a part of the form would provide a space for a detailed explanation of the reason for the change, the importance of the change, and when it could be ready for production. See a large set of these forms in FE 732, NASM.

[44] Von Braun circular, 7/10/44, FE 694/a, NASM. Von Braun to Steinhoff, 8/15/44, FE 694/a, NASM.

make deliveries in a timely fashion.[45] He also directly intervened on a number of occasions in order to quickly cut through bureaucratic Gordian knots and sent his representatives to problematic firms in order to assure compliance with his directives. For example, the Heinkel factory in Tyrol manufactured specialized housings for the missile's internal assembly. Most, it turned out, were very poorly constructed. Von Braun wrote a stern letter to the factory, complaining that "The output of your firm is simply not useable." To clear up this problem, von Braun informed Heinkel's plant manager that he was sending a deputy to the factory and ordered the manager to support his representative's efforts "with all means possible."[46] He meant to bring this problem under control as quickly as possible and had no qualms about stepping on the toes of others to do it. For whatever reason, von Braun continued to exert all of his influence, even after his arrest, in the service of the missile program.

Von Braun's arrest, while no doubt forcing him to speak and act carefully, did little to dampen his enthusiasm for his work. The development chief used his authority to directly and effectively intervene in important parts production issues. He proved his mettle by deploying his considerable administrative muscle to sort out the myriad of problems that were caused both by an immature weapon system that was rushed into mass production as well as an unwieldy administrative system that was not ready to handle the burdens that came with such a rash move. His and others' efforts to coordinate the activities of the developers with those who manufactured the missile paid off handsomely by September 1944.

[45] Huzel to Friederich, 7/11/44, FE 694/a, NASM.
[46] Von Braun to Bäderich, 4/1/44, FE 732, NASM.

In that month, Mittelwerk began churning out missiles at the rate of 600 to 700 per month through March 1945.[47] The developers' activity, however, did not center merely on ensuring that the missile functioned at a basic standard of performance. Because of their unique expertise, Peenemünde specialists were also central figures in the process of training the first cadres of missile troops who would conduct operations against Allied targets. Peenemünders wrote the specific handling and transportation instructions for the new troops and responded to inquiries from members of the military involved with support and supply activities for the missile battalions.[48] When asked by operations officers about night launches, for example, the engineers quickly conducted experimental shots at night to see if lights used by artillerymen could substitute for natural light. The results were good, and the test engineers recommended outfitting the launch batteries with lights for 'round the clock operations.[49] Moreover, Peenemünders were a part of the teams of "Technical Stormtroops" that operated with the batteries during early firing operations. Dornberger first ordered these into effect in July, writing that V-1 operations, which began in June, showed that the troops firing the cruise missiles were not prepared to deal with technical difficulties as they came up at the front. In order to avoid this problem with V-2 operations, Dornberger ordered that "as many expert engineers as possible" were to be sent to the firing positions. He specified that the engineers sent to the launch sites should be thoroughly familiar with the missile, especially with its on-board electronics and steering, engine operation, and ground support equipment.

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[47] Neufeld, *The Rocket and the Reich*, 213.

[48] Vorläufige Transportvorschrift für das Gerät A4, December 1943, GD639.4.8, DM. Beantwortung der Fragebogen für: Feldspeicherpersonal, FR-Gefechtstaffel, Treibstoffkolonne, 1/12/44, RH8/v.1265, BA/MA.

[49] Arbeiten am Gerät A4 bei Nacht, 1/19/44, RH8/v.1265, BA/MA.

They should also, according to Dornberger, have a "can do" attitude.[50] His specifications meant that Peenemünde engineers were ideally suited to this task, and Dornberger meant to draw specialists from Usedom, the Ordnance Division, and Mittelwerk. By the middle of August, he was beginning to assemble a list of both civilian and military personnel from Peenemünde and Mittelwerk who were to serve with the launch battalions.[51] Peenemünde personnel went on to work successfully in their tasks of training and accompanying the launching troops throughout 1944 and 1945.[52]

Moreover, in the course of their work, Peenemünders also suggested changes that went beyond establishing a minimally reliable level of functionality and actually improved upon the finished product. They did not merely allow themselves to be carried along by the inertia of their project, nor did they need orders to motivate their work. Rather, they drove the work forward in a way that they hoped would offer a solution to Germany's worsening military bind. Though V-2 operations began in earnest in September 1944, the Peenemünde engineers never stopped tinkering with the missile. Even after it flew reliably, the missile's designers worked its performance problems exhaustively through late 1944 and into 1945. Much of the work in this period pushed the theoretical and practical boundaries of rocket engineering forward. Some of the ideas were quite fanciful, but the Peenemünders' imagination, creativity, and work ethic was on full display between the summer of 1944 and the winter of 1945.

[50] Dornberger, "Technische Stosstrupps," 7/21/44, RH8/v.1960, BA/MA.
[51] Magnus von Braun to Wa Pruf 10, 8/10/44, RH8/v.1960, BA/MA.
[52] Heinz Krause Statement, Gericht Rep. 299, Nr. 588; Leonhard Specht Statement, Gericht Rep. 299, Nr. 588, HStaD-ZA Kalkum.

Individual engineers and their teams worked on specific packages of problems based on their areas of expertise. This led not only to a strong familiarity with the issues involved, but also helped make the mechanical difficulties into a very personal problem for the engineers. Because engineers at the base became so thoroughly familiar with the design and operation of particular sections of the weapon, they were often able to come up with a variety of ways in which to improve the missile's performance. Moreover, except for general inquiries regarding the range and power of the missile, the direction of research on the V-2 in this period was not dictated by regime authorities. Instead, specialists at Peenemünde took the initiative and guided the research in directions that they felt were militarily the most appropriate. Peenemünde administrators had long encouraged them to think flexibly about problems and improvements and to bring any potential solutions to their superiors. This they did, and those who contributed often and in key areas were handsomely rewarded. This, of course, meant that senior administrators such as von Braun, who already found himself inundated with work, had even more tasks to tasks to perform and projects to guide. Senior level Peenemünders remained fully prepared to dedicate themselves to the war effort. The missile specialists beneath them were also ready to do their part, and many came forward with a number imaginative advancements.

There can be no doubt that developing technology with clear military applications was important to the employees at Peenemünde. Many of experiments carried out by them in the last twelve months of the war indicate a strong proclivity for producing a more militarily effective weapon with which to help win the war. Such a goal was of course directly in line with the regime's aims. In May 1944, Hitler inquired to Speer about the possibility of increasing the explosive effect of the missile by using liquid nitrogen in the warhead.[53] Though there is no evidence that this question trickled down to the shop floor at Peenemünde, they did conduct important experiments – again, with little prodding from regime authorities – in order to seek the same increase in explosive capability. For example, between January and December 1944, engineers at Peenemünde and the Heidelager test range carried out a number of different experimental detonations of the missile with hollow charges mounted outside the engine block. The tests showed that it was possible to exploit the liquid oxygen and fuel that was unconsumed after engine cut-off to increase the effect of the detonation. They accomplished this using a shaped charge with a hollow cavity that directed the explosion into the engine and ignited the highly flammable leftover fuels. Engineers completed the testing and reported their findings to Kammler, Dornberger, and Army Ordnance in December.[54] Though these test results and others like them arrived too late in the war to see their implementation in mass production, they are indicative of the Peenemünders' self-mobilization in armaments development during the closing year of the war.

One way to understand the quality and amount of inventive work that went on in this period is to examine the issue of patenting in Peenemünde. It serves as a key indicator of the specialists' willingness and efforts to advance the technology. In the first place, the effort to earn new patents on their technology reflected the Peenemünders' ongoing desire to maintain their professional ideals, even very late in the war. Secondly, patent applications filed at Peenemünde help elucidate the

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[53] Speer Desk Calendar, T-73, roll 192, NARA.
[54] Hoffe, "Sonderlaborierung im A4-Gerät mit hohlladungen (Sprengversuch)," 12/17/45, GD 633.20.11, DM.

underlying technological concerns of the development engineers and also illustrate rapid technological development that took place in the last years of the war. Not only the patent awards, but also the applications themselves, were an important way for engineers at Peenemünde to show their dedication and hard work done in the name of missile development. This was to become a key issue as civilians at the base grew increasingly concerned about the status of their draft exemptions in the face of increased conscription into the Army and *Volksturm* militia. Patenting activity, then, served a number of goals at once.

Technology policy in National Socialist Germany, ideologically reactionary in so many ways, was ruled by a rather modern and liberal patent system. The Reich Patent Code, promulgated in 1936, borrowed extensively from liberal models that favored individual inventors over corporate interests. The new law, based on a few obscure passages in *Mein Kampf*, eliminated the idea that corporations, with their excellent resources and deep pockets, were the fountainheads of invention. Rather, the patent law recognized individuals as the origin of every idea worthy of a patent. The law, refined and sharpened in 1942, also forced corporations to grant appropriate compensation, calculated by the state, to individuals whose ideas were put to use. The results were a remarkable success, and for a brief period, the number of patents filed in Germany outstripped those filed in the far more populous United States.[55]

[55] Kees Gispen, *Poems in Steel: National Socialism and the Politics of Inventing from Weimar to Bonn* (New York: Berghahn Books, 2002), 177-250. Nazi rhetoric about the value of inventors and technology helped garner support among engineers and technicians in the interwar period. After the war, this law, stripped of its racist hogwash, was the model for the Federal Republic's Patent Law of 1957. Gispen correctly points out that in this case, the regime left "a positive legacy … in the politics of inventing," 8.

The Peenemünders took full advantage of this modern, progressive arrangement. Between 1939 and 1945, Peenemünders filed at least 124 patent applications with the Reich Patent Office (*Reichspatentamt* – RPA). However, of this number, only sixteen applications emerged between1939 and 1941. After 1941, this number spiked dramatically, receding only in 1945. The increase in applications was geometric. In 1942, thirteen applications from Peenemünde appeared in the RPA. In 1943, this rose to twenty-six, then again to fifty-four in 1944. In 1945, with the abandonment of Peenemünde and final defeat of Nazi Germany, the number of applications dropped to a mere five.[56]

These numbers reflect several factors. First, it must be said that the state of missile technology before 1939 was quite primitive. Though some advances had been made, especially by the Army's researchers, it is probably the case that the technology was not yet fully patentable because of its immaturity. However, by the end of 1941, the specialists at Peenemünde had developed the basic technology that would be key to the success of their endeavor. The most fundamental problems of missile development in guidance, propulsion, and aerodynamics had been solved.[57] Even so, the number of patent applications did not rise sharply until 1943. By the end of that year, as more instruments and parts began to show success, the likelihood that they could be patented increased.

The huge technical and scientific strides made between 1937 and 1941, and the relative paucity of patent applications in this period (twenty-one), indicates that

[56] These numbers are culled from the patent applications found in the Deutsches Museum's Peenemünde Archive Reports, largely a collection of scientific and technical documents that, until this point, was of greater use for scientists and engineers than historians. This series holds the most complete collection of purely technical documents that are available.
[57] Neufeld, *The Rocket and the Reich*, 73-109.

technical maturity, though important, was not a central factor in the increased number of applications in the second half of the war. Another critical factor can be found in the rewards that inventors at Peenemünde received for successful patent submissions or, at least, the applicability of their inventions to missile technology. The Peenemünders collected handsome monetary compensation if their work was patented or used on the V-2. Shortly after July 1942, when the Reich government clarified the patent code to emphasize the rewards due to individual inventors, military patent evaluators developed a calculus for remunerating their inventors, which were sometimes small groups or teams of people. They evaluated the position of each individual in the team according to technical training, management position, and key contributions to come up with a performance assessment for individuals involved in the invention. Secondly, they assigned the patented invention or process a value based on its applicability to the work at hand. More important were the final two factors in the calculus. Evaluators divided the usefulness of the invention into categories ranging from "pure military application" through "equal military and other applications" to "predominantly for other applications." The final table categorized the invention or process with values ranging from "crucial military importance" to "little military importance." The greater the military application and the military importance of an invention, the higher numerical value it was assigned. Evaluators then multiplied all of these numbers together in order to come up with the proper remuneration for the inventor.[58] This method of evaluation put a premium on the military value of technology and encouraged individuals to continue to think

[58] Formel für die Berechnung der Vergütung (für Wehrmacht u. Werhmacht-ähnliche Betriebe), GD634.14.45, DM.

creatively about how to improve the state of the Wehrmacht's own technology. In an operation like that at Peenemünde, busy scientists and engineers stood to profit handsomely from such a system.

Profit was not always a primary concern for all Peenemünders, however. On some occasions, they sought only recognition of their accomplishments and the professional satisfaction of a patent award. In May 1943, for example, the RPA awarded propulsion specialists Karl Neubauer and Friederich Wilhelm Dürre with a patent for their work the cooling jacket for the missile's combustion chamber. Dürre made it clear that he did not wish to receive remuneration for the use of his patented ideas, only to be named as inventor on the officially issued patent. In the end, Riedel III insisted that both men receive at least RM150 for their valuable work.[59] Other Peenemünders were similarly motivated by such professional technical considerations. However, their work was informed by the ever-present necessity of easing the transition to mass production and simplifying assembly, which simultaneously increased the pace at which functional missiles could be turned out at Mittelwerk. Konrad Dannenberg, in his application, also for improvements in the cooling jacket, explained that his improvement would ease manufacturing problems by simplifying the combustion chamber's design. "In this way," he wrote, "the means of cooling with only a single [alcohol] intake will make production easier. This applies for the assembly of the entire engine block. Furthermore, fewer possibilities for disturbances exist because of looseness at weldings and couplings.

[59] Neubauer and Dürre Patentanmeldung, "Raketenofenkühlung," 5/1/43, GD624.193.3, DM.

With this, a higher degree of operational reliability can be counted on."[60] Simplified manufacturing and improved technical performance were obvious concerns for men like Dannenberg. Professional motivation then, with the extra incentive provided by monetary rewards, was enough for most Peenemünders.

However, nearly all missile specialists kept in mind the purpose of their work and mobilized their skills in an effort to increase the destructiveness of the missile while improving its flight characteristics. A typical example is the prodigious Konrad Dannenberg's patent application for a "Process to Hinder Explosions."[61] Dannenberg reasoned that when missiles re-entered the atmosphere, the volatile fuels remaining in the tank would explode because of heat friction. His solution was to drain the remaining liquid oxygen into the fuel tank. The liquid oxygen/fuel mixture would then gel and remain in the confines of the tank. Dannenberg argued that his idea improved flight stability by moving the inbound missile's center of gravity toward the rear while decreasing the hyper-volatility of the propellants. Importantly, he also held that this was a valuable advance because the fuel, while more stable, still increased the punch offered by remaining fuel upon impact detonation.[62] Von Braun and Eberhard Rees were thrilled with the idea and after determining how they could

[60] Dannenberg Patent Application, "Raketenofen-Kühlung," 8/16/44, GD624.193.2, DM. Alcohol burned at a lower temperature than the gasses in the combustion chamber, so a film of alcohol fuel along the wall of the combustion chamber would provide an insulating layer against the heat and prevent burn-throughs of the combustion chamber.

[61] Dannenberg's background is a common one among the Peenemünders. Born in 1912 just south of Leipzig, his interest in rocketry first emerged after he saw Max Valier speak and witnessed a demonstration of Opel's rocket cars in Hanover. He completed the work toward his diploma-engineer degree at the Technical University of Hanover in 1936, was drafted into the reserves in 1939, then served in France before being assigned as a civilian reservist with the VKN. Dannenberg was never a Nazi party member, but given his background, almost certainly sympathized with them and was at least a fellow traveler. Dannenberg OHI, NASM.

[62] Dannenberg Patent Application, "Verfahren zur Verhindern von Explosionen," 7/8/44, GD634.11.12, DM.

incorporate Dannenberg's ideas, forwarded the application to the RPA.[63] Dannenberg was eventually notified that his process would be put to use and that he could expect compensation for it as soon as the patent was granted.[64] In addition to concerns about upholding engineering's professional standards, then, military considerations and the effort to help bring about victory were also of paramount importance for development engineers in the project. They were not only interested in spaceflight, nor were changes of this sort insisted upon by regime officials. Rather, Peenemünde engineers took the initiative and made improvements in the missile's destructive capability themselves, enhancing the military effectiveness of the weapon.

These military concerns resulted in a number of interesting and forward-thinking experiments, but also led the Peenemünde developers into technical flights of fancy that, given the state of missile technology and availability of resources in 1944/'45, were impossible to fulfill. One relatively simple theoretical concept they embarked on was experimenting with putting wings on an A-4 missile to expand its range, an idea first given attention in 1939. They eventually shelved the idea for this missile, code-named the A-9, because of cost and priority problems. Responding to pressure from military authorities in the middle of 1944, the Peenemünders revived the project and re-christened it the A-4b. By September and October, the Peenemünders had developed test missiles and were preparing launch experiments, which they carried out with very limited success in December and early January

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[63] Von Braun and Rees to RPA, 9/21/44, GD634.11.12, DM.

[64] Schilling and Rees to Dannenberger, 12/15/44, GD634.11.12, DM. Because of its submission so late in the war, the RPA never made a decision on Dannenberg's application.

1945. The project ended shortly thereafter.[65] Military necessity partly drove this work, as Allied forces steadily regained ground in Western Europe throughout the summer, forcing the operational missile batteries to launch from greater and greater ranges. However, Wernher Dahm, a test engineer in the projects office at Peenemünde, also pointed to a concern that had long plagued the Peenemünders, but became particularly acute at the end of 1944. In an interview given decades after the war, he admitted that the motivation for reviving the A-9 was to show that the Peenemünders were in fact attempting to make dramatic advancements in the missile's range. However, this was done in order to show that as a group, missile developers were too important to be conscripted into the *Volksturm* or *Wehrmacht*. According to Dahm, local authorities around Peenemünde had been clamoring in late 1944 to draft the specialists on Usedom and employees at the base were becoming increasingly concerned about just such an event.[66] This is an entirely plausible argument and probably true, but must also be seen in the larger context of the near manic pace of development and design taking place at Peenemünde in the second half of 1944.

Other projects reflect the strong motivation of the Peenemünde specialists to create powerful weapons in the service of the Nazi state. Perhaps the second most important development project after the V-2 was the Wasserfall anti-aircraft missile, which had its origins in plans begun in 1941. The crash status of the ballistic missile project, however, meant that most of Peenemünde's resources were not dedicated to Wasserfall until the second half of the war. The Allied bombing campaign and slow

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[65] Heinz-Dieter Hölsken, *Die V-Waffen: Entstehung, Propaganda, Kriegseinsatz* (Stuttgart: Deutsche-Verlags Anstalt, 1984), 135-145, 200. Neufeld, *The Rocket and the Reich*, 251.
[66] Dahm OHI, NASM.

but steady seizure of air superiority made Air Ministry officials increasingly desperate to develop a weapon to reverse Germany's losses in the air. Despite major efforts by engineers at Peenemünde East and West, the project faltered because of extremely complex problems of fuel supply, guidance, and control.[67] As a long-term project, it made sense, but in a nation so desperately short of supplies, manpower, and time, there was no way for Wasserfall to be completed in short order. However, the regime's paralyzing fascination with war-winning technology had deeply entrenched the project into the bureaucracy, and the specialists' dedication to its success meant that the project would continue despite its short-term uselessness.

Peenemünde developers also carried out smaller scale, but equally important tasks in the last eighteen months of the war. Guidance, steering, and fuel injection improvements for the V-2 all steadily emerged over the course of late 1944.[68] In addition, by the end of November, fuel was in drastically short supply across the Reich, a dearth possibly made even worse by the early preparations for the Ardennes offensive in the West. Development engineers made a number of pro-active efforts to get around these shortages. In one case, engineers Tschinkel and Rössler came up with a process for using lignin as a dilutant in fuel. Lignin was a cheap and abundant by-product of the cellulose industry that, through various chemical processes, was fully soluble and burned fairly efficiently.[69] Their idea was never utilized on the V-2, but even so, it was a clear attempt to mitigate fuel shortages and make a substantial impact on Germany's precarious supply problem, especially regarding the missile's

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[67] Neufeld, *The Rocket and the Reich*, 230-237.
[68] Ibid., 251-252.
[69] Tschinkel and Rössler Patentanmeldung, 11/7/44, GD624.624.4, DM. The two engineers never heard back from the RPA about whether or not they would be awarded a patent.

demands. In addition, the problems created by fuel shortages mandated that a standard fuel combination be used for all new missile projects. By this point, Peenemünde engineers were with directly or indirectly involved with four different anti-aircraft missile projects: Wasserfall, Rheintochter (Rhine Maiden – a solid fuel missile developed and manufactured by Rheinmetall-Borsig), Schmetterling (Butterfly – designed by Henschel), and Enzian (a wooden, unmanned, rocket powered interceptor). All of these used different types or combinations of fuel. Peenemünde engineers conferred about this problem and after a number of experiments, came up with a single mixture of fuel that would be used for all missile projects, thereby rationalizing and standardizing future supply needs.[70] Smaller projects of this sort are reflective of a willingness by the Peenemünders to continue their hard work by improvising, adapting to changing circumstances, and overcoming difficulties imposed by the war's increasingly bleak circumstance. They did not fold in the face of military adversity.

Other projects were less technically mundane as well as a reflection of the professional commitment, technological desperation, and military fantasy exhibited by Peenemünde engineers in the war's last year. One proposal, written jointly by Peenemünde development engineers and Luftwaffe officials, called for the rapid deployment of the V-2 using the Messerschmitt Me-323 "Gigant" transport plane, which had six engines and a carrying capacity of twelve tons. First circulated in March 1944, this proposal argued that it was impossible to set up forward launch areas because it took too long for the support equipment to get to the location, deploy, and launch. Rapid deployment to these areas was for all intents and purposes

[70] Von Braun and Riedel to Halder, 11/18/44, GD624.623.14, DM.

impossible. Air lift to specific locations would solve this problem, and the proposal included technical requirements, manpower needs, and equipment quantities for large operations.[71]

This plan had virtually no grounding in reality. To be sure, the Me-323 could carry the missile, but to have all of its support equipment come with even one V-2 required a small fleet of transport aircraft. The number of planes required for the movement of an entire battery of V-2s was an astounding 123.[72] By March 1944, only about seventy Me-323s were ready for operation, with the underwhelming number of six to eight new planes per month being added to the fleet. Not only that, but air transport to forward areas in the middle of 1944 would have been a suicide mission. Allied warplanes were rapidly gaining control of the skies and could operate almost unmolested over much of Western Europe. Even if the lift capacity for a battery of V-2s existed, any mission of this sort would have rendered the transport fleet completely impotent because of Allied air superiority.

Worse however, were other missile projects that ranged from the far-sighted to the preposterous.[73] The embodiment of both was the idea for a submarine launched ballistic missile, known first as "Project Swimming Vest" [*Projekt Schwimmweste*] and then as "Test Stand XII." As early as 1942, the *Kriegsmarine*

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[71] Vorschlag für einen Schnelleinsatz des Sondergerätes mit Luftransport der Me323 "Gigant," 3/1/44, GD639.4.6, DM.
[72] Ibid.
[73] One important project that was envisioned as early as 1936, but shelved in 1942, was the A-10 intercontinental ballistic missile. This was a two-stage missile with a range that would enable it to reach New York. It was beset by a number of scientific and technical problems and remained on the drawing board until 1942, when it was set aside. According to Peenemünde design engineer Wernher Dahm, "It might have worked in the long run, but the technology was not available to make it a really useful project." Dahm OHI, NASM. Though it was not a part of the spasm of desperate ideas in the closing stages of the war, it is indicative of the Peenemünders' willingness and ability to think about developing increasingly complex weaponry.

had taken an interest in installing missiles on its ships and submarines. Its Commander in Chief, Admiral Karl Doenitz, met with von Braun in August of that year to discuss the use of missiles as anti-ship weapons. Despite the major complications inherent in ship-to-ship missile operations, von Braun was interested and promised to consult Dornberger about it.[74] Dornberger also thought that the idea had merit and proposed that Peenemünde developers work with *Kriegsmarine* engineers to study what would be needed to develop such a weapon as long as no resources were diverted from the V-2 effort, which, as of that point, had not experienced a successful launch.[75] Very little came of it, as the Peenemünders were far to busy with the V-2 to dedicate any of their resources to such a difficult problem. *Kriegsmarine* officials brought the idea up again in 1943, and there were a few meetings to discuss technical details, but no concrete plans were laid for development.[76]

However, in June 1944, less than two weeks after the Allied invasion at Normandy, a Peenemünde engineer named Sachsenberg approached Riedel III with technical drawings and the outline of a plan for an underwater launch canister to be used in conjunction with U-boat operations. The concept was based around the idea that the United States might reconsider its participation in the war if V-2s began falling on New York City. The missile canister would displace approximately 500 tons when fully loaded and would be towed behind a U-boat. Once at its launch destination, the carrier could be erected into vertical position by flooding its ballast tanks, which would extend the bow of the carrier above the surface of the water.

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[74] Von Braun, Niedershcrift uber die Besprechung in Kiel, 8/28/42, RH8/1960, BA/MA.
[75] Dornberger to Goetze, 9/21/42, RH8/v.1960, BA/MA.
[76] Von Braun to Loewe, 5/29/43; OKM to Dornberger, 6/17/43, RH8/v.1254, BA/MA.

From that position, the doors of the carrier would be opened, the missile prepared for launch, and fired. One U-boat could supposedly tow three launch canisters at a speed of approximately twelve miles per hour.[77]

In retrospect, the idea was utterly absurd on its face. The technical difficulties of towing the canisters, erecting them, and launching the missile were enormous. However, in an atmosphere in which German officials and armaments specialists increasingly cast about for solutions to get them out of their predicament, it seemed to have merit. Peenemünde developers embraced the idea and in September, reported the results of preliminary experiments to the division heads of EMW.[78] In December, Peenemünde developers met with representatives of Vulkan Docks in Stettin, which was contracted to build a prototype, in order to hammer out the difficulties inherent in such a project. Everyone involved, including many important Peenemünders such as Hans Hüter, Riedel III, and Kurt Debus, took the project very seriously and attempted to solve many pressing technical questions at the meeting. The project was conducted in utter secrecy (at this point, the revealing code name "Schwimmweste" was changed to "Test Stand XII"). Even other engineers inside Peenemünde were not to be told of the work if they were not involved in it.[79] Test engineers expected to have the prototype vehicle available to them by March 1945 and requested that the building contracts be handled expeditiously.[80] Though the submarine launched ballistic missile would go on to become one of the twentieth century's most fearsome weapons systems, in 1944-'45, the idea of a delivery platform like "Schwimmweste"

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[77] Sachsenberg, Aktennotiz über eine Besprechung mit herrn Direktor Diplom. Ing. Riedel, 6/15/44, RH8/v.1276, BA/MA.
[78] Vorversuche für Projekt Schwimmweste, 9/11/44, RH8/v.1276, BA/MA.
[79] Niederschrift über die Besprechung vom 9.12.44 bei Wa Pruf (BuM) 10, RH8/v.1276, BA/MA.
[80] Aktenvermerk über die Besprechung am 25.1.45 in K., RH8/v.1307, BA/MA.

was ridiculous in its strategic concept, technical demands, and tactical applications. It was a reflection of the utter desperation with which Peenemünde developers carried out their work in the last year of the war.

Missile designers at Peenemünde did not just satisfy their own professional standards with their work, nor did they work merely to meet demands of the state or Nazi Party, as many of them might argue. Rather, they strove to push the technology to its performance and destructive limits. The Nazi regime had long benefited from the Peenemünders' ability to direct their own development activities, and this approach continued to pay dividends in the closing months of the war. The missile specialists' mobilized nearly all of their efforts in support of the regime. Some began to feel an increased disillusionment with the idea of a victorious finish to the war – on a report underlining the importance of missiles for breaking allied air superiority and "therefore the achievement of final victory," von Braun sarcastically scrawled, "Final victory, well, well!" – but this did not dampen their enthusiasm.[81] The Peenemünders absolutely buried themselves in their work, making major theoretical and practical strides in the field of missile technology. For this, they were amply compensated in a number of ways.

Von Braun had a long track record of looking after people who bent all of their effort toward the success of the German missile program. This was no different after his arrest. In addition to the compensation due to employees whose inventions were used at Peenemünde, other rewards were available as well. For example, in early April, the technical director attempted, though Heinz Kunze, to procure extra food rations for those "intellectually creative workers" in armaments industries. The

[81] Neufeld, *The Rocket and the Reich*, 247.

group from Peenemünde that he recommended included engineers, scientists, technicians and secretaries, all of whom "performed a great service in the area of development and serial production … They have worked long hours, day and night, Sundays and holidays, foregoing free time and have exhibited exemplary lives in their private activities."[82] Also, he informed Kunze that he would be sending a new list of personnel to be rewarded with these extra rations every six months. Kunze promptly informed von Braun that this ration program had been cancelled, but von Braun's note to Kunze underlined the extraordinarily hard work that Peenemünde specialists had been putting in as well as the von Braun's own efforts to reward them for their activities.[83]

Intellectually creative, hard-working Peenemünders received other forms of rewards as well. In late 1944, many developers at Peenemünde began receiving official, non-remunerative rewards in addition to the money that was their due if their ideas were to be patented. Some individuals won prizes for technical improvements that they made on the missile. Technician Bruno Helm, for example, received a prize for improvements he made in sealing missile combustion chambers.[84] Promotions, titles, and medals were all distributed in the closing months at Peenemünde. Engineers Dannenberg, Hackh, Heimburg, Tessmann, and Martin were awarded the title of *Oberingenieure*, and all of the "authority of leadership that comes with this title," by von Braun and Storch in October 1944.[85] Administrators at Peenemünde recommended many of their employees for the War Service Cross, either first or

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[82] Von Braun to Kunze, 4/5/44, FE 732, NASM.
[83] Kunze to Von Braun, 4/21/44, FE 732, NASM.
[84] Bruno Helm Basic Personnel Record, RG 165, Entry 179, Box 703, File "Boston," NARA.
[85] Von Braun and Storch to Dannenberg, Hackh, Heimburg, Tessmann, and Martin, 10/15/44, RH8/v.1941.

second class, in the same period. Friederich Duerre, an engineer who also helped with security measures at the base, was recommended for this award because he "has fully proven his worth" in teaching counter-intelligence measures to employees of EMW. Richard Lochman, in charge of organizing transportation at Peenemünde, was recommended for the same award because of his hard work and skill in carrying out his duties.[86] None of these rewards were the result of political cronyism on the part of management or employees. Rather, they reflected the hard work and long hours put in by Peenemünde specialists to push forward their project and do all they could to contribute to their nation's efforts in the war.

Finally, throughout all of their activities over 1944 and 1945, the senior Peenemünders and most rank and file employees were well aware of the results of their work. According to Dieter Huzel, the first reports of V-2 operations came to Peenemünde by newspaper in September 1944. He recalls an electric atmosphere in von Braun's office, writing that

> The news had arrived there also, and the room was rapidly filling as staff engineers drifted in. A dozen excited conversations were going at once. Von Braun cut in on the enthusiasm with a sober dose of reality. This was not the final payoff – far from it. The V-2 was not fully developed. Many specific problems remained to be overcome, despite the exaggerated propaganda of the Hitler government.[87]

Foreign press reports about the V-2 campaign emerged steadily late 1944. These reports arrived at Peenemünde, ostensibly for intelligence reasons, in order to measure the results of the attacks. They included photos showing buildings reduced

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[86] Storch to Rees, 12/26/44, RH8/v.1941.
[87] Huzel, *Peenemünde to Canaveral*, 119.

to rubble and massive craters left in urban areas.[88] Perhaps understandably, few Peenemünders, who by this point fully felt the impact of the war on their nation and families in other parts of Germany, had little remorse for the victims of their weapons. Auguste-Elfriede Friede, one of Von Braun's secretaries, recalled after the war that "We worked from the standpoint that war is war, and when their bombs stopped falling on the populations of Hamburg, Cologne, and other areas, things would change."[89] This hard-headed attitude was partially a result of the steadily increasing brutality of the war, combined with the Peenemünders' own nationalist and patriotic feelings. Unlike many, the Peenemünders had a way to reply to the bombing of German cities, and felt no obligation to reign in their efforts to maximize this response. To the extent that they did reflect on their work, they did so in the context of a war in which neither side granted any quarter. Virtually no one felt guilty about their work or the use of the missile against civilian targets in England and elsewhere.

Norbert Frei has shown that the virtually unimpeded destruction through air attacks in this period produced a siege mentality that penetrated far into the consciousness of individual Germans. This state of mind brought German citizens closer together through both shared physical and psychological stress. Citizens in Berlin, Schweinfurt, Essen, Dresden, and Peenemünde could all relate to each other based on the shared suffering that they experienced. Frei shows convincingly that

[88] See collected foreign news reports, FE 688, NASM.
[89] August-Elfriede Friede statement, *Peenemünde: Schatten eines Mythos*. Huzel remembered being stunned at the magnitude of destruction on a trip from Peenemünde to Bavaria. He wrote that "In the isolation of Peenemünde, I had not realized the extent of damage from Allied air attack. Practically every city or town of any size I passed through showed the marks of heavy bombings, particularly in the immediate vicinity of railroad stations and along the tracks." Huzel, *Peenemünde to Canaveral*, 118.

this reinforced the idea of a “national community” throughout the country.[90] The Peenemünders were not immune to this feeling. In his memoir, Huzel recalled the “universal expression of *Kameraderie* which these declining days had so brought about.”[91] Indeed, the true meaning of the *Volksgemeinschaft* was made abundantly clear in the last years of the war, when class barriers utterly vanished in the rubble of Germany’s bombed-out cities. Despite this destruction, Germans proved ever more willing to invest even more in the regime and offer up their services to the nation in its time of need. Hans Mommsen has demonstrated that the Nazi party boosted its prestige among the population by stepping up its involvement in the welfare sector, bolstered its reputation by arranging obligatory meetings, rallies, and marches, and increased its strength by taking over the functions of much of the civil administration. It cast all of this work in revived notions of the so-called *Kampfzeit*, the period leading up to Hitler’s appointment as Germany’s Chancellor. The Nazi Party, in reality the cause of Germany’s destruction, successfully cast itself as the nation’s only means of salvation. Mommsen argues that “The experiences of the *Kampfzeit* were repeatedly referred to in order demonstrate that through heroic exertion the imminent crisis could be overcome, and for this the party was indispensable.”[92] Such ideas buttressed the German nation’s dedication to the party, which provided the only sources of aid to its beleaguered population, and helped ensure that they would provide it with their best efforts even as collapse became imminent.

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[90] Norbert Frei, “Peoples’ Community and War: Hitler’s Popular Support,” in Hans Mommsen, ed., *The Third Reich Between Image and Reality: New Perspectives on German History* (Oxford: Berg, 2001), 59-75.
[91] Huzel, *Peenemünde to Canaveral*, 168.
[92] Hans Mommsen, “The Dissolution of the Third Reich: Crisis Management and Collapse, 1943-1945,” *GHI Bulletin* 27 (Fall 2000), http://www.ghi-dc.org/bulletin27F00/b27mommsen.html, 3.

The actions of those at Peenemünde are stark evidence of both this siege mentality and the utter dedication to the nation and regime in its most desperate hour. The desire to throw back Germany's enemies could only be accomplished by "heroic" action. The technical projects embarked upon by the Peenemünde engineers were prosecuted with phenomenal effort under increasingly inadequate conditions. Of course, not every engineer was inspired to work frantically in the last year of the Nazi regime and there were gray areas of motivation, but for the most part, the profound dedication to success that the project as a whole brought forth from the Peenemünders in its early years merged with a fortress mentality to elicit continued dedication to its goals. Indeed, as the regime became even more desperate, its goals and those of the Peenemünders became even more deeply enmeshed. For their part, the Peenemünde specialists continued to push the technical limits of missile development even as time and resources dwindled away.

The Last Months of the German Missile Program

By January 1945, an untenable war situation had become unwinnable. On the Eastern Front, Soviet Armies pushed across Poland and were advancing on Germany proper. In the West, Germany's last, desperate gamble in the Ardennes had been crushed by American forces, and the path across the frontier lay open. The war was irrevocably lost, and the outlook for the Peenemünde missile base, hard on the Baltic and not far from the Russian lines of advance, was hopeless. Evacuations began in early February, and by early March, the formerly bustling and dynamic missile development center was a ghost town. The final collapse of the program was not far behind.

The staff at Peenemünde had been shrinking throughout 1944. In August, the German staff at the base had been reduced to 4262, while a total of 379 forced Eastern workers and prisoners of war remained at Peenemünde.[93] That number was further reduced as Storch responded to Kammler's demands for reallocated personnel by ruthlessly cutting employees loose either for military service or for work elsewhere. He calculated that 342 employees could be given up at Peenemünde without limiting current development activities. Storch also reported that another seventy-eight could be sent east for "East Wall Operations" [*Ostwalleinsatz*]. Twenty-one employees, according to Storch, had volunteered for duties at the Front, and another thirty-four were being prepared to serve as members of Dornberger's "Technical Stormtroops." Storch finally argued that as more projects neared completion, the base at Peenemünde could give up even more people for other activities.[94] By October, however, development administrators were beginning to feel the sting of these losses. Von Braun wrote to Army Brigadier General Josef Rossmann, Commander of the Ordnance Office responsible for missile development, to complain that the base's ability to keep up its output was declining "as we give up workers for the war or they are replaced by women." Most personnel were being assigned to missile batteries, but the use of the batteries also depended on the completion of proper ground facilities, a task for which those who were leaving were needed. Though most employees were already working at least twelve hour days,

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[93] Storch to Kammler, 8/21/44, RH8/v.1960, BA/MA. Of this number of employees, about half were salaried employees, that is, engineers, mathematicians, physicists, technicians, and clerical help. The balance was made up of hourly workers such as joiners, welders, electricians, and mechanics. 618 of the 4262 were women, mostly clerical staff. Of the 379 forced laborers, 126 were Eastern workers and 253 were prisoners of war. According to Storch, there were no concentration camp prisoners engaged in missile work at Peenemünde.

[94] Storch, "Berufsaufteilung der zur Abgabe vorgeschlagenene Arbeitskräfte," 8/23/44, RH8/v.1960, BA/MA.

Peenemünde's forfeiture of personnel, argued von Braun, was delaying the development of the equipment while the backlog of missile troops awaiting outfitting grew.[95] The development pressure at Peenemünde, made worse by the Allied advances on both fronts, was only increasing as personnel departed Usedom for other projects or operations across the rapidly shrinking Reich.

Von Braun's complaint to Ordnance was probably based also on his desire to keep the program's experts together and relatively safe. They had forged strong bonds of friendship and professional camaraderie in the course of their work on the base, and without question, he felt a great deal of loyalty and responsibility for their care. For example, by January 1945, von Braun was pushing Storch on the "unfortunate question" of a "separation allowance" (*Trennungsentschädigung*), which he first raised with the company director in December. He argued that employees who, by dint of their work on the missile project, had been separated from their families, should receive an extra allowance for the difficulties of this separation and urged Storch to take up the matter.[96] Moreover, in a separate notice to Storch written on the same day, von Braun requested that the director consider transferring funds from a social insurance program for VKN members into a general insurance fund for all employees. He envisioned paying out this money as other sources of support dwindled in the face of constant air raids.[97] Von Braun clearly felt a sense of responsibility for those under him who had worked so hard in previous years to bring his life-long dream to fruition. Understandably, he was willing to do what he could to make sure that they remained safe in the last months of the war.

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[95] Von Braun to OKH Wa Prüf (BuM) 10, 10/6/44, RH8/v.1960, BA/MA.
[96] Von Braun to Storch, "Trennungsentschädigung," 1/13/45, RH8/v.1941, BA/MA.
[97] Von Braun to Storch, "Monatsbericht Dezember 1944," 1/13/45, RH8/v.1941, BA/MA.

During these last frantic days at Peenemünde, rumors and fears of the Soviet Army were rampant and confusion about the situation grew. As streams of German refugees from the East marched past Usedom, military employees were made to carry guns, and the prospect of civilian participation in the *Volksturm* became a reality.[98] The fear of espionage increased as the Soviets steadily advanced in the East, and administrators began laying plans for destroying technical documents and even sensitive testing equipment.[99] At the end of the month, when Soviet tanks were rumored to be in the area, Rossmann issued a set of orders outlining procedures over the next few days. He ordered that launch tests be completed as quickly as possible, and that when evacuation did occur, all unimportant documents were to be burned. The rest he ordered taken to their evacuation location. All missiles not ready for launch tests in the next few days were to be relocated, as were key components and equipment.[100] The next day, however, he indicated that "The situation has calmed. It was only a few tanks that appeared … The situation in Pomerania has not been upset." He went on to order that the launch experiments and static tests would continue to go forward until the instruments "were totally serviceable and will fulfill their purposes without any trouble." All employees at Peenemünde were to remain in place.[101]

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[98] Huzel, *FromPeenemünde to Canaveral*, 133.

[99] Vorbereitung zur schnellen Vernichtung geheimen Aktenmaterials, 1/23/45, RH8/v.1941, BA/MA. Officials at the base had been concerned about important documents falling into enemy hands since September 1944. Peenemünde administrators began to worry about surprise attacks by both Soviet and Western Allied forces. See Huzel circular, "Sicherstellung von geheimen Aktenmaterial," 9/25/44, FE 734, NASM; Storch, "Sicherstellung von geheimen Aktenmaterial," 10/3/44, RH8/v.1294, BA/MA. Secrecy remained a key consideration, even at the end of the program's existence.

[100] Rossmann order, 1/30/45, RH8/v.1941, BA/MA.

[101] Rossmann order, 1/31/45, RH8/v.1941, BA/MA.

Work at Peenemünde continued in its last desperate days. Von Braun, who no doubt saw the writing on the wall at this point, continued to push the tasks of those associated with continued development and was unafraid to use his connection to Kammler to do so. In January, the firm Gema Blucherwerk in Leignitz (Legnica) in Poland was conducting work on the guidance system for the V-2. When the Soviet advance forced the firm to abandon Leignitz, von Braun arranged for its workers to come to Peenemünde to continue their experiments. However, managers at Gema Leignitz informed him that a Dr. Rottgart of Telefunken, in his position as Chairman of the Development Committee for Radio Measurement, had forbidden further work in this area. Von Braun requested to Kammler that he intervene directly with Rottgart in order to force him to allow the experiments to continue on Usedom.[102] The engineer, who had pinned his professional existence on the success of the V-2 and in so doing, hitched his wagon to the Nazi star, was not yet ready to give up the ghost. Certainly, he still felt concerned in the wake of his arrest to at least give the impression of loyalty to the end, while at the same time showing evidence of disillusionment with the war. However, in a situation in which other individuals intervened to slow the process of the work and in which von Braun might have simply washed his hands of this particular event in light of the situation, he still directly intervened by asking Kammler to ensure that the experiments would go on. Here, von Braun was offered a choice between continued maximum effort or allowing the program to decline, with no penalty for the latter. That he chose the former only points to his continued allegiance to its central tenet of hard work in the service of the Nazi state.

[102] Von Braun to Kammler, 1/31/45, RH8/v.1265, BA/MA.

That same day, however, Kammler ordered the final evacuation of the base. Preparations were hastily begun, and within two weeks, employees, equipment, and instruments began moving south, to be relocated in the area around Mittelwerk.[103] Most of the personnel made the dangerous journey either by truck or train, while much heavy equipment went by boat.[104] By March, the last of the transports left Usedom to join what came to be known as the Central Construction Development Cooperative, (*Entwicklungsgemeinschaft Mittelbau*), made up of thirty firms (with approximately 7000 total employees) such as Henschel, Dornier, Ruhr Steel, and others.[105] About 400 people remained behind at Peenemünde because they refused to leave their homes.[106] For many of those who left the base, it would be the last time they would ever see it.

After the evacuation, a strange atmosphere of Götterdämmerung hung over Peenemünde. In the face of utter collapse, the few remaining specialists did their best to enjoy the benefits of life at the base in its last bleak days. According to Huzel, alcohol reappeared in relative abundance, local cinemas still showed films, and the trains, most empty, stil operated. "One of the flak units which included in its personnel a number of women telephone operators sponsored a few dances," Huzel recalled. "These usually ended early since the port wine was sweet and easy to take." For Huzel personally, who took strolls along the beach and watched the waves while

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[103] Neufeld, *The Rocket and the Reich*, 258-259.

[104] According to U.S. authorities, about seventy percent of the equipment reached the town of Barby on the Elbe River, where it was to be transported by rail to the Harz. However, destruction of railroad tracks along the route meant that it was impossible to ship most of it to its final destination. Much of the stock was either in Lübeck or Barby when the war ended. Intelligence Report, File "V-2 (A-4) Miissile (Germany, WWII), Intelligence Interrogations," NASM.

[105] Huzel, *Peenemünde to Canaveral*, 139. Von Braun, Antrag auf Genehmigung und Einstufung eines Bauvorhabens der Entwicklungsgemeinschaft Mittelbau, 3/6/45, RH8/v.852, BA/MA.

[106] U.S. Army Intelligence Report, File "V-2 (A-4) Miissile (Germany, WWII), Intelligence Interrogations," NASM.

listening for the sounds of launch tests that never came, it was as if "The uneasy stillness of a death watch had settled over Peenemünde."[107]

The newly relocated EMW set up its headquarters in the town of Bleicherode, not far from Mittelwerk. Those Peenemünders who arrived safely set themselves to work trying to organize themselves in their new accommodations. Efforts to restart the program began, and its administrators expected to have operations fully reset by July.[108] Rossmann wrote to Dornberger that a crash program for improvement in the V-2 was in development.[109] In March, his staff reckoned that these modifications could be brought on line by September 1945, and laid development plans stretching six months into the future.[110] Engineers busied themselves with other tasks as well. The Taifun anti-aircraft missile, a small, unguided weapon initiated by Luftwaffe Lieutenant Klaus Scheufelen and developed at Peenemünde, received much of their attention during this period. This desperation project began in the late summer of 1944, and by March 1945, Peenemünde engineers, now in Bleicherode, sought to clarify what development problems remained and how they could give Mittelwerk the help necessary to quickly bring it into production. However, the test stands built to launch the seventy missiles delivered had not been completed. Two, constructed by concentration camp prisoners, of course, were nearing completion, while two more were still in the planning stages and would be located somewhere in the vicinity of Mittelwerk. In addition, EMW managers agreed to subordinate a number of

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[107] Huzel, *Peenemünde to Canaveral*, 142.

[108] "Investigation of Rocket Research, Elektromechanische Werke GmbH," C.I.O.S. (Combined Intelligence Objectives Subcommittee) Report, Allied Operational and Occupational Headquarters, WWII, Entry 13D – General Staff, G-2 Division, Box 93, RG 331, NARA.

[109] Rossmann to Dornberger, 2/27/45, RH8/v.1307, BA/MA.

[110] Schneider, Niederschrift über die Entwicklungsvorbesprechen bei B.z.b.V. Heer am 20. und 21. März 1945; Graphische Darstellung der Entwicklungsvorhaben gemäss Entwicklungsbesprechung von 21. u. 21.3.45, RH8/v.1307, BA/MA.

engineers to a test engineer from the Luftwaffe in order to streamline the development process as much as possible.[111] Von Braun had little faith in Taifun, but the industrious work of others continued to advance this desperate and relatively primitive project, which never had any hope of breaking the "terror bombing."[112]

In early March, von Braun drafted a seven page proposal for laying out the development and production areas in *Sperrgebiet Mittelbau* for the V-1, V-2, Schmetterling, and Wasserfall missiles. The outlook was bleak. Because of security considerations, continued testing for the V-2 and Wasserfall could no longer be conducted. The area around Bleicherode was filling with refugees, who occupied not only possible factory spaces, but also accommodations needed to house factory workers. Von Braun concluded that while some expansion of the underground facilities was possible, time constraints did not make this a viable option. Rather, he held that above ground construction of machine shops, testing facilities, barracks, and assembly plants was absolutely necessary. Von Braun argued that "All working and living space not already requisitioned" must be augmented by new construction, suggesting also that more space might be made available if they occupied buildings being used by refugees from the East and employees of other factories in the area.[113] It is worth mentioning again that all new construction would be carried out by concentration camp prisoners. Huzel, who joined von Braun at Bleicherode in March and received personal instructions from the Technical Director to help reestablish

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[111] Aktenvermerk über Taifun – Besprechung am 24.3.45 bei den Elektromechanischen Werken GmbH, RH8/v.1941, BA/MA. Present at this meeting were a number of middle and upper level engineers, including Konrad Dannenberg, Hans Hüter, and Klaus Scheufelen, as well as Storch, Dornberger, von Braun, and Sawatzki.

[112] Von Braun dismissed the Taifun in early December '44, telling his shop managers to treat it as "filler work." Neufeld, *The Rocket and the Reich*, 255.

[113] Von Braun, Antrag auf Genehmigung und Einstufung eines Bauvorhabens der Entwicklungsgemeinschaft Mittelbau, 3/6/45, RH8/v.852, BA/MA.

plant operations, recalled that "even in the face of such hopelessness, I observed, von Braun's agile mind continued to function and to plan ahead."[114]

Analysis of von Braun's motives can be nothing more than pure speculation. Though it is possible that he may have merely been, as Neufeld has argued, "putting on a show for the ever-watchful SS," it should be considered equally plausible that, despite his misgivings, von Braun was caught up in the self-same institutional inertia that he himself helped create. With the majority of the German population, including the engineers engaged in missile work, whipped into a final spasm of xenophobia by the regime, why should von Braun be expected to be a lone rational voice who understood that resistance was no longer practical? To be sure, the engineer was most certainly not caught up in the Nazis' calls to fight to the death for Germany. Nevertheless, he had long since totally imbued himself with Peenemünde's mission of service to the state, and his deep paternal interest in the program was not so easily cast aside, especially by one who dedicated his entire professional life to it. The narrowed sense of responsibility engendered by the years at Peenemünde had cut off any option but to forge ahead as best as possible. As Huzel put it, "We had no sensible choice but to continue working."[115] Von Braun, who helped establish this narrowed professional vision, was a victim of it as well.

In Dora-Mittelbau, the worsening war situation had an even more dramatic effect. In January 1945, thousands of evacuees from Auschwitz, Gross-Rosen, and other camps in the East began arriving, worsening a food situation that was tenuous at

[114]Huzel, *Peenemünde to Canaveral*, 147.
[115] Ibid., 133.

best.[116] The population of prisoners in the entire complex of camps skyrocketed from approximately 27,000 in November 1944 to over 40,000 in March 1945.[117] The food supply, already stretched to the breaking point just to feed the German population, could not handle the strain of the added prisoners, and deaths due to starvation soared. Between the end of December and the beginning of March, over 5300 people in the complex perished, 1090 of whom, or just under twenty percent, lived in Dora.[118] Among this number are the prisoners who died because of mass hangings that took place in March under the orders of the new camp commandant, Richard Baer. The executions, 162 in all, took place inside Mittelwerk, and the bodies were left dangling for twenty-four hours so that all employees of the factory could view them.[119] Despite these horrific circumstances, the factory continued to turn out missiles, with at least 362 V-2s emerging from the tunnels in March.[120] In the fifteen months since August 1943, the missile program's administrators, along with their partners in the Armaments Ministry and SS, expanded the tunnel complex under Kohnstein, relocated and installed a huge factory, and pumped out 5789 V-2 missiles. It is a feat that boggles the mind both for its technological accomplishment and the horrific brutality with which it was achieved.

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[116] See transport lists on Roll 18, RG 04.006M, Nazi Concentration Camp Records; Roll 161, 196.A.0342 National Archives Captured German Records Collection, both at USHMM.
[117] Manfred Bornemann and Martin Broszat, "Das KL Dora-Mittelbau," *Studien zur Geschichte der Konzentrationslager*, Schriftenreihe der Vierteljahreshefte für Zeitgeschichte, 21 (Stuttgart: Deutsche Verlags-Anstalt, 1970), 191-194.
[118] Wincenty Hein, "Lagerstärke in KL Dora," U.S.A. vs. Kurt Andrae, et al., roll 1, M-1079, NARA.
[119] Erich Ball Testimony, U.S.A vs. Kurt Andrae, et al., roll 1, M-1079, NARA. Baer arrived from Auschwitz on February 1 to replace Förschner, who assumed command at Kaufering. Jens-Christian Wagner, *Produktion des Todes: Das KZ Mittelbau-Dora* (Göttingen: Wallstein Verlag, 2001), 200.
[120] Neufeld, *The Rocket and the Reich*, 263. According to Neufeld, documentation exists only for missiles shipped up to March 18.

At the beginning of April, Kammler ordered that nearly 500 people in the missile program evacuate Bleicherode to Oberammergau, in Bavaria. Allied armies had collapsed the western front and were streaming into Germany. The core of the Peenemünde group, including von Braun, Dornberger, and many others, proceeded south by car and train. A U.S. intelligence report filed shortly after the war and based on interviews with former Peenemünders points out the profound impact that years of Nazi propaganda about Germany's final victory had on these engineers and their lasting faith in the Nazi regime. Investigators explained that when the Peenemünders arrived in Bavaria, "It was thought by some that they would enjoy somewhat of a vacation until the Wehrmacht drove the Allies back across the German border, at which time the research people would return to their work."[121] This conclusion, along with Kammler's *orders* to evacuate both Peenemünde and Bleicherode, destroys claims voiced loudly after the war by the Peenemünders that they knew that the war was over and that they did everything they could to avoid the Russians and give themselves up to the Americans. It is more accurate to say that some still held on to a shred of hope that the regime would survive and that they could resume their work in short order. Even in the face of total collapse, some Peenemünders still held on to their belief, born of years of Nazi propagandizing, in a final, miraculous victory.

This intelligence also forces a reevaluation of another act during the last weeks of the war. In early April, Dieter Huzel and Bernhard Tessmann, both long time Peenemünders, buried Peenemünde's most important documents in a mine northwest of Mittelwerk. Huzel and others' plausible claim is that they did this so that they could use it as a bargaining chip in their dealings with the Allies at the end

[121] C.I.O.S. Report, "Investigation of Rocket Research," Box 93, Entry 13D, RG 331, NARA.

of the war. However, in light of the U.S. intelligence report indicating that some engineers were still convinced of the Wehrmacht's ability to hurl the Allies back across the Rhine, their view of the inevitability of Allied takeover, trumpeted after the war's conclusion, must come into question. It is perhaps equally plausible that yet another reason to keep the documents at arm's length from the Americans and British was based on the chance that Germany might still be victorious. In any case, Huzel put himself in grave danger by carrying out this task. He spent an anxious number of days dodging Allied soldiers and airplanes in his quest to hide the documents, retrieve his wife from Berlin, and then drive to southern Bavaria to reunite with his colleagues.[122]

The Peenemünders had meanwhile spread themselves out in the hotels and resorts outside of Oberammergau. They did no work and merely waited for the war to end and to surrender to the Allies.[123] On May 2, Magnus von Braun, at the bidding of Dornberger and his older brother, rode his bicycle down the mountain and surrendered himself and the rest of the 500 missile specialists on the mountainside to the U.S. Army.[124] The German missile program, with its modest roots the Weimar rocket societies, its meteoric rise under Army supervision, its culmination at the

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[122] Huzel remembers that road blocks were set up all over Germany. However, even at this late date, secrecy provided the Peenemünders with the privilege of passing them by with no trouble. Everywhere little units were setting up road blocks, defense establishments, vain efforts to hold back the inevitable," he wrote. "Always our 'Secret Material' pass got us through. *Destination: Classified,* it proclaimed." Huzel, *Peenemünde to Canaveral*, 168. On his adventures across Germany, see 148-180.
[123] During this time, aerodynamicist Hermann Steuding, a Nazi Party member and troubled with the prospect of having his skills put to use either by the western Allies or the Soviet Union, disappeared and was rumored to have committed suicide.   Frederick Ordway and Mitchell Sharpe, *The Rocket Team: From the V-2 to the Saturn Moon Rocket* (Cambridge, MA: MIT Press, 1982), 268.
[124] Neufeld, *The Rocket and the Reich*, 265.

world's most advanced missile research facility, and its descent into barbarism, had finally come to an end.

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The closing months of the war brought about the slow end of the formative period in the lives of the Peenemünders. The years at Peenemünde were marked by close friendships, deep professional satisfaction, and a life free of most wartime difficulties. All of this was cast through a prism of Nazi ideology and state secrecy. Employees of the Peenemünde missile base had a deep connection with their work and each other. In the last months of the war, they continued to work as long and as hard as they could, a result of the lasting devotion to the tasks in front of them that was instilled by Peenemünde's institutional culture. In taking the initiative to perform such tasks, the Peenemünders were in effect making a clear statement of their personal and political loyalties. The technical work, sometimes brilliant, sometimes outrageous, was a key indicator of such loyalties. The surrender of the leading technical experts to the United States signified the end of the missile base's existence, but its work, as well as its culture, would be perpetuated in the years afterward by those Germans who came to the United States. It was a system and a culture that worked, both technically and politically, and it has a legacy that stretches into the twenty-first century.

Conclusion

Engineering Consent at Peenemünde

> A screaming comes across the sky. It has happened before, but there is nothing to compare it to now.
>
> Thomas Pynchon, *Gravity's Rainbow*[1]

In the summer of 1945, when the former Peenemünders were awaiting transfer to the United States, a team of interrogators from the U.S. Third Army was assigned to screen the specialists for potential security risks before their departure. In short order, they discovered that these people could not be evaluated as individuals, as single experts who might be considered reliable from a political standpoint. Rather, they were "a closely knit research enterprise, firmly controlled and carefully chosen by Dr. Dornberger and Professor von Braun." Army investigators also noted the pull of National Socialist ideology, made clear in the Peenemünders' conversations about Germany's victimization at the hands of Communist hordes in the East and the service that their nation performed for the West. In the end, however, the report noted something even larger and more influential on the Peenemünders' outlook:

> The cohesion of the group and their persistence in ideas ranging from German patriotism to Nation-Socialism [sic] is explained by a number of factors. The lived a secluded life on the island of Usedom in which they were not excessively bothered by the party. They were an Army concern, a closed corporation, carefully supervised by the Abwehr in matters of choice of personnel and security. They were enthusiastic technicians with the mission, according to Goebbels, of saving Germany. As a team they were granted all the financial support, materials, and personnel they

[1] Thomas Pynchon, *Gravity's Rainbow* (New York: Viking Press, 1973), 1.

> required, within the means of the German war machine. Continuance of the work depended on continued conduct of the war. At a time when the generals were dissatisfied with the party rule to the extent of attempting to overthrow it, Peenemünde was out of touch and sympathy with such developments – not for love of the party necessarily but because their work and the war were one.[2]

The Peenemünders were hardly the apolitical technocrats that they claimed so loudly to be.

The U.S. Army investigators had discovered something that would be largely forgotten or ignored by chroniclers of the German liquid fueled missile program in the years after the war. The post-war apologetics and denials offered by the Peenemünders focused on a supposed distaste for both the regime and the purpose of their work. In the narrative established by this effort, the missile specialists cast themselves as apolitical technocrats, unhappy with the war and forced by the regime to use slave labor. According to the Peenemünders, the only group engaged in oppressing the concentration camp slaves was the SS, while they themselves made every effort to ease the prisoners' suffering. The truth is something else entirely.

The ideas underpinning the Army's insightful intelligence report came about because of the specialists' socialization into the secret world of the Peenemünde missile base. Half-military facility and half technological Shangri-la, Peenemünde created a cultural environment in which the needs of the regime and the needs of the missile specialists were inseparably intertwined. The Army's construction of the base carved a space in which its employees and their families could live and work, but also in which their activities could be closely regulated. The idea was to create a closely-

[2] Osborne to Army Chief of Staff, G-2, USFET, Appendix A, Walter Jessel, Special Screening Report, 10/29/45, RG 260, OMGUS/FIAT, Box 8, folder 47.94, NARA.

knit community out of which a revolutionary weapon might spring. To design such a weapon required the deep commitment of a huge group of civilian laborers made up of engineers, scientists, technicians, craftsmen, secretaries, and assistants. Through a complex combination of secrecy, regulation, professionalism, and reward, the system came to function so that individuals subject to its rules adhered to them and reproduced them automatically. The result was a group of specialists who all came to instinctively identify with the goals of their work. The deeply self-interested Peenemünde employees became the model of a compliant citizenry in which employees led a pleasant life while conducting interesting work and enjoying each other's company. This led them to do their level best to protect the regime that made their situation possible. That their fortuitous state of affairs was brought about by a genocidal regime that engulfed the continent in a catastrophic war made the circumstances of their acquiescence all the more insidious.

The dynamism of the German ballistic missile program stemmed from the active identification of the specialists themselves with the objectives of their work. The Peenemünders understood that they could rely on the best efforts of their colleagues, even those that they did not know, because none of them doubted the value of what they were doing. This in turn promoted trust and understanding, enabling them to rely on each other to carry out their tasks to the best of their abilities and bring about the final achievement of their objective, even when they had no personal or consistent supervision. A large institution like Peenemünde, with its sizeable population, would not have seen the success it did if dissent seeped into the fabric of the work. To be sure, the size and complexity of the facility opened up numerous opportunities for dissent, which might have been registered by such nondescript actions as bureaucratic inefficiency, work slowdowns, or unwillingness to put in overtime – a constant demand, given wartime pressure. That virtually none of this took place among the missile development specialists is a testament to their profound dedication to their tasks and belief in the work.

Every facet of the Peenemünders' world was suffused with National Socialist ideological messages and thoroughly imbued with deep secrecy. This proved to be a poisonous combination. Secrecy was not the single overriding factor in decisions made at Peenemünde, but it did provide a framework for those decisions. It must be taken at least as an important factor in the complex cultural dynamic at the base, and its influence in other historical circumstances must be investigated as well. Historians of the Nazi period have long ignored secrecy as an influencing factor in the behavior of historical actors. Too often, they have not paused to consider the important meaning of the bold "Geheime Reichssache!" or "Streng Geheim!" stamps on important documents, the solemn oaths of secrecy given by individuals or groups, or the omnipresence of police and guard posts dotting the landscape. Nor have historians considered concepts that they represent. Objects such as stamps and signed declarations, along with the myriad of other secrecy regulations and activities, were in fact daily indicators of inclusion in a strictly limited club that only a small group of professional elites had entrance to. Activities conducted within this community were expected to stay there, and outside influences were explicitly cut off. At the same time, the stamps were also projections of state power into the daily world of the Peenemünders, reminding them of both the importance of their work and the presence (or lack thereof) of state coercion. All of this resulted in an important dynamic that both offered the Peenemünders a sense of elitism while also narrowing their political, moral, and ethical choices and restricting contravening views.

Indeed, with the rise of the national security state in the post 9-11 world, historians are in a position to make an important contribution to an understanding of both the beneficial and destructive effects that secrecy has on groups and individuals. It is a powerful social and cultural phenomenon that exercises a potent influence over those it affects. Historians' failure to address it as such leaves a deficit in our understanding of society and culture generally. The broader effects of secrecy are not necessarily unique to Nazi Germany and have parallels in contemporary events, making an understanding of the phenomenon all the more important.[3]

Of course, secrecy is a complex phenomenon. Its presence does not necessarily equate with moral depravity or the formation of ill-informed assumptions.

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[3] For example, in order to publicly justify the case for going to war in the Middle East in 2002, the Bush Administration used a CIA intelligence estimate that Saddam Hussein's Baathist regime in Iraq possessed weapons of mass destruction. The Senate Select Committee on intelligence later found that estimate to be fundamentally wrong, that the analysts had left unchallenged an institutional belief that Iraq had illicit weapons of mass destruction. It accused the analysts and intelligence chiefs of succumbing to erroneous assumptions because of what it called "group think," which it argued was a result of the utter secrecy in which the estimate was prepared. The Committee blamed intelligence officials who "did not encourage analysts to challenge their assumptions, fully consider alternative arguments, accurately characterize the intelligence reporting, or counsel analysts who lost their objectivity." The absence of outside analysis and opinion crippled the findings in the intelligence estimate from the start. See "Panel Condemns Iraq Prewar Intelligence," *Washington Post*, July 10, 2004, 1. "Senators Assail C.I.A. Judgements on Iraq's Arms as Deeply Flawed," *New York Times*, July 10, 2204, 1. Also troubling is the evidence and allegations in 2004 of the torture of detainees held at Abu Ghraib Prison, the Guantanamo Bay detention center, and elsewhere. Though as of this writing, the full outlines of the abuse are not clear, it is apparent that the disturbing events that took place inside these facilities did so within a culture of secrecy and neglect. The secrecy around these prisons helped create a universe that operated under fundamentally different norms than the outside world and restricted the important corrective function allowed by full and open access. In both cases, secrecy set up a barrier between the outside world and the secret world, a world within which the activities performed are meant to stay and in which false assumptions and bad logic can fester and reproduce. These cases call for a deeper understanding of how secrecy interacts with other socio-cultural issues and functions to both empower and corrupt. See "New Papers Suggest Detainee Abuse was Widespread," *Washington Post*, December 22, 2004, 1.

A comparison with the other "big research" undertaking of World War II, the Manhattan Project, specifically the Los Alamos research laboratory, is highly instructive for many different reasons, one of which is that it offers the chance to examine the physicists' relationship with secrecy. The base at Los Alamos was a military facility under the overall control of Brigadier General Leslie Groves, but staffed with civilian experts who were managed by J. Robert Oppenheimer. The administration of the Manhattan Engineering District centralized its atomic bomb researchers on top of an isolated, dusty, windswept mesa at Los Alamos in early 1943. Its remote location made for excellent security and easy monitoring of individuals coming and going from the base. Moreover, it contributed to the sense that it was an isolated cloister (J. Robert Oppenheimer once referred to it as a "monk's colony") that was populated by like-minded physicists and engineers who were dedicated to the goal of producing an atomic bomb.[4] Upon arriving at Los Alamos, all new employees received a series of lectures that indoctrinated them into security measures and briefed them in on present state of the work. As at Peenemünde, the secrecy around the project and the chance to be let in on it was a source of excitement. Physicist L.D.P. King clearly recalled the great anticipation of "going to a secret new place."[5] Karan McKibben, whose father worked at the laboratory, wrote that "The number of fences behind which our fathers disappeared every work day added an aura of intrigue to their already mysterious work in sundry,

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[4] Peter Bacon Hales, *Atomic Spaces: Living on the Manhattan Project* (Chicago: University of Illinois Press, 1997), 42.

[5] L.D.P. King, "The Development of Nuclear Explosives and Frontier Days at Los Alamos," in John Allred, ed., *Behind Tall Fences: Stories and Experiences about Los Alamos at its Beginning* (Los Alamos: Los Alamos Historical Society, 1996), 62, 64. King arrived at Los Alamos in 1943.

odd shaped buildings."[6] As at Peenemünde, secrecy created an element of elitism, privilege, and value of the work among those who were privy to the activities at Los Alamos.

In the laboratories, Los Alamos physicists found great professional satisfaction coupled with extraordinary military pressure. The work, so advanced as to be alien to outsiders, was conducted in an atmosphere of informality and collegiality that one might come to expect from a small community of super-elite specialists. The language used to express it was utterly foreign to all but the small community of atomic physicists.[7] Social life was also deeply fulfilling. Many laboratory employees took up hiking, skiing, and other recreational activities. Most employees held dinner parties and weekend events, while dances, plays, and skits were popular.[8] Such events served to draw the Los Alamos scientists even closer together. All the while, the employees of the laboratory never forgot that they were there to construct a weapon that, as opposed to the V-2, was so destructive both physically and psychologically that its application would crush the will of its enemies to continue. Fifty years after the conclusion of hostilities, the physicist L.D.P. King expressed his thoughts on life and work at Los Alamos in terms that might just as easily have been repeated by a missile engineer at Peenemünde.

> I would like to say that to have been able to work at the Laboratory during those early, vital, and important years was indeed a memorable experience. The excitement of a small frontier community plus the excitement of working on a new frontier of science and technology cannot often be combined. Where else

[6] Karan McKibben, "Behind Tall Fences," in Allred, ibid., 179.
[7] Hales, *Atomic Spaces*, dubs it "speaking in tongues." See 243-272.
[8] Arthur Wahl, "Los Alamos, 1943," in Allred, *Behind Tall Fences*, 173. Wahl was a radiochemist at Los Alamos.

> could one have had so many technical developments in so short a time; where else could one culminate the efforts and singleness of purpose of so many famous men but here in those momentous years of 1943, ’44, and ’45?[9]

Where else but half way around the globe on an island on Germany’s Baltic coast?

The cultural parallels between Los Alamos and Peenemünde are in some ways striking. What, then, is to be made of the Peenemünders’ decisions to offer the Nazi regime their full support, seek out the SS to provide slave labor for their production work, directly or indirectly participate in the abuse and murder of concentration camp prisoners, and work with a furious desperation to reverse the tide of the war in its last few months, especially in light of the close parallels between the two institutions? In the first place, Germany’s unique historical circumstances in the interwar years were of fundamental importance. Hitler promised and delivered Germany’s rebirth, and weapons engineers, who came of age in the conservatively charged atmosphere of the technical universities, owed him a great deal. The Peenemünders in particular were deeply in the Nazis’ debt. Moreover, missile specialists on Usedom proved to be intensely self-interested. Like those at Los Alamos, their work kept them off of the front lines and safely tucked away in a comfortable community that for a long time managed to avoid the deprivations of war. They were paid well and received both professional and official adulation. Continued efforts to fulfill the program’s goals meant the maintenance of this situation, something nearly all Peenemünders were loath to give up.

Even so, these factors still do not fully explain their descent into moral abomination and the belief that slave labor was the proper course to fulfill the

[9] L.D.P. King, “The Development of Nuclear Explosives,” in Allred, *Behind Tall Fences*, 67.

program's objectives. Of more immediate and direct importance was the pervasiveness of National Socialist ideology and rhetoric in which their work was framed. Years of public adulation of Hitler and the Nazis appearing in print and on the radio, numerous speeches about Germany's victimization at the hands of nations east and west, and never-ending grandiloquence about the international conspiracy that forced war upon Germany created a hyper-nationalist, xenophobic atmosphere that was intensified by the increasing violence of the war. Even if they were not dedicated Nazis, the Peenemünders came to see these bromides as unshakeable truths. Like many Germans, they internalized these feelings and turned them into action to defend their nation. The fact that all of this took place in the framework of deepest secrecy made for an even more poisoned environment by reinforcing received assumptions, limiting conceivable alternatives, and even making possible acts that might be expected to never see the light of day. In short, it ensured that there would be no opportunity to carve out a counter or dissenting discourse. The toxic atmosphere that these two factors ushered in, coupled with the real benefits of working where they did, is of fundamental importance in explaining how it was that employees at Peenemünde came to embrace slave labor specifically and the Nazi regime generally.

As Michael Neufeld first pointed out, the rise of National Socialism was an important component in the development of this most radical weapon, supplying the materials, bureaucracy, and finances to push the work forward in the context of aggressive rearmament and then global war. Battles over priority of the weapon system and conflicts over controlling it aside, the Nazi regime provided important human resources and raw materials necessary to carry out the work.[10] However, the will to actually complete their tasks was supplied by the Peenemünders themselves. It was a will that stemmed from a deep identification with the work and with each other. Without it, such a complex technological system as a ballistic missile could not have been invented in so short a time. "Self-mobilization," a term first supplied by Karl-Heinz Ludwig, is an apt description of what the Peenemünders engaged in daily while developing the missile. Throughout their time on Usedom, they worked furiously to complete their Herculean task, not, as they would claim later, primarily because they feared for their lives or wished to explore space, but because they were so profoundly and prosaically self-interested. Employment on Usedom gave them comfortable accommodations, stimulating work, excellent pay, professional satisfaction, and a vibrant social life. Peenemünders consciously understood that they owed the good circumstances of their lives to their skills and to a Nazi state that valued what they could do for it. In turn, they felt an internal compulsion to work as hard as they could on behalf of the regime that sponsored their work.

In addition, Ludwig found among engineers in Nazi Germany both strong ideological and practical reasons for supporting Hitler and the regime. The same is true in the more specific case of the Peenemünders. The institutional practices that employees found at the base connected them to the nation and the regime in novel ways. The Peenemünders had a clear vision of what was best for both themselves and the nation. This vision and that of the Nazis mutually reinforced each other, and the Peenemünders engaged in very little systematic reflection about the direction that

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[10] Michael Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era*(Cambridge: Harvard University Press, 1995).

National Socialism was taking them. For them, crucial political issues turned on the quality of social and cultural conditions that made up their lives. Their perceived role in the nation as well as the duty assigned to them by the regime encouraged varying degrees of affinity that were nonetheless long lasting.[11] Some were at least sympathetic to Nazism while others were outright supporters, but ideology was only one factor among many in play at the facility. Technological fascination, nationalism, money, and careerism all joined with ideological considerations to play key roles in building a compliant community of consent at Peenemünde.

After the war, in late 1945 and early 1946, the U.S. Army transferred 120 former Peenemünders, representing the core of the group that previously worked on Usedom, to Fort Bliss Texas, where it assigned the group to assist in V-2 experiments that were to take place in White Sands, New Mexico and help with Project Hermes, the United States' own missile program.[12] The former Peenemünders distanced themselves as much as possible from the Nazi regime, telling anyone who asked that they only wanted to build rockets to explore space and were forced by the Nazi party

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[11] Indeed, support for the Nazis is no longer to be understood as the result of dislocation, crisis, and collapse. Historians now acknowledge the broad popularity of the Nazis and the strength of the relationship between average Germans and the regime. See Alf Lüdtke, *Eigen-Sinn: Fabrikalltag, Arbeitererfahrungen und Politik vom Kaiserriech bis in den Faschimsus* (Hamburg: Ergebnisse Verlag, 1993); Donna Harsch, *German Social Democracy and the Rise of Nazism* (Chapel Hill, NC: University of North Carolina Press, 1993) shows that the Nazis were more successful than other parties because they mobilized the idea of a new, forward-looking national identity that was not associated with the defeats and losses in the past.

[12] Frederick Ordway III and Mitchell Sharpe, *The Rocket Team: From the V-2 to the Saturn Moon Rocket* (Cambridge, MA: MIT Press, 1982), 310-317. Von Braun commented on their time at Fort Bliss and White Sands, "Frankly, we were disappointed with what we found in this country during the first year or so. At Peenemünde, we had been coddled. Here they were counting pennies." Ordway and Sharpe, 352. The Soviet Union also took part in the intellectual plundering of the German missile program, but the specialists who found themselves launching the V-2 at a site outside of Stalingrad were never fully integrated in the Soviet missile establishment in the way that the Peenemünders who came to the U.S. were. They were headed by Helmut Gröttrup, who, along with von Braun and others, was arrested by the Gestapo in 1944. Ordway and Sharpe, 318-343; Irmgard Gröttrup, *Rocket Wife* (London: Andre Deutsch, 1959).

and SS to build missiles using slave labor. The U.S. Army helped them in their obfuscation burying their records as best they could.[13] The only high-ranking individual to be brought before a war crimes tribunal was Georg Rickhey, Mittelwerk's General Director. He convinced the court in 1947 that he was also a pawn in the machinations of the SS and did everything he could to help the prisoners. The court found him not guilty and released him.[14] After this brief and mild embarrassment for the Army, the worst of the incidents were behind the missile specialists until Rudolph came under investigation in the early 1980s. Throughout the Cold War, the former Peenemünders carefully cultivated an image that distanced themselves from their Nazi past and played up their dedication to the United States' space program that was engaged so heavily in the space race with the Soviet Union.

In 1950, the group found itself transferred to Redstone Arsenal in Huntsville, Alabama. Here, they re-established the system of "everything under one roof" that had worked so well for them at Peenemünde.[15] This style of organization, which had proven highly efficient in the war years, also maintained the cohesion of the Peenemünde group. Only after they were organized in this way and given the proper resources did the U.S. rocket and missile program truly blossom. For instance, Dornberger's "Everything under one roof" concept proved pivotal in the development of the Redstone and Jupiter missiles.[16] Shortly after, the Army transferred the group over to NASA when that organization was created in 1958. In the following years,

[13] Linda Hunt, *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip, 1945 to 1990* (New York: St. Martin's Press, 1991), 41-77. Hunt sees a Pentagon conspiracy to bring Nazis to the United States, but it closer to the truth is that it was a combination of technical expedience and Cold War politics that brought the Peenemünders to the United States.
[14] See the record of the trial, "United States vs. Kurt Andrae, et al.," M-1079, RG 226, NARA.
[15] Neufeld, *The Rocket and the Reich*, 271.
[16] See Ordway and Sharpe, *The Rocket Team*, 363-387. A Redstone rocket carried John Glen into space.

they would come to dominate the U.S. space establishment. Von Braun went on to become the Director of the Marshall Space Center in Huntsville, Arthur Rudolph was the Project Manager of the Saturn V rocket program, and Kurt Debus, the Director of Testing at Peenemünde, became the first Director of the Kennedy Space Center in Florida. The group's enthusiastic pursuit of space exploration contributed to the strengthening of the narrative that they had no love for National Socialism and pursued the work they did at Peenemünde for purely humanitarian and scientific purposes. It was buttressed by a raft of books and articles that celebrated their achievements, but ignored the dark side of their records. Despite some necessary corrections, this style of work continues to proliferate.[17] In any case, their group cohesion was an essential part of the successful Apollo missions to the moon and also the growing proliferation of more and more advanced inter-continental ballistic missiles in the Cold War. Through all of their assignments, nearly all of the Peenemünders kept in close touch and spoke warmly of their days on the Baltic coast.[18] Most of the remaining specialists have retired to Huntsville and still correspond with each other.

The persistence of the Peenemünders' group cohesion and identification is further evidence of the profoundly formative impact that living and working on Usedom had on their lives. The Peenemünde missile research facility melded a group of individuals into a community of shared condition, discourse, and belief. The

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[17] See Ordway and Sharpe, *The Rocket Team*, Thomas Franklin (pseudonym for Hugh McInnish), *An American in Exile: The Story of Arthur Rudolph* (Huntsville AL: Christopher Kaylor, 1987), Marsha Freeman, *How We Got to the Moon: The Story of the German Space Pioneers* (Washington DC: 21st Century Science Associates, 1994), Guido de Maesseneer, *Peenemünde: The Extraordinary Story of Hitler's Secret Weapons V-1 and V-2* (Vancouver: AJ Publishing, 2001).
[18] Konrad Dannenberg, personal correspondence with author, May 27, 2003.

dynamic nature of the project developed out of the initiative that the program's personnel brought to their work, and they would come to define what it meant to be a professional missile developer – the proverbial rocket scientist. All of this was founded upon a single idea, and within this group, no one questioned the base's central mission of producing missiles for the purposes of defending the Nazi state. This axiom became so powerful during the war that it pushed aside all other considerations and made it possible for the missile specialists to thoroughly enmesh themselves in the structures and practices of the National Socialist regime. Though bureaucratic battles took place over control of the program, the demands of the technology as well as the shared goals between the Peenemünders and more radical elements in the regime ensured that cooperation, not competition ruled the day. This was what they themselves interpreted as the appropriate behavior of their organization. In the end, this interpretation led not only to one of the twentieth century's most impressive technological achievements, it also resulted in one of its most heinous crimes. Indeed, in order to continue to enhance our understanding of the hold that National Socialism had over many Germans like the Peenemünders and others, historians must continue to examine the fluid, but important combination of nationalist sentiment, political ideology, cultural practices, and collective identities.

Bibliography

A note on sources

This dissertation is based primarily on documents found in archival collections in Germany and the United States, but is also relies heavily on oral histories, memoirs, and autobiographies completed by participants in the German liquid fueled missile program. In the United States, the majority of documents are to be found in the Fort Eustis (FE) Collection in the archives of the Smithsonian Air and Space Museum (NASM). This collection holds sixty-four reels of the technical and administrative correspondence produced at Peenemünde during the war. In addition, the Air and Space Museum archives contains transcripts of numerous oral history interviews carried out by Michael Neufeld and others. The interviews with the Peenemünders cover everything from technical development to personal anecdotes.

The National Archives and Records Administration in College Park, Maryland (NARA) holds a much smaller, though still significant, collection of documents pertaining to Peenemünde and Dora-Mittelbau. Of particular importance is the record of the U.S. Army Trial of Dora defendants, *U.S.A. vs. Kurt Andrae, et al*., located in the Captured German Documents Collection. Moreover, records relating to Project Paperclip are located in numerous record groups in the archive. Researchers should consult with archivists and finding aids to gain a complete picture of this large, but scattered group of documents.

The United States Holocaust Memorial Museum (USHMM) archive in Washington, D.C. contains several document collections that include videotaped or transcribed testimony given by former Dora prisoners. In addition, important documents such as transport lists and correspondence about slave labor reside in the museum's archive. I also consulted videotaped Holocaust survivor testimonies held at the Fortunoff Video Archive at Yale University in New Haven, Connecticut.

Huntsville, Alabama, the current home of many surviving Peenemünders, has two archives that focus on the post-war period, but can still offer a contributions to a study of Peenemünde in the war period. The Willy Ley Collection at the University of Alabama, Huntsville (UAH) holds the videotaped oral histories of former Peenemünders that were conducted in the early 1980s by UAH sociologist Donald Tarter. The Space and Rocket Center holds most of the Wernher von Braun papers. The collection is limited for researchers of the Peenemünde period, but it is possible to find some key documents.

In Germany, perhaps the most important collection of documents can be found at the *Bundesarchiv/Militärarchiv* (BA/MA) in Freiburg. Many of the original documents that can be found in the FE collection at NASM are located at the BA/MA, but more importantly, a large proportion of the documents missing from the FE microfilm can be found here. The collection at BA/MA is smaller than that at NASM, but no study of Peenemünde is complete without examining these records. For this study, the most important files in Freiburg are those located in the records of the *OKH/Heereswaffenamt* (RH8), but the records of the *Reichsminister der Luftfahrt* (RL1) are also helpful. A smallish amount of interesting candid photos are also available in the records in RH8.

In Berlin, the *Bundesarchiv-Lichterfelde* (BAL) proved surprisingly important. Many key documents pertaining to the administration of Dora are located in NS-4 (*Konzentrationslager*) and NS-4-Anhang (*Konzentrationslager, u.a. Mittelwerk GmbH*). Even more importantly, BAL contains the corporate records of the Mittelwerk GmbH and its umbrella firm, Rüstungskontor GmbH. These valuable records were recently transferred from the *Bundesarchiv Koblenz* can be found in R121 (*Industriebeteiligungsgesellschaft*). Researchers should request this collection ahead of time, as the records are located in the off-site storage facility at Dahlwitz-Hoppegarten.

Though it is a museum rather than an archive, the *Historisches Technisches Informationszentrum Peenemünde* (HTIZP) holds a wealth of information that was central to this study. There are certainly few documents in the collection that cannot be found elsewhere. Nevertheless, the archive, closed to the public, houses some documents and artifacts, such as *Festzeitschriften* and other pieces, that may not be kept by a large state or federal archives. Moreover, curators at HTIZP have gathered dozens of videotaped interviews of former Peenemünders and made them available to me. These videotapes proved to be of surpassing importance, given the reluctance of Peenemünders to hold interviews with those they do not know well. They, along with a collection of rare photographs, are the treasure of the HTIZP collection.

The records of the 1967 West German trial of three Dora defendants were also important. Those in the dock were SS men at Dora, and a large number of civilian engineers were examined by both sides. Many of them had moved from Peenemünde to Dora. This trial was conducted by West German prosecutors, but an East German attorney participated in this effort as well. For this reason, records of the trial can be found a two locations. The primary repository of the trial record is the Nordrhein-Westfälisches Hauptstadtsarchiv Düsseldorf, Zweigarchiv Schloss Kalkum (HStaD-ZA Kalkum). However, many trial documents and a great deal of fascinating correspondence from the East German attorney are held by the *Bundesbeauftragte für die Unterlagen des Staatsicherheitsdienstes der ehemaligen Deutschen Demokratischen Republik* (BStU), or more simply, the Stasi Archive. In the late 1950s and early 1960s, the Stasi also attempted to discredit FRG President Heinrich Lübke, who directed construction at Peenemünde during the war. They were unsuccessful in this effort (they eventually engaged in an amateurish effort to manufacture counterfeit documents to make the point), but in the attempt, uncovered a wealth of information about forced labor at Peenemünde. Documents relating to this topic are scattered across numerous files.

Finally, the Deutsches Museum in Munich holds a large and expansive collection of technical documents pertaining to V-2, Wasserfall, and other ballistic missile development at Peenemünde, filed under German Document (GD) numbers. A substantial part of this collection is made up of correspondence pertaining to patenting and the effort to expand the capabilities of ballistic missiles. Most important for study, however, was the mammoth collection of original photographs held by the Deutsches Museum. The photos depict everything from trial missile launches and buildings on the base to small instruments and technical parts. They make an important contribution to an understanding of the flavor of life at Peenemünde.

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