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Technical advisers and technocrats in the corridors of power: The dialectic between science and technology in the building of an aerospace program in the Third Reich. (Volumes I and II)

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TECHNICAL ADVISERS AND TECHNOCRATS

IN THE CORRIDORS OF POWER

THE DIALECTIC BETWEEN SCIENCE AND TECHNOLOGY IN THE BUILDING OF AN AEROSPACE PROGRAM IN THE THIRD REICH

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
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Dr. William Wright, Faculty Adviser

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by

James J. Hurtak

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This is to certify that I have examined this bound copy of a doctoral thesis by

JAMES JOACHIM HURTAK

and have found that it is complete and satisfactory in all respects,
and that any and all revisions required by the final
examining committee have been made.

DR. WILLIAM E. WRIGHT

Name of Faculty Adviser(s)

Signature of Faculty Adviser(s)

Date

GRADUATE SCHOOL

Dedicated to

Admiral Delmar Stater Fahrney, Col. Holger Toftoy,
and Dr. Robert Lusser who took the German
teamwork to the Moon and opened up a new
chapter for life in outer space.

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ABBREVIATIONS

A-	Aufstellungs-
A-Fall	mobilization
A-Heer	mobilization army
A-Vorarbeiten	mobilization preparations
A K	Abwehr wirtschaftlicher Kampfmassnahmen (RWiM)
A St	Aussenstellen (of RWiM and GBK)
Abt.	Abteilung (department section)
Andr., and, an	Andreas (code for Nachschubstab)
BfdVJP	Beauftragter fuer den Vierjahresplan
d	code for Truppenamt, 1923-34
DAF	Deutsche Arbeitsfront
DDIK	Die Deutsche Industrie im Kriege
EAP-	a document series designation, derived from "Einheitsaktenplan"
F.P.	Fertigungs-Program (Wehrmacht)
FWi Amt, Fwi Amt	Feldwirtschaftsamt (in OKW 1944-45)
g	geheim
GB	Generalbevollmaechtigter
GBA	Generalbevollmaechtigter fuer den Arbeitseinsatz
GB Bau	" fuer die Belegung der Bauwirtschaft
GB Chem	" fuer Sonderfragen der chemischen Erzeugung
GB Eisen	" fuer die Eisen- und Stahlbewirtschaftung
GBK	" fuer die Kriegswirtschaft
GBV	" fuer die Reichsverwaltung
GBW	" fuer die Wirtschaft
gK	geheime Kommandosache (military top secret)
GL	Generalluftzeugmeister
gR	geheime Reichssache (civilian top secret)
GenStdH	Generalstab des Heeres
HA	Hauptausschuss (under RMfBM, RMfRuek)
HL	Herresleitung
HVA	Herresverwaltungsamt
HWaA,Wa A	Heereswaffenamt. Sometimes used with Nss, Wa Stab, Wa Wi, Wi Stab.
I u H	Industrie- und Handelskammer
IWG	Inspektion fuer Waffen und Geraet

k-	kriegswichtige (Betriebe)
l-	lebenswichtige (Betriebe)
L	1. Landesverteidigungsabteilung 2. Luft
LWA	Landeswirtschaftsaemter
ML	Marineleitung
M Wa A	Marinewaffenamt
NSDAP	Nationalsozialistische deutsche Arbeiterpartei
Nss	Nachschubstab
Ob d H	Oberbefehlshaber des Herres
Ob d L	" der Luftwaffe
Ob d M	" der Marine
Ob d W	" der Wehrmacht
OKH	Oberkommando des Herres
OKL	" der Luftwaffe
OKM	" der Marine
OKW	" der Wehrmacht
OKW/WFSt	see WFSt
OKW/Wi Rue Amt	see Wi Rue Amt
Org.	Organisationsabteilung
RAM	Reichsarbeitsminister/-ium
REM	Reichsminister/-ium fuer Ernaehrung u. Landwirtschaft
RFM	Reichsfinanzminister/-ium
RKM	Reichskriegsminister/-ium
RLM	Reichsluftfahrtminister/-ium
RMfBM	Reichsminister/-ium fuer Bewaffnung u. Munition
RMfRueK	Reichsminister/-ium fuer Ruestung und Kriegsproduktion
RVA	Reichsverteidigungsausschuss
RVR	Reichsverteidigungsrat
RwM, RwMin	Reichswehrminister/-ium
RWiM, RWM	Reichswirtschaftsminister/-ium
Rue I, Rue In	Ruestungsinspekteure, -inspektionen
Rue Kdos	Ruestungskommandos
Rue Amt	Ruestungsamt
sth.	code for Heeresleitung Stab. 1923-24
T	Thomas micro-documents in NA
TAT	Truppenamt
T2	-Organisationsabteilung
T3	-Zentrale
VJP	Vierjahresplan

W A	Wehrmachtamt
W A (L)	-Landesverteidigungsabteilung
W A (W)	-Wehrwirtschafts- und Waffenwesen
W A (W Stb)	-Wehrmachtfuehrungstab
wg	geheimme Waffen
W I, W In	Wehrwirtschaftsinspekteure -inspektionen
W O	Wirtschaftsoffiziere
W O-Heer	-of the Army
W O-Luft	-of the Air Force
W O-Marine	-of the Navy
W Ro	Wehrwirtschaftsstab, Rohstoffabteilung (late Wi Rue Amt, Ro)
W Rue	Wehrwirtschaftsstab, Ruestungs-wirtschaftliche Abteilung (later Wi Rue Amt, Rue)
W Stb, W Stab	Wehrwirtschaftsstab
W Wi	Wehrwirtschaftsstab, Wehrwirtschaftliche Abteilung (late Wi Rue Amt, Wi)
WaA	Waffenamt; Herres-; Marine-
WaB	Waffenamt, Beschaffungsabteilung
Wa Stab	Herreswaffenamt, Stabsabteilung
Wa Wi	Herreswaffenamt, Wirtschaftsstab
Wi/I,Wi/IA	
Wi/IF-5/Wi/VI	document series in NA
Wi Amt	Wehrwirtschaftsamt (in OKW 1942-43)
Wi Rue Amt	Wehrwirtschafts- und Ruestungsamt
Wi Rue Amt Stab	Wehrwirtschafts- u. Ruestangsamt, Stababteilung
Wi Stab	Wirtschaftsstab (in Heereswaffenamt, 1927-34)
Wi Stab Ost	Wirtschaftsstab Ost (during WWII)
Wumba	A World War I consortium of forty-five leading German industrial firms
Z, z	Zentrale (T 2 III)
Z P	Zentrale Plannung

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Introduction

The interaction of scientific and political institutions in The Third Reich is explored in this dissertation. It argues that scientific research and development cannot be separated from its social, cultural, and political context. Our model is the German Wunderwaffen (Miracle Weapons) before and during the Second World War.

A careful distillation of the research on the subject has led this author to the premise that if technocrats had been allowed greater independence and support earlier in The Third Reich, research into advanced technology, especially those designed for military weapons, would have greatly aided the German war effort. This impression is borne out if one looks at the declassified personal papers of Georg Thomas and Rolf Wagenfuehr, the discovery of new classified reports of Admiral Delmar S. Fahrney papers, and the personal testimonies of survivors of the Peenemuende group.

The overwhelming consensus among the analysts of German technology and developmental policy regarding the birth of a German aerospace program during The Third Reich is that it was chiefly dominated by Hitler and the German High Command. Hitler built an infrastructure of economic and technological management that was largely answerable to

Hermann Goering.[1]

Under the influence of Hitler and The Third Reich, Germany forged ahead into a strong program of modernization and expansion. To ensure this era of expansion, several leadership commands were established: Fritz Todt, engineering specialist, president of the Association of German Engineers, VDI (Verein Deutscher Ingenieure) oversaw the construction of the Autobahn; I.G. Farben Industries developed and patented important chemicals applications for German industry; and Hermann Goering, Reichsminister for Aviation, and Supreme Commander of the Luftwaffe, established a wide range of institutional programs for the development of new technologies as head of the Four-Year Plan.[2]

The specialists also correctly claim that although a centralized power existed in the hands of a small group in the Third Reich from 1937 to 1942, there was no central plan for the Nazi economy.[3] There developed only several partial plans such as the Four-Year Plan, the Westwall fortification plan and smaller technological and military equipment plans for the supply of fuel and industrial products for rapid modernization. Goering, as head of the Four-Year Plan, worked with the principal industrialists of Germany in establishing a structure of economic control under his authority. Under Goering's administration, the Plan was to control all types of military and economic

agencies, resulting in the creation of a vast military-industrial structure within The Third Reich.[4]

Goering viewed the Four-Year plan exclusively as a show-place for modernization and the pursuit of technical developments operating throughout German industry. He diminished the power of the Ministry of Economics and the traditional military leadership, while reinforcing his own unlimited economic and political ambitions throughout German industry. Economic and military thinkers (like Georg Thomas) and Nazi Party officials opposed Goering's empire building and a great imbalance was created between the Luftwaffe (under Goering) and the Ministry of Economics, as well as with the other military services who desired to have their say in determining long-term planning needs.

As several archival sources have shown, the modernization of Germany led to the securing of markets in the surrounding countries and fostered a desire to reincorporate territories separated as a consequence of the First World War. Initially, the German generals and admirals aided and abetted Hitler's desire for territorial expansion. To acquire territory and economic security and to avoid prolonged war (like the First World War), Germany's High Command devised a Blitzkrieg strategy. When it succeeded beyond their wildest expectations with the fall of Poland and France, they reacted in awe, suspending

reason for a blind faith in the invincibility of the Reich. They no longer sought to develop a stronger industrial complex or advanced military weapons to secure a favorable result from the war.

Although the Blitzkrieg strategy did not allow for planning for total war, the Bavarian Motor Works, the Messerschmitt, and the Reichsforschungsrat files [5] reveal a nascent military-industrial establishment that had various loci during the Second World War. Private papers of such leading thinkers as Ernst Schmidt,[6] father of the studies of heat-transfer, and Wernher von Braun, head of the research team at Peenemuende, contain thousands of pages of transcripts, minutes of formal and informal meetings of Reich officials, memoranda, and other written communications which this writer has examined. By using this new material in combination with the extant but often overlooked sources such as the SS archives, I.G. Farben archives, reports by émigré scientists, and extensive post-war notes on the German economy, it is obvious that the exercise of power was held not only by one, but by several groups who continually vied for control of economic and military power. Through this continual struggle for power an effective and efficient war strategy was neutralized.[7]

German technological developments in air weaponry represented the hope that the military forces could win through a campaign of a short, decisive Blitzkrieg.

However, classified German and American naval documents (some of which this researcher acquired through the Freedom of Information Act) suggest that German engineers and technical experts were stymied early in the war by rival political managements, industrial institutions, and lack of an overall military focus.[8] According to General Georg Thomas (Director of the Economic Staff for tne Armed Forces), full economic and technical mobilization for military ends along the lines proposed by Walter Wever (director of the Research Division of the Aviation Ministry) was sorely needed and a quick advancement to total war should have been promptly initiated. Ironically, the military leadership failed to draw upon a totalitarian economic system for effective technological and industrial developments that would have insured a successful ground and air war.[9]

During the First World War, the military had a precedent for economic planning in the Walter Rathenau policy through which industrial giants could work with the German General Staff in overall supply and demand requirements. However, with the coming of The Third Reich, Hitler decapitated the German military leadership with the removal of General Blomberg and other military leaders. Many military requirements were ignored even by the Reichsleiter and Gauleiter and by those industries which had devised their own unique relationship with the Hitler

government.

Since the new political leadership, neither the milieu and institutions of the Nazi, the Fuehrerprinzip, nor the techniques of politics throughout the rest of the state followed a consistent strategy, the balance of power between institutions and agencies shifted back and forth. Moreover, since the National Socialists were devoid of an ideology that inspired rational function, no one, not even scientists who are essentially rational people, could operate in this environment. There were great difficulties for the technological institutes and their engineering cadres who relied on economic support from political rather than military agencies. In fact, the military was overshadowed by political management. In the end, the German engineers became an independent third force standing between the Party and the capitalists.[10]

The technocrats who foresaw the need for rapid development and new technology were also stymied by the parallel organizations of the military and Party apparatus. This was not to change until the Russian counter offensive and the ascendancy of Reichsminister Speer to head the Ministry of Armaments and Munitions. Albert Speer succeeded Todt as armaments minister in February 1942, after the latter's death in a plane crash. Speer was able to achieve a more effective civilian control over the various military armaments offices and established effective communications

among the industrial sectors. Speer also improved the armament industry through his system of committees and rings. A reliable supply of parts and materials for German war production was thus insured.[11]

Crucial to the war against Britain was the development of the Luftwaffe and the Army's rocket program. Both were children of their time. In order to develop the V-1 and V-2 rockets, specialists had to overcome shortages in raw materials and manpower delivered to research facilities such as Peenemuende. Even the strong support of the German Army High Command could not insure full supply to the scientists. General Walter Dornberger and Wernher von Braun worked on solutions to alleviate the shortages. Besides relying on scientists and engineers in academia, industry, and the military for the supply of manpower to aid in the expansion of technical programs, they resorted to cheap, forced labor which was plentiful in the prisoner of war and concentration camps under the command SS Reichsfuehrer Heinrich Himmler.[12]

A careful reexamination of German scientific and political documents of the Speer Ministry (1942-1945) show that the German High Command did not have a consistent policy for their air force and rocket development programs. They also made several fatal mistakes in shifting priorities of production in their management of armaments and scientific development of new aerospace weaponry.

Moreover, the Party, because of its rivalry with the Luftwaffe, actually worked against Speer's efforts to streamline air power. While many geopolitical mistakes were made, e.g., the shifting of air force manpower to the Eastern front instead of continuing the Battle of Britain, there were managerial-scientific judgments showing rivalry and lack of support for innovations in the air industry.[13]

This study will show that, owing to the conflict between political institutions, crucial technological developments were delayed. Hermann Goering provided no leadership role as the nominal head of the Luftwaffe, and Wilhelm Keitel, the Oberkommando der Wehrmacht (OKW), failed to play a much needed role as coordinator of the Armed Services.

The history of German aerospace science provides a unique opportunity to examine the influence of external factors on the development of modern science. It was the disorganization, the insensitivity, and the inability to understand the significance of science and technology on the part of the political leadership that prevented the scientists from accomplishing their purposes. The failure was not the scientists', but rather the politicians who made it impossible to accomplish their technological aims; thus, created another significant factor which led to the failure of the Third Reich.[14]

International isolation, persistent government interference, and politicized philosophical debates led to obstacles nowhere else encountered with the exception of the pre-war Soviet Union. Dominated by economic, military, and cultural components of the German political institutions, the engineering community was forced to suffer within each of these spheres of confusion.[15]

One sees, then, at the beginning of the war, government agencies made technological decisions based on political agendas. By the end of the war, out of desperation, these agencies would overturn their previous decisions in the hope that the new miracle weapons would save the Third Reich.[16] However, by that time, Germany's industrial base was on the verge of collapse. This was the ultimate frustration for the technocrats and technicians of wartime Germany. Beyond establishing a scientific agenda for rocketry, the most striking development that arose out of the German war effort was that the technocrats and technicians, under Speer's leadership, became innovators who exemplified a new scientific kind of warrior in the modern concept of total war.

I. MILITARY CONTROL OF ROCKET DEVELOPMENT

Hermann Oberth, the father of modern rocketry, focused his early research on the development of a rocket motor called the Kegelduese. The Kegelduese was the first logical step to demonstrate the feasibility of steady combustion of two separate streams of gasoline and liquid oxygen injected into a combustion chamber. In May 1930 he received word from Rudolf Nebel that the Chemisch-Technishe Reichsanstalt in Berlin had offered the use of an experimental area and some workshop facilities to set up a series of experiments.[1]

23 July 1930 was a great day in the history of rocketry and space engineering, the Kegelduese worked beautifully. For over a minute and a half, a three-feet-long fiery jet roared from the exhaust nozzle. The diamond pattern of interacting shock waves clearly proved that the gas left the nozzle at supersonic speeds.[See Appendix A.] Other pioneers watching the events were Franz von Hoefft and Baron Guido von Pirquet from Vienna. Von Hoefft proposed his own generic family of liquid rocket-powered vehicles, ranging from a simple parachute-recoverable meteorological research rocket to modernistic multistage, hydrogen-oxygen powered spaceships. Von Pirquet advocated the establishment of orbital space stations and contributed greatly to the understanding of the fundamental process in

a rocket engine.[2]

In the later part of 1931, more flights were conducted with an improved rocket which was pulled by a nose-mounted motor. Its oxygen and fuel tanks were arranged in tandem. The tail of the rocket accommodated a beer-can-sized container with a parachute. There were several successful flights in which the pencil-shaped rocket rose from one thousand to one thousand five hundred feet and descended by parachute to be used again.

The Kegelduese was a hybrid rocket using pressure-fed gasoline with liquid oxygen. This rather inexpensive rocket was paid for largely out of the pockets of Hermann Oberth, but was destined to become the prototype of the Saturn-V Apollo system that put mankind on the Moon.[3]

These flights and their attendant publicity attracted the interest of the Ordnance Department of the Reichswehr, as the German Army was then known. Rocketry offered an approach to a long-range weapon unrestricted by the Treaty of Versailles, whose authors had limited their provisions to classical artillery. In the spring of 1932, the Raketenflugplatz facility at Reinickendorf, the quasi-private proving grounds of the rocket society, witnessed the first economic support of solid rockets for field artillery under the direction of Dr. Walter Dornberger.

Nebel (a founder of Raketenflugplatz) argued with the military that there was no money for elaborate tests. The

development of instrumentation and future launchings could not go forward without greater funds to operate the Rakenenflugplatz. His arguments did not prevail. Karl Becker, chief of ballistics had made it clear that there would be no military support for the activities at Reinickendorf. However, he was prepared to support serious liquid rocket development work as long as it was conducted behind the fence of an Army enclave. This Nebel initially declined.

After a thorough briefing on the Raketenflugplatz's test, its flight activities, and future plans, an agreement was finally signed stipulating a payment of 1,360 RM, an advanced and still untested version of the rocket of the Verein fuer Raketen (VFR) was to be test-flown on the Reichswehr artillery range of Kummersdorf, sixty miles south of Berlin. The site was equipped with elaborate photographic equipment to track the rocket's flight path.[4]

Becker had a deep-seated concern that any public mention of the Ordnance Department's support of liquid-propellant rocket development might bring about an international controversy which could only result in stopping the Reichswehr from exploring this unique opportunity to circumvent legally the long-range artillery limitations imposed by the Versailles Treaty. This concern was not limited to Nebel and his rocket operation. Indepen-

dent rocketeers and space writers such as E. Winkler, Rolf Engel, and Willi Ley maintained rambling correspondences with rocket and space-flight enthusiasts all over the world.[5] Becker felt strongly that this had to stop if the Reichswehr was to go into secret development of long-range rockets. Just as the word "atom," for centuries an international scientific term without any military connotation, fell under a military veil when a few years later the United States initiated its Manhattan Project, Becker wanted to remove the word Rakete from the German dictionary.

In the midst of depression times the German military's offer for complete support seemed as the most practical way out of insolvency. Those rocketeers who accepted Army offers and contracts had to abide by the new strict classification rules. Among those who failed to receive such contracts or who refused to submit to the new secrecy, there was, of course, some grumbling. Some of them later said they suspected that the Army had used its clout secretly in order to eliminate independent competition from entrepreneurial associations under National Socialism for its own official aspirations. However, not one of the independents had either successful rockets or the resources to develop them.

As work progressed in 1932, the new experimental work on a combustion process in a liquid-propellant rocket motor

was assigned by Karl Becker to the young Wernher von Braun. Becker arranged for the study report to be accepted as a doctoral thesis by the University of Berlin, where he also held a full professorship. The historic report would be classified Geheim.[6]

Von Braun accepted this attractive invitation, although it meant that he had to sever his association with the Raketenflugplatz. He was extremely skeptical about the future of the Reinickendorf establishment. When he thought of all the new elements needed to make a real rocket work --gyro controls, jet vanes, actuators, cut-off controls, feed pumps, and electromagnetic valves--he was sure that the Reinickendorf group in Berlin was utterly inadequate even to commence such a vast program. It seemed that the funds and facilities of the Army were the only practical approach available to advance the cause of space flight. Later, Hermann Oberth would be forced to accept German citizenship or remain in his native Romania because he knew too much of the secret studies developing in Berlin.

Adolf Hitler was not yet in power and did not figure at all in this military reasoning. Nobody at that time, and that included great statesmen in other countries, predicted the magnitude of Hitler's future aggressive exploits. The moral issue, therefore, of the acceptance of an Army research grant in rocketry at that time did not differ from that faced by any of the many aviation-pioneers

accepting grants or contracts from their respective armed forces.[7]

When on 1 November 1932, von Braun began work on his doctoral thesis at a remote test site of the Kummersdorf Proving Ground, he did not imagine that a mere five years later most of his friends at the Rakentenflugplatz would be working together at the great rocketry center at Peenemuende. His university laboratory was only one-half a concrete pit with a sliding roof, the other half being devoted to solid-fuel rocket work. His staff consisted of one mechanic. Six months later the rocket, A-1, was ready. With minimal engineering staff the greatest of all space efforts in the twentieth century was launched--without political management.

By 1935, Wernher von Braun and his colleagues realized their final goal of a new non-air-breathing engine could only be accomplished through the development of new synthetic fuels which would enable rockets to reach the upper atmosphere. Mankind had begun to take the first steps beyond the lower planetary realms.

II. THE GERMAN ENGINEER AND THE NATIONAL SOCIALIST MOVEMENT

From the days of its founding in 1919 and refounding in 1925, the Nationalsozialistische Bewegung included members who were aware of the ideological role engineers would play in the national socialist movement and its mobilization of Germany's resources for impending war. Both Gottfried Feder and Fritz Todt, important figures in the history of the Party, were engineers. Feder, both an economist and engineer, organized a series of National Socialist pamphlets on technology, which were published in the half-decade preceding the seizure of power. A 1930 pamphlet, Nationalsozialismus und Technik: Die Geistigkeit der nationalsozialistischen Bewegung indicated points of convergence between the Nazis and the engineers, as well as themes that were to become recurrent in the propaganda of the Hitler regime.[1]

When the Nazis gained power, they faced the dilemma of institutionalizing ideological perspectives and traditions seemingly at odds with the requirements of political rule in an advanced capitalist society. The institutional focus was to build a national unity based upon a techno-culture using new technology. The Organisation Todt (named after its organizer, Fritz Todt) with its fifty thousand-member NS Bund Deutscher Technik became the Nazis' umbrella organization for college-trained engineers. The NS Bund

published a monthly journal, Deutsche Technik, from 1933 to 1943 and listed as its editors Gottfried Feder, Fritz Todt, and Albert Speer.[2] The purpose of the techno-political journal was to make German technology into a pillar of the totalitarian state and to place the cultural and spiritual attitudes of engineers on the foundation of a broad National Socialist Weltanschauung. The journal was filled with photos of the Autobahnen, which Todt described as primarily a cultural accomplishment, an "expression of the German landscape and German essence." [3]

Todt urged engineers to realize that the Nazis had delivered them from individual egoism and placed before them great national tasks. Technology and science had been rescued from soulless eras and returned to the Volk and to nature.

Deutsche Technik continued to be published until 1944. There was little new or creative in its cultural politics that had not appeared before 1933, except, of course, for the centrality of racial-biological themes and for the sense of cultural deliverance that every essay exuded. Germany was a Kulturnation between the Americans and Soviets. The fragmented liberal, capitalist, Jewish-economic age had been overcome. The Autobahnen were bound to the landscape. Technology had its source in Gutenberg, Goethe, and Luther. The German Geist was seen as a Germanic and historical force which had been disentangled and

liberated from the Jewish Ungeist. In short, there is considerable evidence to suggest that this reactionary modernist tradition persisted into the last days of the Hitler regime.[4]

The institutional roots of German National Socialism within German engineering lay in the technical universities, the national journal of the Verband Deutscher Diplom-Ingenieure, and later the Nazi Party. The professors of the technical universities were acutely aware of the anti-technological views of their humanistic counterparts and were determined to integrate technology into the prestige and status of the national Kultur.

Alongside the professors, engineers played a growing role in the conservative and socialistic movements within the Weimar Republic, particularly large numbers of engineers in Berlin chose to support the Tat Kreis group.[5] Some of their favorite themes bear some resemblance to the ideas of the rightist faction of Bolsheviks, such as the view that technology and authoritarian politics were well suited to one another. The fascination for the Soviet Union one finds in Ernst Niekisch's writings was absent from the tradition of the reactionary modernists. Far more common was the view that Germany was the nation in the middle whose mission was to offer a modern Gemeinschaft different from the soulless individualism of the West and the soulless collectivism of

the East.[6]

The Verein Deutscher Ingenieure (Association of German Engineers) similarly used the propaganda theme of technology and culture. They published a monthly journal from 1909 to 1937 with the title Technik und Kultur which was a title taken from a book of like-minded concepts first published as early as 1906.[7] From 1923 to 1935, this journal was edited by Carl Weihe, an unusually energetic fashioner of an engineering cultural tradition. German scientists as early as the 1880s had portrayed themselves as having the most glorious role in Europe's technological future. Drawing upon Schopenhauer's conception of the will, Weihe and other contributors to Technik und Kultur presented an image of the engineer-artist struggling to beautify the external world in the face of commercial interest bereft of an appreciation or understanding of the metaphysical foundations of technology. Initially, for many young Germans, technology had become confused with the plague of Americanism. Now in the 1930s, they were beginning to see that technology could be understood as carrying hints of a "nobler race...of stronger life-instincts."[8]

Unfortunately, the damage caused by the official German view on the interrelationship of technology, science and culture or what was called "German physics" in the academic and engineering communities is impossible to

calculate in terms of the potential student lost by the émigré scientists vacating positions at the top of their profession. By 1934, the situation was so serious that talk began in industrial circles of compensating for the losses by establishing a Ph.D program in industrial laboratories. A large number of critical vacancies plagued academic departments throughout the Hitler years.

Nevertheless, the propaganda of the Gauleiter and Reichsleiter, in the long run, diminished interest in scientific solutions that were necessary for the war effort. While the Nazis made much of their love of airplanes, by 1943 Germany's production in aviation was only 20 percent of the Allies' in spite of capturing major metallurgical works by the German forces and in spite of significant advances in aviation.[9] Ludwig Prandtl, the most respected aeronautical expert in Germany complained that physics as a discipline had fallen perilously behind the Allies. Mindful of the falling scientific rates of production, it was Fritz Todt, Minister of Armaments, who informed Hitler as early as December 1941 that Germany lacked the required technical capacities to prevail against the Allied coalition. Why Hitler did not respond quickly to this warning can be traced to many factors, one of which stems from his overreliance on his managerial structure and the accomplishments of Hermann Goering.

Even though policy-makers in science and

administrators acted unreasonably at times, technical sponsors and researchers connected with the German aerospace camp began to readjust their view of innovations in engineering by early 1943 (see Appendix H) and acted in a careful, justifiable, and reasonable manner. National Socialist policy in science was effective because the majority of German engineers and technicians willingly or unwillingly rallied to, or passively supported, the National Socialist revolution of revitalizing German tradition.

What attracted the true engineers was not NSDAP politics. These engineers of the Verein Deutscher Ingenieure were interested in technical projects which they perceived, as war drew closer, could bring about a victory in the war. Energy engineers saw synthetic fuels as a solution to problems in Germany's fuel production and they correctly saw the need for alternative fuels before shortages of raw materials came into play during the war. They sought to use their skills within the new engineering programs to help revitalize the nation. The "Fuehrer principle" as the focus for the sacrifice and struggle was usually a subordinate interest for the most gifted scientists.[10] In the end, the relationship between German engineers and National Socialism became one of compromise and collaboration. Indeed every branch of the Nazi state had competent, loyal specialists in its employ,

and the engineers' loyalty was first and foremost to their organization.

The history of projects in Germany in high technology prior to or during the Second World War illustrates what can happen when there is no clear leadership. Owing to the incoherent nature of the Third Reich, whether in engineering, military science or economics, no one was ever quite sure who or what represented true National Socialism. In the rigors of a new type of war, total war, emerging technocrats like Albert Speer and Gerhardt Degenkolb and their colleagues stepped forward to offer leadership where it was absent in the military and in Hitler's Party. They were to exemplify a new warrior class where the dedicated engineers and technicians were to be the "front-line" soldiers.

III. GOERING AND THE FOUR-YEAR PLAN

Hermann Goering was made responsible for the military-scientific infrastructure of the Third Reich. As Germany prepared for war, Goering, as appointed Plenipotentiary for the execution of the Four-Year Plan (Beauftragter zur Durchfuehrung des Vierjahresplan), began to control new activities, in addition to the Luftwaffe.[1] His main tasks included: increasing synthetic fuel and rubber production, as well as the output of iron and coal mining. Goering performed these tasks with little attention paid to production costs. Prior to the "Speer period" all major industrial projects were to revolve around largely Goering.

In a 1936 private memorandum, Hitler had outlined the infrastructure needed for the Four-Year Plan. At the top of the pyramid of governmental workers, Goering was to head the General Four-Year Plan Council which was composed also of the Staatssekretaere for economy, agriculture, labor, transport, as well as to export the needed synthetic fuels for the transportation industry and the Luftwaffe.[2] All officials were appointed to special councils with the aim of facilitating coordination between government departments, especially in the creation of a complete technical infrastructure that would build the best air force in the world. Often these councils encroached on the

authority of other councils and as a result a parallel chain of command in the Nazi hierarchy arose.[See Appendix B.]

Goering also appointed a number of authorized general deputies for various production branches, i.e., the steel, iron, chemicals, construction-work, and motor industries. Karl Krauch, an experienced chemist, industrialist and a board member of I.G. Farben, the leading chemical industry group in Germany, was put at the head of the department for chemical industries. Krauch had already served as Goering's adviser at the Air Force Ministry in 1933; in 1934 he was instrumental in the establishment of an industrial combine for the extraction of gasoline from coal. Now he was assigned as well to the development of synthetic rubber (Buna).[3]

Goering's close association with the I.G. Farben group allowed it to become an integral part of the machinery of the Four-Year Plan. By the beginning of the war, I.G. Farben's synthetics factories produced no less than half the petroleum consumed in the Reich.[4] However, petroleum was still in short supply and I.G. Farben initiated research on alternative, synthetic fuels for both automobile, aircraft and rocket research. Without its extraordinary achievements, Hitler would have been unable to deploy a modern air force. In turn, the chemical firm was able to expand from an oversized trust to an awesome

megacorporation between 1933 and 1945. Similar cooperative arrangements were established with other industrial branches connected to rearmament and ordnance production, and these were progressively expanded during the war.[5]

Goering soon began to establish new state-owned enterprises directly managed by his administration. Paul Pleiger, an industrialist from Westphalia and a friend of Goering's, headed this group of enterprises. Pleiger rose to prominence as the chief executive officer of Reichswerke Hermann Goering.

Conflicts did arise; a consequence of one of them brought about the replacement of Hjalmar Schacht as Minister of Economics in November 1937. He was replaced first by Goering himself and later, at the beginning of 1938, by Walter Funk, who in January 1939 also took over Schacht's position at the Reichsbank.[6] Schacht's resignation masked a deeper split between traditional economic leadership and Goering's new controlling power over fuels, synthetic manufacturing, and the development of new armament technology. Ever since Hitler had given Goering authority over raw materials and foreign exchange, Schacht and Goering had been feuding over Goering's development of managerial teams to control the areas of fuels and energy which Schacht perceived as within his jurisdictional control. Goering sought a new approach to manage fuel supplies, develop alternative, synthetic fuels

and strategic ores for the coming technical and developmental needs in both the military and civilian sectors of the Reich.

Major conflict of interest between Schacht and Goering also centered around Goering's desire to exploit Germany's low-grade ores. Here main opposition to the domestic ores project came also from leaders in the steel industry, especially Ernst Poensgen of the Vereinigte Stahlwerke and spokesman of the Ruhr industrial complex. They were convinced that increased extraction of domestic ores would prove unprofitable. Nevertheless, under pressure from Schacht's Ministry of Economics in June 1937, a working compromise was reached for mining the inferior ores by government subsidies according to a plan agreed upon by the military (under General Georg Thomas) and the Four-Year Plan (under Colonel Wilhelm Loeb) before being sealed by the Ministry of Economics.[7]

Further disputes took place between Reichswerke Hermann Goering and the steel industry, sparked off when the foundrymen refused to smelt the low-grade German ores of the Salzgitter fields of Vereinigte Stahlwerke. The consumption of this raw material would have required doubling the blast furnace capacity and the conveying of ores that had a high rate of coke consumption. Unable to force the steel industry to submit to his demand, Goering called a conference on 16 June 1937 to entertain problems

of steel shortages and new resources, and to announce the formation of the firm named after himself which would erect the largest blast furnaces in history.[8]

The Hermann Goering Werke started production in 1937 at Salzgitter near Braunschweig and processed iron ore with quantitative and qualitative inferiority that was unattractive to private industry. The reaction by Vereinigte Stahlwerke was explosive. At the same time the Hermann Goering Werke was seen as a manipulation of material power by Schacht. In his opinion, this new enterprise would never justify the strain it would place on Germany's finances and materials resources. He also considered it a moral blow to his standing as Minister of Economics. In effect, it was Goering's proclamation to the leaders of German industry that Schacht no longer governed nor protected them, and that Goering could overturn Schacht's rulings with a mere flip of his hand.

The ebullient Goering was able to maintain a strong focus on new resources and in July 1937 a non-committal personal agreement to cooperate was signed by Schacht and Goering. The others that signed this document showed that Schacht's position had diminished; although he received support from General Georg Thomas and General Kurt von Blomberg, he failed to win the full support of the steel industrialists even though Poensgen prepared a memorandum attacking the Hermann Goering Werke.[9] On 26

August 1937, Schacht wrote Goering that "fundamental differences exist in our economic policies, which I will induce the Fuehrer to place the further direction of economic policies solely in your hands."[10] With this Schacht resigned his position of Ministry of Economics, and a way was opened for larger participation of a hand-picked Goering team in economic policies.

After resigning, Schacht remained President of the Reichsbank and Minister without Portfolio until 1939. In the interim until Walter Funk, formerly State Secretary in the Propaganda Ministry, took office (February 1938), Goering, as acting Minister of Economics, effected the administrative reorganization of the Reich's industrial priorities.

In the course of time, the Hermann Goering Werke became a giant industrial complex involved in the production of machinery, mining of various kinds, and even shipping, its functions extending far beyond its assignments within the framework of the Four-Year Plan. Next to Peenemuende, the Hermann Goering Institute for Aviation Research (Luftfahrtversuchs-forschungsanstalt Hermann Goering) at Braunschweig became the most important center for the work of advanced airborne research.[See Appendix C.] The engineers and scientists there were directly responsible for the more subtle development of motor synfuels, gigantic wind tunnels that put the Germans

first into space, and the development of the prototype for NASA's Apollo spacecraft that went to the Moon following the Second World War.

The Hermann Goering Werke brought together the leading scientists and technicians who laid the basic foundation for aerospace research and produced 90 percent of aviation fuels used by the German Luftwaffe. Fuel was a critical element for the success of Blitzkrieg strategy. These experts played an important role in handling Germany's limited resources before the shortages of raw materials became critical during the Second World War.[11]

The Hermann Goering Werke kept flickering amidst the tempests of war. During the war years, Paul Pleiger, who ran the Four-Year Plan, after Colonel Wilhelm Loeb retired because of personal conflicts with Goering, did succeed in establishing new plants and in annexing existing ones in Austria and in occupied countries.[12] Pleiger was also designated chief of the new Reichsvereinigung Kohle (Reich's Coal Association, RVK). The Coal Association was to be a prototype for the organization of Selbstverantwortung der Industrie (industrial self-responsibility) later championed by Albert Speer after his appointment as Minister of Armaments and Munitions in February 1942. RVK's authority superseded that of all other coal industrial associations. The Bergassessoren (mining coal advisors) administered the new body under the

direction of a director representing the interests of the state.

Pleiger proved to be an effective guardian of the industry despite long-standing conflicts between Goering and the Ruhr coal administrators. He protected the mines from irresponsible political attacks and persuasively defended their special needs and concerns. Within limits, he also protected the industry against itself, by ending some of the restrictive practices which had made it the object of jealously and aversion. For example, the Ruhr was the biggest producer of coal and steel in Europe and was under the direction of Bergassessoren who continually fought against the stratified National Socialist controls. Yet, Pleiger and RVK came too late to change the outlook of the coal industry. By 1942 shortages were desperate and growing worse. Pleiger's job was to force production to the maximum, the mines be damned.[13]

In spite of its apparently powerful status, the Four-Year Plan administration never reached the level of a comprehensive planning agency, its activity centered mainly on a few strategically important sectors governed by party management, although special attention was paid to the production of substitutes for rubber, fuel, and fibers for textile industries.

The Four-Year Plan was the only great effort worthy of recognition made in the economic field before the war, even

if its effects did not make themselves felt until 1941 and after. The Ruhr coal industry may be the worst-case example of the downside of the Four-Year Plan during the Nazi years. The mines' difficulties, already in evidence during the process of Gleichschaltung, became increasingly severe from 1935 to 1939 because the industry refused either to expand subsurface operations or otherwise play a prominent role in energy planning. Even with the forced imposition of a coal commissar, inadequate preparations led to acute fuel shortages before and during the war. The inadequate preparations caused the slow-down of labor, shortages in ore processing, and, in turn, a slow-down in armaments production. The unwillingness of coal management to grasp the initiative in the manner of an I.G. Farben and their continued lack of commitment, reduced Germany's ability to wage the Second World War.

The formation of a regime-sponsored consortium, Reichsvereinigung Kohle, and the savings in distribution came too late to make inroads into the coal problem. The added use of foreign labor, in place of trained coal workers, who were forced into the military, eventually kept output fairly steady but failed to meet rising coal demand.[14]

Amidst all of the endeavors by Reichsmarshall Goering to restructure the German economy through development of energy technologies, one accomplishment was the most

noteworthy of the Four-Year Plan. This accomplishment was embodied in the creation of a research group of aviation engineers and synfuel experts which served as the core leadership for the Hermann Goering Aviation Research Institute at Braunschweig. Most major aviation fuels and aerospace propulsion guidance technology owes their origins to the scientific elite that Goering was able to quickly assemble prior to the war years.

Under the leadership of Ernst Schmidt, the father of the studies of heat-transfer, Adolf Busemann, the father of supersonic flight, and Wolfgang Noeggerath, the creator of synthetic aerospace fuels, and others, the Hermann Goering Aviation Research Institute became the most potent think-tank in the history of aviation. The end of the First World War had brought all aviation research in Germany to an abrupt halt. With the most modest of means, through technical start-ups in the decade of the 1920s, Germany's advancements in aviation did succeed in re-establishing itself to some degree through two primary research institutes: the German Aviation Research Institute in Berlin-Adlershof (DVL) and the Aerodynamics Research Institute (ADA) in Goettingen.[15]

The economic recovery that began after 1933, made it possible to meet the research demands of the rapidly expanding aviation industry. Soon after Hitler came to power, responsible individuals came together to work on

plans for a revitalization and modernization of the aviation industry. In particular the then Director of the Research Division of the Technical Administration in the Aviation Ministry, Adolf Baeumker, recognized the need for specialized planning in this area that would extend over the next few decades. On 21 March 1935, the directive was issued to begin the consolidation of such an institute which had found support at the highest levels of government. It was soon recognized that a significant expansion of the then existing facilities would have to be accomplished, that is, an entirely new and generously planned research institute would have to be established.

All of the requirements were met by the area near the city of Braunschweig. After consultation with the local governments an approximately twelve hundred acre (485 hectares) site south of the village of Volkenrode was selected. This provided the planner with enough space to build an airfield approximately 1.2 kilometers in diameter and sufficient wooded areas to provide natural cover for the associated buildings. On 14 May 1935, final approval for the site was issued.[16]

The German Aviation Research Institute (Deutsche Forschungsanstalt fuer Luftfahrt) was organized as a registered association.[17] The State Secretary for Aviation approved the incorporation in January 1936 and the final phases of organizational preparation began.[18]

One important decision that was made at this time was that each of the heads of the institute would have complete independence in carrying out his scientific and technical obligations. In February 1936 a number of highly placed and respected individuals in the German aviation industry were called together to put the plan into effect. The focal point of all efforts was to conduct fundamental research in the long-term.

The institute began operations in the Fall of 1936 although many technological research facilities were not completed until late 1939. Since many technological institutes in Germany were closed after the onset of hostilities in 1939, an additional number of highly respected individuals offered their services to the institute. In addition, a highly qualified staff of administrators was hired to run the general affairs of the institute.[19]

In accordance with a directive issued by the Aviation Ministry in June 1938, the name of the institute was changed to the "Hermann Goering Aviation Research Institute." This brought about a change in the intensity of obligation the institute had to the war effort.[20] The board of directors was changed somewhat as well and included twenty-one corporate members (primarily from the aviation industry itself) and thirty-four scientists.

Amongst the names of the fifty-five board members were

men like Dr. Hans Teuber of Rheinmetal-Borsig and Professor R. Betz from the University of Goettingen. One never gets the impression that political favors were being disbursed in favor of position, rather there was genuine effort to identify the best minds in the field and to have them participate in the institute's activities. This applied to the administration, as well as to the scientific and technical personnel who made up the prestigious Reichsforschungsrates that supervised all significant armament projects and scientific research for industry in the Reich. [See Appendix D.]

In the end, the Four-Year Plan created the road from invention and research to development and, finally, to military testing and deployment. Goering's economic support through the Four-Year Plan allowed in a short time new technologies to be invented that normally would have required many years. Goering did build a unique supply of new fuels so necessary for wartime in the midst of domestic fuel shortages, and created for himself and those around him an atmosphere where technical advisors and high ranking military could meet and work together in designing the most advanced air force of its time.

IV. THE GERMAN ARMED FORCES HIGH COMMAND IN THE SPHERE OF ARMAMENT PRODUCTION

During the period following the First World War, prior to Hitler taking office, the procurement of armaments presented no problem to Germany. The requirements of the 100,000 man army, and also a small navy, were insignificant for German industry. Besides, the Versailles Treaty fixed all pertinent details, even designating specific manufacturers. Within the framework established by the German National Government in 1926, an Economics Staff was created as part of the then Army Ordnance Office of the Army High Command, the only agency of the Reich War Ministry where this was feasible. Further, the position of "Economics Officer" was created at several military area headquarters since there was no central economic facility. These agencies formed the basis for the Military Economics Organization of the later Oberkommando der Wehrmacht (OKW).[1]

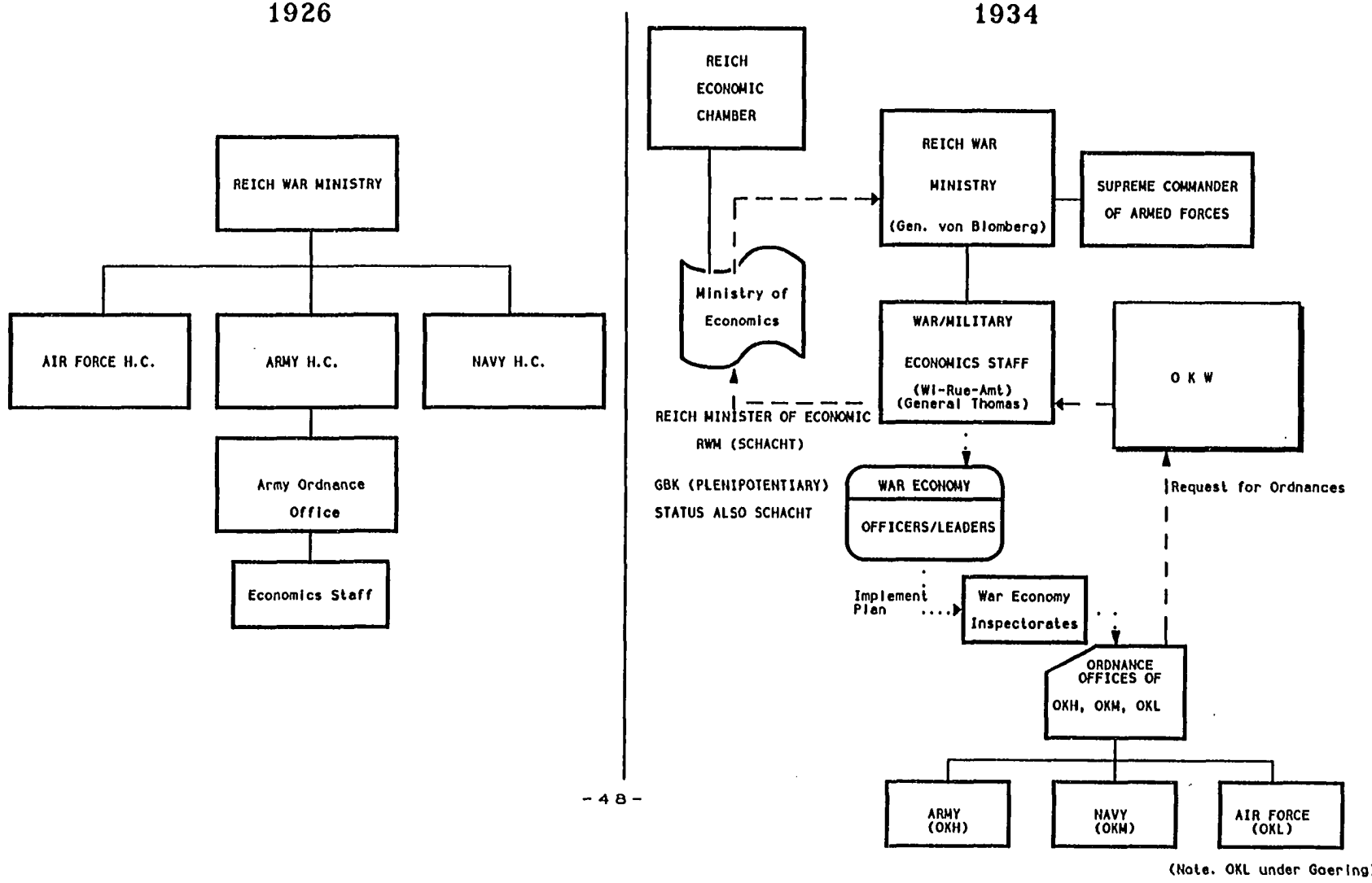
One of the most urgent tasks, upon the ascendancy of the National Socialist government, was the establishment of an organization capable of mobilizing the economic resources of the Reich for the scheduled rearmament program and of coordinating the requirements of the three services of the Armed Forces. In order to solve major problems arising from confusion of programs within the three

services, a "Military Economics Staff" was established with the Reich War Ministry (Armed Forces Office) at the end of 1934.[2] This staff took over the functions of the Economics Staff of the Army Ordnance Office.

The mission and authority of the Military Economics Staff was influenced from the very beginning by the most varied factors within and without the Armed Forces. Serious differences of opinion developed within the Armed Forces and there was an immediate fear that one central economic agency would somehow interfere with the independence of the three services. Reichsmarshall Hermann Goering, in particular, again and again objected to the idea of submitting the armament needs of the Air Force to an armament authority superior to the three services.

Notwithstanding these faults within the total organization, the Economics Staff, when originally with the Reich War Ministry, was able to fulfill its missions as long as General Kurt von Blomberg was the Minister of War and the German military establishment as a whole remained firm.[3] During the early period before the outbreak of war, the services of the Armed Forces submitted their armament plans to the OKW. The latter then made up an over-all program in accordance with industrial capacity. A basic procedure was applied by which the procurement of war equipment was allotted to each of the services according to their needs (e.g., small arms, motor vehicles,

1926-1934: Military Departments that Shaped Germany's Economic Future



explosives, new rockets were allotted to the Army) in accordance with a basic plan of the OKW.[4]

The Economics Staff, then, made presentations to the Reich Minister for Economics concerning the requirements of raw material as resulting from this over-all program and suggested allocation of raw materials to the Reich Minister of War, who made the final decision. Once raw materials and funds had been allocated, the Commander-in-Chief of the Armed Forces (Minister for War/Economics Staff) could exercise his basic influence on the execution of the programs of the services of the Armed Forces.[5]

Goering's appointment in 1937 to head the Four-Year Plan began encroaching on the functioning of the Military Economics Staff, headed by General Georg Thomas. General Thomas was infuriated by the private dealing between the Ordnance Offices and the Four-Year Plan which gave authority over the fuel agencies to the Bureau for German Raw Materials and Synthetics. Von Blomberg sided with Thomas in issuing an order in May 1937 making direct negotiations between the services and the Bureau for German Raw Materials and Synthetics prohibited, except with the express approval of the War Minister.[6]

Von Blomberg, siding with Thomas, publicly stated that the main function of the Four-Year Plan was to overcome particular economic bottlenecks, viz., ores, fuel, and rubber, in peacetime, while that of the Plenipotentiary for

the War Economy was to prepare the entire economy for war, and in war-time to direct it.[7]

Finally, General von Blomberg wrote to Hitler on 29 November 1937 suggesting that Funk be appointed the Plenipotentiary for the War Economy, and that the office would be strengthened by adding to its head a State Secretary. Goering was able to appoint Hans Posse of the Ministry of Economics as Deputy Plenipotentiary for the War Economy.[8] Moreover, Posse gained control of the staff of the Ministry of War Economy and remained a dominant influence in that office even after Funk was appointed its head Plenipotentiary.

By decree on 4 February 1938, Hitler abolished the Reich War Ministry and assumed the position of Commander-in-Chief of the Wehrmacht and thereby achieved the unification of command and ministerial functions on the highest level as the omnipotent Chief of State.[9] By 4 September 1938, Hitler reconstituted the relationship between the German Armed Forces and the highest administrative authorities in the Reich by assuming dominion over both the National Defense Council (RVR) and the military establishment, as Fuehrer and Reich Chancellor.

Hitler also replaced the Commander-in-Chief of the Army (Werner von Fritsch) by a new man, Walter von Brauchitsch. The elimination of the Reich War Minister,

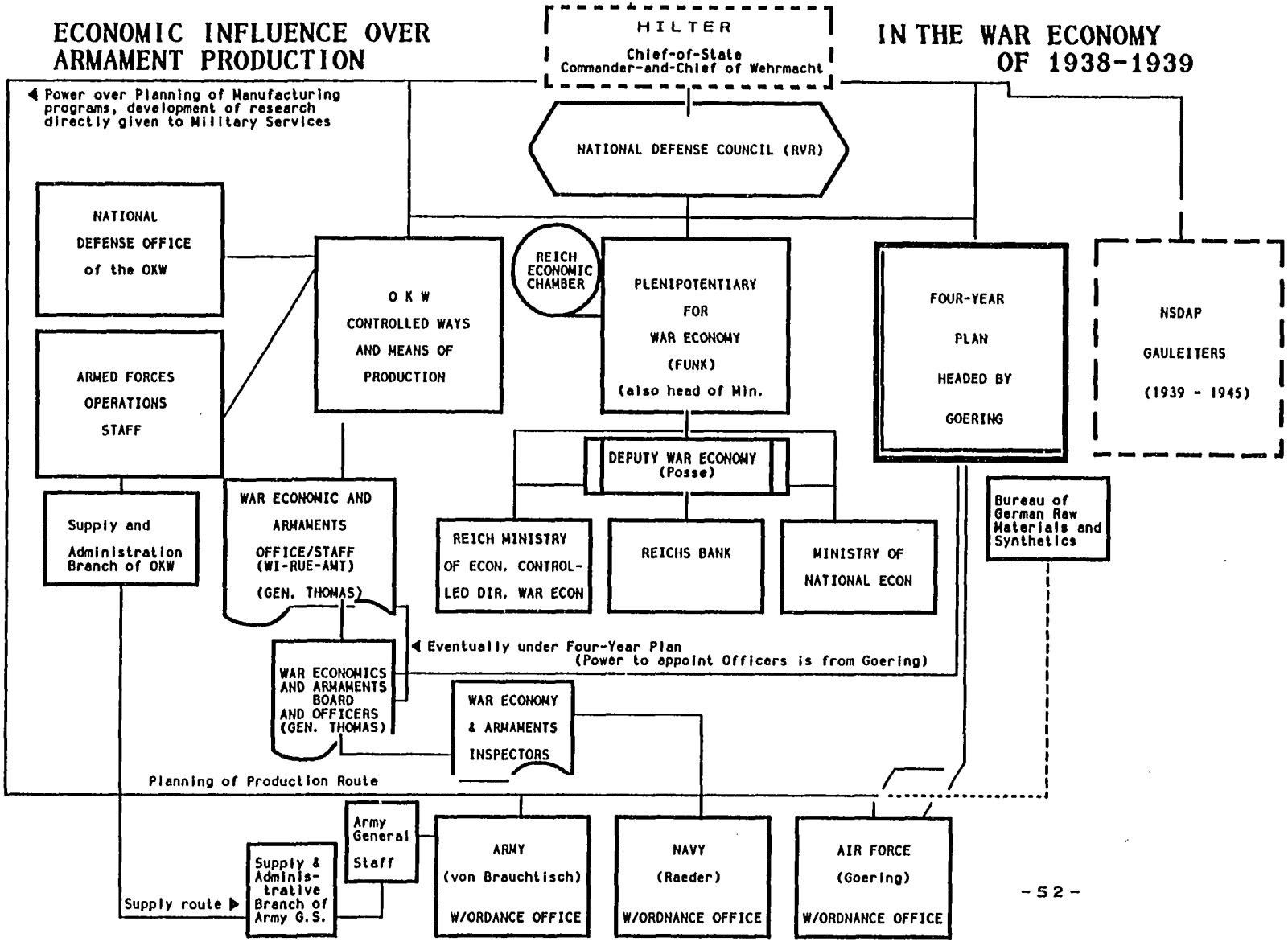
left the Commanders-in-Chiefs of the Army, Navy, and Air Force directly subordinate to the Chief-of-State, without modifying their functions.[10]

At the end of September 1938, the Chief-of-Staff of the Army General Ludwig Beck, having not approved of Hitler's foreign policy, was relieved and replaced by General Franz Halder.[11] Beck was one who considered that a long span of peace was necessary for strengthening the state and its military force before war should begin.

The leading generals of the Army did not at that time show any visible reactions to the measures directed against them by Hitler. They did not resist the abolition of the office of the Reich War Minister, the replacement of the Commander-in-Chief of the Army under false pretenses, or the change in the position of the Chief-of-Staff of the Army. As a consequence of this passive attitude, Hitler's disdain for them only increased.[12] In addition, Hitler's foreign policy proceeded from one success to another against the predictions made by General Beck.

After von Blomberg's resignation in 1938, because of Hitler's encroachment on the military, the Economics Staff of the Reich War Ministry transferred to the OKW with little or no change in its missions and position. The powers of the Wehrmachtamt were transferred to the Oberkommando der Wehrmacht and its head, Wilhelm Keitel, became Chief of the OKW. General Walter von Brauchitsch

ECONOMIC INFLUENCE OVER ARMAMENT PRODUCTION IN THE WAR ECONOMY OF 1938-1939



succeeded von Fritsch as Commander-in-Chief of the Army, and sixteen other generals were removed. Werner von Fritsch and Blomberg had the physical attributes of power but they made no better use of them than von Brauchitsch and Keitel. However, from the beginning, the position of the Chief of OKW had been weaker than that of the former Reich Minister for War who, simultaneously, had been the Supreme Commander of the Armed Forces.[13]

The position and authority of the OKW in matters of armament was, in principle, also limited by the addition of an overlapping office. The "Decree concerning National Defense" (issued in 1938 as the National Defense Law) provided for a Plenipotentiary General of War Economy in the event of war, and for the preparation of the economy for just such a case. The Reich Minister of Economics was to occupy this post. He was to be charged with the over-all direction of the war economy and its preparation, while the actual munitions industry (finished products: arms, ammunition and equipment) was to be directed by the OKW.

Within the scope as laid down by this decree, the Economics Staff of the OKW was charged with the following missions:

a) to establish the requirements of the German military establishment and to incorporate them into one over-all program;

b) to act on behalf of the entire military

establishment in economic matters in negotiations with the Plenipotentiary of Economy (Funk) and the Plenipotentiary for the Four-Year Plan (Goering);

c) to allot available raw material and means of production to the services on the basis of the programs prepared by the services of the Armed Forces;

d) to aid the services in obtaining acceptance of their production requirements by industry and price control agencies; and--

e) to plan the mobilization of the armament industry, and secure the required supply of raw materials, means of production and labor for the services in the event of war.[14]

Thus the Economics Staff of the OKW was charged more with the tasks in the economic field of the armament industry (securing raw materials, industrial power, labor, plants and means of production) while the three services, preserving a large part of their independence, remained responsible for the total sector of technical armament (planning of programs, development including scientific research, procurement and acceptance of scientific equipment ordered by them, preparation of mobilization of the manufacturing plants assigned to them by the Economics Staff). In reality, the OKW was plagued with overlapping offices and had no influence on the preparation of the manufacturing programs of the Armed Forces services.[15]

Although the Chief of OKW was nominally responsible for securing the planned armament progress of the Armed Forces services and was also responsible for the preparation of the munitions industry in the event of war, the superior authority of Goering in all economic affairs had been strengthened so much that, in the last analysis, all actual decisions depended upon him. Goering had been appointed Plenipotentiary for the Four-Year Plan and charged with the special mission of making the German economy independent of the world market as far as possible. In addition, the authority between the Plenipotentiary of War Economy and the services was not clearly delineated. Goering with his extensive powers outranked by far the Plenipotentiary for War Economics.[16]

Within this interplay of forces the military position of the OKW/Economics Staff was weak from the start since it lacked authority to issue binding directives to either the Plenipotentiary for War Economy or to Goering. OKW, in working with Goering or the Plenipotentiary for War Economy, rather had to depend on mutual agreement and, frequently, was unable to carry its needs to fulfillment.[17]

From 1938 on, Hitler, too, began to exercise increased personal influence in armament questions. In addition, as Hitler probably intended, the Economics Staff had become increasingly an arbitration office rather than a command or

control organ. Goering, in particular, removed his air force program rapidly from any control on the part of the OKW.[18]

During the last prewar years the Economics Staff attempted, outside of the German military establishment, to put a firmer foundation under the broadly extended armament industry by means of proper stock-piling. Its requests, however, did not sufficiently impress the proper authorities. It was at the repeated suggestion of the Economics Staff that, finally in the summer of 1938, Goering, considering the insufficient armament preparations, put in effect a "Powder and Explosives Plan."[19] A Plenipotentiary under Goering, and within the scope of the Four-Year Plan, had been charged with its execution. In addition, the Economics Staff, through Goering, initiated sweeping measures to improve the raw material reserve by increased exports in the fall of 1938.

The Economics Staff also attempted to clarify the problem of labor allocation in the event of war.[20] Corresponding requests were submitted to the Chief of the OKW, the Wehrmacht Operations Staff, and the National Defense Office of the OKW to bring about a solution to this problem. But the OKW was unsuccessful in bringing about a clarification in principle of the problem which was sufficiently known from the First World War pertaining to the long term coordination of personnel between the Armed

Forces and industry. This major problem in technical crisis management in The Third Reich was only partially solved later by Speer.[21]

Goering and the Plenipotentiary for War Economy, as well as the NSDAP, refused to recognize the problem of labor shortage and other problems that were mounting. They rather considered problems that came exclusively within their own sphere of authority and they fulfilled the requests of the OKW only to a slight extent.

The execution of the mission of the Economics Staff, also, was made more difficult for several reasons. In the regional supply organization of the NSDAP there were Gauleiter who were pivotal regional party leaders later appointed as National Defense Commissars. They, generally, interfered with the direction of the munitions industry and complicated the control of armament production. Gauleiter lacked any comprehensive view of military necessities and their orientation was political.[22]

Even at the beginning of the war, the mobilization of the armament industry, as prepared by the Economics Staff, continued to be initiated only hesitantly and the entire economy was far from being properly adjusted to its tasks of converting to total war.[23] Since most ordnance projects required approval of the Plenipotentiary for War Economy, his staff was not prepared sufficiently in either in its personnel or in its training to recognize the

importance of the requests put forth by the Economics Staff of the OKW.[24] Added to these complications, the authority to appoint the War Economy Officers, positions which had been instituted by the War Economics Staff, was transferred to Goering.[25]

The War Economy Officers played an important role in the functioning of the OKW. To execute its task on a regional level, the OKW Economics Staff had created field offices as early as 1934. A "War Economy Inspectorate" was established in each military area and was appointed by the War Economy Officers of the Ruestungs und Wehrwirtschaftamt--OKW. By 1939, they were called "War Economy and Armament Inspectorates." These Inspectorates, in cooperation with the regional offices of the Plenipotentiary for War Economy, supervised the armament-factories within their region and prepared the mobilization of the armament industry, to be directed by the Economics Staff.[26]

As industrial advisers, the War Economics Inspectorates had well-known leaders of industry at their disposal. These were selected by the Economics Staff and were appointed as "War Economy Officers." The tasks of the War Economics Inspectorates entailed assisting the ordinance departments of the Armed Forces services concerning distribution of their orders to the different manufactures and supervising manufacturing of these orders.

They also were responsible for scouting the manufacturing capacity in event of war and assisting the ordnance departments in the preparation of the manufacturing capacity allotted to them in the event of war. The Inspectorates were to secure energy, labor forces, and technological production teams required in the event of war.[27]

For the purpose of executing these missions, the War Economics Inspectorates were composed of one department each for the affairs of the Army, Air Force, and Navy. The elements of the German military establishment dealt directly with them and issued their orders to them. The Economics Staff interfered only in the event of difficulties which could not be eliminated by the Inspectorates in direct cooperation with the Economics Offices. The Economics Staff, then, either ordered the Armed Forces services concerned to place its manufacturing order in another area, or, by way of the Minister for National Economics, initiated the necessary procedure.[28]

It is clear that the Inspectorates took over many of the functions for the practical preparations for the war economy. However, in the midst of the many overlapping offices, in 1938 Goering had been gaining power and control over top economic positions and was victorious in gaining a position of control by appointing officers to the Armaments and War Economy Board of the OKW.

Hitler's direct assumption of the direct command of the armed forces furthered seriously weakened the position of the OKW. Hitler gave legal ground and moral encouragement for the Commanders-in-Chief of the military service to appeal to him directly and go over the head of Wilhelm Keitel. For example, on the basis of an appeal by Admiral Erich Raeder, Commander-and-Chief of the Navy, Hitler ordered in January 1939, without consulting the Army, the Air Force, or the OKW, or even informing them, that the German ship-construction program was to take priority over all other military production.[29]

Hitler further emphasized the establishment of a "Ministerial Council for National Defense," sealing the fate of the OKW, where problems of National Defense were transferred from the National Defense Office under the chairmanship of the Chief of the OKW to the Ministerial Council for National Defense under the chairmanship of Hitler and his representative, Goering. Hitler became Chairman of the National Defense Council consisting of the following members:

The Reich Minister of Air Transport and Commander-in-Chief of the Air Force.

The Commander-in-Chief of the Army.

The Commander-in-Chief of the Navy.

The Chief of the Armed Forces High Command.

The Deputy of the Fuehrer.

The Reich Minister and Chief of the Reich Chancellery.
The President of the Secret Cabinet Council.
The Plenipotentiary General for the Government of the Reich.
The Plenipotentiary General for Economic Affairs.
The Reich Minister of the Foreign Office.
The Reich Minister of the Interior.
The Reich Minister of Finance.
The Reich Minister for Popular Enlightenment and Propaganda.
The President of the Reichsbank Directorate.[30]

Inasmuch as Hitler would not agree to establish long-term planning goals for prolonged and total war, his decision to assume power over the military offices further hindered those who would make practical measures necessary for getting war industries under way. Neither the OKW Economics Staff nor the Commander-in-Chief of the Army, who wanted quickly to mobilize the armament industry to that purpose, were allowed to proceed as they wished. Moreover, the Chief of the OKW sided with Hitler in this matter.[31]

In the event of war, theoretically a manufacturing program was to be consolidated by the Economic Staff of the OKW for the production of all materials for the Army, Air Force and Navy. However, by the end of 1939, the manufacturing program had barely gotten underway and the conversion of industry for total war had not yet been

ordered. To the contrary, owing to half-way measures by the Plenipotentiary General for War Economy, the mass of industry continued with its peacetime production.[32]

Innumerable attempts on the part of the Economics Staff to bring about a change in this matter remained unsuccessful because both Goering and Funk, the Plenipotentiary General for War Economy, also rejected long-term systematic economic planning as required by the Economics Staff. The only progress which the Economics Staff was able to achieve in this direction was a Goering decree issued toward the end of 1939 containing directives for the concentration of all forces to increase the armament output. This, at least, partly fulfilled the demands of the Economics Staff.

Immediately subsequent to this, Goering made a basic change in the overall direction of industry in order to eliminate the overlapping of the spheres of tasks of the Plenipotentiary General for War Economy and the Four-Year Plan. He himself took over leadership of the entire economy and limited the Plenipotentiary for War Economy to the affairs of the National Economics Ministry and of the Reichsbank. The Chief of the Economics Staff simultaneously was appointed to the General Council of the Four-Year Plan without his position or mission thereby being changed.[33]

The problems faced by the Economic Staff arose in the separation of the military from the political environment.

The policy-making branches within the Armed Forces Operations Staff, which was under the direction of the Chief of the OKW and their assignments, were exclusively of a military nature. The Chief of the Armed Forces High Command, and, for that matter, the OKW (Armed Forces High Command) itself had no influence whatsoever in the political sphere and those in the political sphere wanted to keep it that way.[34]

Even short-term strategy meant that if the productive capacity of the Army was to be increased, it was necessary to influence Hitler directly if resulting action was to be timely and effective. Thus, in the field of armaments, the war had started with improvisations which could not do justice to the real demands of war. Military authorities and industry likewise suffered as a consequence of a lack of any implementation of a long-term military strategy for war.[35]

On the surface, the organizational consequences that began in 1939 appeared to strengthen the central executive, the OKW. In reality, the independence of the services increased, particularly that of Goering's Luftwaffe. The services enjoyed the same privileges as the OKW and therefore saw themselves, as under the monarchy, agencies directly subordinate to the Chief of State and not the Armed Forces Operations Staff.[36] In 1939, the Wehrmacht entered its fateful struggle with a structure which, though

it had in theory a unified command in the OKW, in reality it was similar to a commonwealth of rival command agencies directly subordinate to a leadership without a master plan for war and without clear political and economic goals for itself or for its allies.

V. THE GERMAN PRE-WAR AND WAR ECONOMY

During the National Socialist regime, five groups emerged hoping to shape Germany's economic destiny. The Nazi Party was one group which resisted increased urbanization and industrialization. This ideology did not disappear under the technical demands of the war, it simply bided its time, secure in its own power base in the Party's regional Gau structure. A second group, the military, was weakened by internal divisions even under the German General Staff. Each branch of the three military services had its own weapons procurement office which set production goals and raw materials requirements without reference to either of the others. Nominally above these bodies was a third group, the Economics and Armaments Office (Wehrwirtschafts und Ruestungsamt, Wi-Rue Amt) of the Armed Forces High Command (Oberkommando der Wehrmacht, OKW), originally commanded by General Georg Thomas. Thomas had laboriously fashioned a local reporting organization consisting of military economics officers (Wehrwirtschaftsoffiziere) and armaments officers (Ruestungsoffiziere).[1] Matching the Wi-Rue Amt in organizational development and surpassing it in political importance after 1937, was Funk's Reich Ministry of Economics (Reichswirtschaftsministerium, RWM).[2] The RWM attempted to influence economic affairs through its

ministerial offices and a complicated series of compulsory organizations that grouped all economic activities geographically and functionally. Finally, atop all of these four groups was the Reich Economic Chamber (Reichswirtschaftskammer). The functional structure was composed of National Groups (Reichsgruppen) of which there were seven in 1938, regional Economic Groups (Wirtschaftsgruppen), and the Specialty Groups (Fachgruppen).[3]

Earlier pre-Reich business groups had been organized originally by outstanding businessmen in their respective industries who were principally concerned with cartelization and price and quota maintenance, according to Walter Schieber who was head of the Armament Branch of Speer's Ruestungslieferungsamt from 1942 to 1944. Their concerns were not centered around increased production and industrial rationalization.[4] With the coming of the political control of the NSDAP over these business groups there was, in many cases, a reluctance to join the Party. Those who did not join were replaced by other industry members anxious for political and industrial power and who, too often, were of mediocre ability.

Nevertheless, the German economy remained strong well into the war years. Government demand for skilled labor, in particular in branches working for rearmament, emerged on the labor market even before full employment was

achieved. The existing law permitted labor trustees to authorize wage increases in enterprises that could demonstrate enhanced productivity. Plants working for rearmament, especially in metal-processing industries, had already utilized this permit in 1934 to attract skilled workers from other enterprises. In this manner they even succeeded in recruiting workers from other districts, in particular, from west of the Rhine, where arms production was prohibited until the German army occupied those areas in March 1936.

At the same time the construction and building industries which played a leading role during the initial stage of unemployment relief, recruited thousands of agricultural workers in spite of the authorities efforts to restrict labor migration from villages to the cities. In response to these pressures a far-reaching obligatory, personal Arbeitsbuch was introduced in which every change of workplace had to be confirmed by the local labor exchange. Nevertheless, freedom of movement between workplaces was not yet restricted, even after the proclamation of the compulsory military services in March 1935. The nearer the economy drew to full employment, the more the signs of labor shortages increased; these were exacerbated by the Nazi policy of returning women to what was affirmed as their natural role, that is, housekeeping and the raising of children.[5]

The fever of war preparations reached its first peak in the summer of 1938, when about four hundred thousand workers were enlisted to build fortifications works on the western frontier, the famous Siegfried Wall. The method of recruitment, legalized by special decree, called for the issuing of individual summonses for a restricted period of time. From March 1939 the law forbade a worker to leave his workplace without permission from the labor exchange; thus militarization of the labor force within the framework of the Four-Year Plan was completed.

A shortage of imported raw materials had already appeared during the first year of Nazi rule (1933-34). In 1928 Germany imported ninety-five percent of the raw materials for its textile industry and sixty percent of all mineral ores for heavy industry. Supervisory Bureaus for the allocation of scarce raw materials were established in 1934.[6]

The Four-Year Plan accorded top priority to the production of raw materials or their substitutes and united the supervisory Bureaus under a central authority. The use of certain raw materials like nickel, copper, and other non-ferrous metals was altogether prohibited in industries producing consumer-goods. In addition, a massive scrap-metal collection was launched with the aid of party agencies, including women's associations, youth associations, and schools. (The refuse dumps of 150 towns

yielded 55,000 tons of discarded tin cans between September 1937 and July 1938.)[7]

The efforts invested in the Four-Year Plan were of course not limited to rationing existing raw materials. They were aimed also at increasing the output of key industrial branches through the establishment of new enterprises and investment in the expansion of existing ones. The data in the table show that these efforts yielded results in a number of spheres.

Production of Strategic Raw Materials (In Thousands of Tons): [8]

	1936	1939	Growth in percent
Iron ores	2,259	3,928	73.9
Aluminum	95	194	104.2
Buna (synthetic rubber)	1	22	2200.0
Synthetic fibers	43	192	346.5
Aircraft gasoline	43	302	602.3
Regular gasoline	1,214	1,633	34.5

In April 1937, Schacht reproached Goering, arguing that German exports were suffering as a result of the heavy demands from the Four-Year Plan and from actions taken to produce a wide range of military ordnances, such as sequestering stock-piles of fuels and ores. Industrial firms producing for Goering's agenda lacked incentive to produce for export, and had to offer such long delivery terms that foreign buyers refused to wait. On the other hand, firms which were not producing for the rearmament or the Four-Year Plan were hampered by serious difficulty in

getting raw materials.[9]

The Four-Year Plan was pushing up the need for essential materials faster than domestic production could be expanded. While domestic production of light and diesel fuels in 1936 was over 700,000 tons above the production of 1933, imports of these commodities had nevertheless increased in the same period by over 900,000 tons.[10]

Goering was forced to introduce the "New Plan" which succeeded in achieving an export surplus by restricting non-essential imports while offering various inducements to export. An export surplus of items was not enough to halt the precipitous outflow of gold and currency which shrank from 530 million to 75 million Reichsmarks from 1933 to 1936. Oil imports went up by an additional 100,000 tons in 1937, despite increases in domestic production.[11]

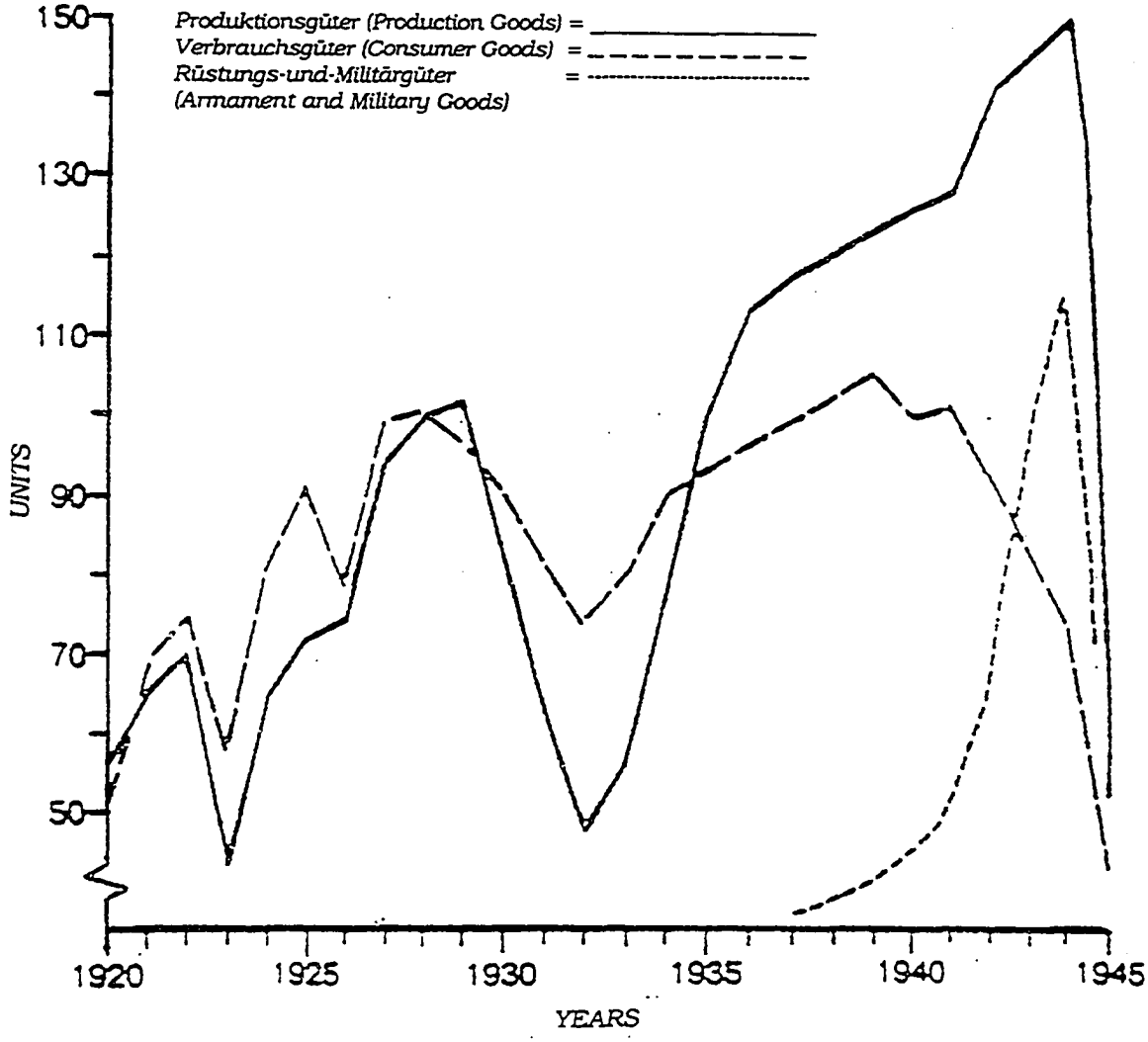
The shortage of raw materials was quite prominent in the textile industries. To meet rising consumer-demand, synthetic fibers of poor quality were added to fabrics, thus diminishing the product's quality and shortening its life-span. Consumer complaints were met with decrees and restrictions for the producer: quality specifications like "pure wool" were prohibited, as were cleaning instructions that were liable to reveal the poor quality of the product.

In spite of restrictions on raw materials, caused mainly by the state of foreign trade, the output of consumer-goods grew throughout these years and declined

only slightly even after the outbreak of war. The per capita production index for consumer-goods in 1936 returned to the level of 1928 and rose by 8 percent until 1939; by economics chart the beginning of 1942 it had returned to the 1936 level and only in 1944, when a final rearmament was made by what was left in the German economy, did the index drop by 18 percent. [See Economic Production Chart following page and Appendix E.]

The production of capital goods grew at a much faster pace over the same period: their per capita production index, which in 1936 already stood at 110 percent compared to 1928, rose in 1939 to 121 percent and to 150 percent in the middle of 1944.[12] There is therefore no doubt that industrial production directly or indirectly connected to rearmament enjoyed preference even before the war, but only to a small extent at the expense of current civilian consumption, although the growth of the latter was slowed down.

Another campaign, accompanied by a clamorous propaganda drive, pursued an entirely different aim. In May 1938, with a great deal of publicity, Hitler laid the cornerstone for the plant that was to produce the popular Volkswagen.[13] Even before the ceremony, numerous Germans had begun to pay savings-installments toward future purchase of such a car. It is reasonable to assume that at the time, with accelerating war preparations, no one



Development of Industrial Production and Consumption Goods On the Basis of Registration for 1920-45 (Where 1928 = 100 units) Note: Speer's Remarkable achievements from 1942-1944

seriously intended to begin production of such cars in the foreseeable future. Instead, it was a measure directed toward the withdrawal of disposable income from the public, whose earnings had grown throughout the period of prosperity, wage restrictions notwithstanding. Hitler himself mentioned the issue in the Volkswagon plant's opening ceremony: "If the German people spend all their wages on consumer-goods, we cannot...produce without limits, it will cause disaster. It is therefore vital to guide the purchasing power of the German people in other directions."[14]

In this case the direction was toward recruiting savings for armaments, with an additional incentive to work overtime in order to realize the dream of owning a car. By the end of March 1939, 170,000 savers had deposited the sum of 110 million Reichsmarks in the Volkswagen account for the popular model. However, when the plant began operating, it produced military vehicles and military aircraft parts exclusively.

Postwar research has tended to depreciate the success in planning and performance of Germany's armament industries. The basis for these evaluations was a survey conducted by the United States Strategic Air Command in 1945 entitled Germany's Preparations for War. Two economists (Burton Klein and Nathan Kaldor) who took part in this survey used it in works they published on this

subject.[15]

Nathan Kaldor claims that "although everything was controlled on paper right from the beginning of the war, the actual administration of controls was often clumsy and amateurish in the extreme." [16] Burton Klein, in the study mentioned above, went even further, claiming that the planning itself was not geared to a lengthy war. According to Klein, although the production of consumer-goods in 1937 had reached pre-depression levels, that is, the level of 1928, it continued to increase right up to the outbreak of the war. His conclusion was that in the prewar period the German economy produced both butter and guns--much more of the former and much less of the latter than has been commonly assumed.[17]

Klein explained this surprising phenomenon by a distinction between rearmament in depth and rearmament in width. The former consideration bases arms production on a firm industrial infrastructure and stable raw material supply, to insure continuous production for war purposes and the renewal of reserves over lengthy periods. In contrast, rearmament in width calls for the production of a wide range of war equipment in large quantities in order to achieve an immediate advantage at the initial stage of war. In Klein's opinion, the Nazis considered creation of a large-scale infrastructure for long-term armament production unnecessary because their military and strategic

planing was aimed at one short Blitzkrieg or a consecutive series of such lightning wars.[18]

There is no doubt that the whole National Socialist period was characterized by the feverish pace of arming oneself. In a short time the military expenditures increased dramatically. More and more people and materials were used for military purposes.

There are a number of estimates regarding the levels of military expenditures. In their definitive work on German economy, two authorities, Hermann Stuebel and Otto Weitzel detail the costs involved. Stuebel upon analyzing the military budget found the following division of costs:

YEAR	ARMY	AIR FORCE	NAVY	RWM/OKW	TOTAL (in Billions of RM)
		In Percentage			
1933	64.5	10.2	25.3		746
1934	51.75	33.1	15.0	.15	1,952
1935	50.1	36.73	13.0	.17	2,772
1936	51.8	38.5	7.5	2.2	5,821
1937	48.2	39.4	8.2	4.2	8,273
1938	53.0	35.0	9.4	2.6	17,247
1939	47.1	33.1	17.6	2.2	11,906
1933/39	50.57%	35.27%	11.71%	2.45%	
	24,638	17,185	5,702	1,192	= 48,717 (billion RM) [19]

These numbers make it clear the high priority position the Army and Air Force enjoyed. Weitzel includes other expenditures, not strictly military expenditures, and calculates that these overall military expenditures went from 2.77 billion Reichsmarks (RM) in 1933 to 37.34 billion RM in 1939. After 1939, expenditures reached levels that

are hardly imaginable with armaments taking the lion's share and reaching 149.8 billion RM in 1944 alone.[20] In the last phases of the war, the demands on the economy were so high that the military expenditures were higher than the entire income of the German nation (national income). Over the entire Hitler period some 647.9 billion RM were expended for war preparations and the war.[21]

The Germans had planned to insure quick victories by conducting rapidly moving campaigns based on the grouping of quantitatively and qualitatively superior forces and armament supplies, thus overpowering the enemy within a short span of time.[22] They did not exclude the possibility that decisive victory would not be achieved in a single, rapid campaign and the war would therefore have to move to additional fronts. However, their planning for such an eventuality relied on the exploitation of the raw-material resources and industrial capacity of occupied territories. These territories were also to supply food for Germany's population in order to avoid the hardship of shortages of the type still recalled from the First World War. As it turned out, such expectations were not exaggerated. Thus, a major obstacle in armament production did not come from the industrial side of the economy per se, but from a lack of realism and coordination of military preparations for war by the Reich, the military, and the industrial management groups.[23]

Although certain Ministries or Armed Forces Offices might have foreseen the need for a more thorough long-term plan, the Nazis had established multiple authorities as seen in the organizational structure of the war economy. This was characteristic of the Nazi regime, where Plenipotentiaries were in constant competition amongst themselves, as well as having ministerial rivalries. The confusion of authority and the existence of parallel or competing agencies represented conflicting economic and social interests which even the totalitarian regime could not control. This infighting generated friction, which damaged efficiency and no doubt also caused economic losses.[24] The surprising fact is that the system nevertheless worked and achieved many short-term objectives. In addition, the method of ad hoc decision-making by the councils in the military-industrial establishment when Albert Speer took control (1942) provided an even greater measure of flexibility and adaptability to rapidly changing conditions in the course of the war.[25]

Can conclusions be made that Germany did indeed prepare for war but the nation produced more butter than guns? Today, it is known that such an evaluation is mistaken. Actually, from 1936 to 1937, Germany pursued a regimen of covert austerity with regard to numerous consumer-goods, with the explicit purpose of directing its

*scarce resources to rearmament. There seems to be some justification for researcher Avraham Blaich's view that during these years Germany produced not "guns as well as butter," but "guns and jam" instead of butter and bunkers and fortifications instead of residences.[26] Blaich is also right to claim that confusion and rivalries within the Four-Year Plan administration "should by no means obscure the fact that by 1 September 1939, the foundations for centralized planning and the direction of the economy, based on private business initiative and private capital, had already been laid."[27] A review of leading and unpublished documents from the military-industrial planners under Goering and Todt clearly show that Germany was not prepared for the eventuality of a long war.

The German industrial autarky of some sixty major firms functioning as major cartels was still limited in its production capabilities; given the prevailing conditions it is doubtful whether it could have expanded. [See Appendix F.] Yet achievements on the road to self-sufficiency were still impressive, and the hope of compensating for shortages quickly by rapid conquests in Europe and the exertion of pressure on neutral countries like Sweden were not groundless, as it turned out.[28]

It appears that at the beginning of the war, owing to military successes in Poland, France, the Netherlands, and Scandinavia, Hitler's reasoning against an infrastructure

for long-term war production seemed justified. The mass production of the armaments necessary for the next stage of the Blitzkrieg was sufficient to achieve a decisive advantage and quick victory.[29]

In occupied countries, the Germans immediately seized all stocks of raw materials, such as mineral ores, and transferred large quantities of them to Germany even before they harnessed local production capacity to their own requirements. Substantial quantities of some materials gained in this manner were instrumental in relieving severe shortages in Germany's war industry.

In Poland and France alone, 355,000 tons of iron ore, along with substantial quantities of aircraft and fuel-stock used for C-Stoff jet fuels, as well as various chemical products vital in armament industries, fell into the hands of the Germans.[30] These, combined with the regular supply of high-quality iron ore from Sweden, enabled Germany to increase steel production by 26 percent between the end of 1939 and the end of 1940, almost without detracting from civilian production; 40.8 percent of Germany's industrial output was still directed to civilian consumption, as compared to 41.5 per cent in the last quarter of 1939.[31]

Further data imply a certain drop in the production of armaments in the summer of 1940 following the surrender of France. Loyal to their Blitzkrieg strategy, German planners

made substantial changes in their production quotas in accordance with the specific requirements of the next campaign. In the summer of 1940, while the invasion of the British Isles was still on the agenda, production was directed to aircraft and shipping.[32] At the end of that year and at the beginning of 1941, when the Barbarossa decision to invade the Soviet Union had been made, production was shifted to tanks, guns, ammunition, and infantry equipment. It turned out that, in this instance, it was precisely the absence of rigid preliminary planning that provided the military and industrial system with a considerable flexibility--as long as war objectives and the manner in which the war was conducted were determined by Germany's aggressive strategy.

The rationality of objective and purposeful planning was confronted in The Third Reich with a rationality, but it was the Fuehrer's rationality about which he philosophized before the regional directors (1937), on the unavoidability of the confrontation with the East.[33] As Hitler put it succinctly:

> Only one can give orders; one orders and the others obey. Why? Because it is only in this way that anything can be accomplished, and because we are men enough to recognize that which is necessary must also take place.... Rationality has its rights, but also its duties; it has the right to raise itself to dictatorial power, and the duty to force the others to obey that power.[34]

Could one man alone construct a Nazi-state undertaking of heroic proportions which would have continued to the bitter end? The Third Reich suffered fundamentally from a deification of orders and the order-givers. Hitler was the deciding factor, but he was surrounded by monopolies vying for control and power.

After 1941 the Reich government no longer existed according to classical NSDAP ideals of a regime composed of small industrial powers. Once a full-scale war was realized, heavy industry assumed greater control.[35] This confirms and reinforces the "Stamokap"-Theory of the Marxist school of historians in East Germany, viz., the melting together of State power and market, monopoly power, politics and economics. The German State was making a definitive transformation into "quasi-capitalism" (as described by economic historians, such as Arthur Schweitzer, to delineate the period from 1933 until the deposition of Schacht in 1936) and into a state monopoly capitalism.[36]

Former East German historians are more severe in this indictment as an underlying theme, but are divided in determining when this period of monopoly capitalism started, viz., was it determined already in the First World War, or in the 1930s with the Goering's "New Deal," or in the Speer era, or only after the Second World War with the

emerging of West German markets. The Marxist "Stamokap"-Theory appears tied to the reality that the State and Hitler were nothing more than executors and technical hacks of the powerful "monopolies," (e.g., large industries: I.G. Farben and Glanzstoff), pointing out that the period of National Socialism was not unique. In effect, Marxist theory suggests that technocrats in The Third Reich were no more than crypto-capitalists.[37]

It is true that The Third Reich, whose Party once attracted members, voters and supporters by mouthing middle-class-friendly slogans, demanded ever clearer monopolization and concentration of the German economy after 1937.[38] The proportion of investments in the production industry (and therewith the larger corporations) rose at the cost of consumer-goods.

The benefactors of the national socialist economic and armament policies and of the closer cooperation between market and state since the mid-1930s were the chemical conglomerates and the armament manufacturers. They influenced the objectives and means planning of the system, regardless of other sectors of the economy and the military strategists.

Heavy industry profited from a system that exhibited pre-liberal and mercantile, as well as post-capitalist and monopolistic characteristics; [39] and it was industry which was the primary partner in the alliance between the

private sector and the state. The incestuous dance between state direction and economic corporate-responsibility was demonstrated by I.G. Farben director Karl Krauch, "General Authorized Agent for the Chemical Industry." He was also Head of the National Office for Economic Growth and (after 1940) Chairman of the Board of Directors of I.G. Farben.[40] He personified the unification of the state authority in regard to chemical production with the oversight over I.G. Farben, the most influential and monopolistic company in the chemical industry.[41]

It is still an open question as to how one characterizes the structure of an economically objective process for utilization of capital where values are determined by political manipulation. In The Third Reich there was the general tendency toward constant investment into the German economy, realized in such a manner that caused economic serfdom in the factories in occupied territories, and, in some instances, within the large industrial regions in Germany and Vichy France.[42]

The objectives of the Four-Year Plan were by no means a general plan for a war economy and the German war economy in 1939 was anything but a fast-running war machine. Hitler's Blitzkrieg concept, as well as the necessity of the regime to keep the people satisfied, ran contrary to the program of "total mobilization." Only after the turning point in the war in late 1942 were the first

attempts made in the direction of total mobilization, which led to a tripling of armament production through the Ministry of Armament and Munitions headed by Albert Speer.

The Germans with the coming of Speer, in 1942 also worked on accelerating production of new types of weapons which continued at an accelerated pace until the beginning of 1945, in spite of their losses in territory and raw-material resources, as well as Allied bombing. Subject to the offices of the SS-Wirtschafts und Verwaltungs-Hauptamt (Economic and Administrative Head Office of the SS), private financing was provided for a wide selection of new scientific projects that later proved to be instrumental for prolonging the war and for providing technological transfer to the postwar American space program.[43]

In retrospect, had the German economy been fully mobilized before 1942, such an increase in output would have been impossible. In fact, armaments and ammunition production rates came to only 16 percent of overall industrial output in 1941; in 1944 it was up to 40 percent. Over the same period, construction work dropped from 13 to 6 percent and consumer goods from 28 to 22 percent, and the rest of the industrial branches from 18 to 11 percent. However, merely comparing the production of various branches could lead to incorrect conclusions because of the increase in total production, resulting

primarily from plundering the occupied countries. The output of consumer goods dropped only by 15 percent and even rose temporarily in 1943 to 90 percent of its prewar level.[44]

Nazi rulers were sensitive to the damage that shortages might have caused to civil population morale, even at the peak of their war effort. The number of women employed in industry remained almost the same: 2.5 million throughout the war.[45] The Germans made no effort to recruit more female labor, even supporting the families of soldiers at a level that permitted them to preserve a relatively high standard of living while the wife remained at home. This is the sole explanation for the fact that the workday in industry was hardly lengthened and that the majority of factories, vital armaments producers included, operated on a single shift up to the end of the war, while in England, for instance, factories had already operated on two or three shifts from the beginning of the war.

A strange combination of constraint and opportunity shaped the business environment of National Socialist Germany, even during the war years. On the one hand, numerous controls had been imposed to gear industrial output to financial markets building a military-infrastructure. On the other hand, dynamic economic growth occurred and the efficient planning processes of new technical breakthroughs created numerous opportunities to

expand profitably, and allowed Germany to experience social and economic changes similar to those taking place in other advanced industrial states.

VI. THE STRUCTURE OF THE ARMED FORCES HIGH COMMAND

Hitler was first and foremost a politician. He, therefore, saw matters of military leadership--both in their foreign-political aspects and in their internal structure--through the eyes of a politician. For this reason, he directed his efforts toward an increasing limitation of the authority of the military commanders. In contrast, he allowed the political sphere to extend its influence, at least territorially, over what were purely matters of military warfare.

When the war started in 1939, Hitler's position of power on the battlefield increased in importance. This, together with the pressures from institutions of National Socialism, forced the Wehrmacht to no longer maintain a classical autonomous structure. It was now placed under a dual chain-of-command which was first and foremost a political chain-of-command under Hitler who coordinated the military agencies. In the military sphere these agencies were the Oberkommando der Wehrmacht (OKW) which had little authority, the military services (Army, Navy, Luftwaffe, and Waffen-SS), the Ministry for Armaments and War Production (headed by Todt and later Speer), and the SS (headed by Reichsfuehrer-SS Heinrich Himmler). Other political powers in the military sphere were the Reich ministers, the Reich plenipotentiaries, the Reich

commissars, the plenipotentiary generals, the Governor General, the Reich Protector, the Party Chancellery, the "Secretary of the Fuehrer" (the exponent of the political leadership in the Ministry of the Interior), among others.

The Armed Forces Operations Staff--hitherto an office of the OKW--was now, in practice, directly under Hitler. Army, Navy, Air Force, and Waffen-SS sent liaison officers to the Supreme Commander.[1] The Ministry for Foreign Affairs, the Reichsfuehrer-SS, the Party Directorate and, later, the Ministry for Eastern Territories were represented with Hitler at his field headquarters by special liaison agents.[2]

The Chief of the Armed Forces Office became Hitler's aide in the capacity of an administrative assistant. At the same time the composition of the OKW staff, which consisted of elements combining command and ministerial functions, remained unchanged, but the branches of the staff were integrated into newly created offices.

The Waffen-SS also exploited their ability to countermand and override military tactical units with their own command system completely autonomous from the German General Staff and the OKW. In 1938, Heinrich Himmler had began to set up the Waffen-SS, as a corps of military shock-troops. Unknown to the military, Hitler had given him a blank check. Without coordinating his plans and efforts with the total industrial and manpower potential of the

nation, Himmler requisitioned personnel, arms, and equipment for his units. The OKW and the Army High Command learned of this siphoning of equipment and recruited manpower only after the Services discovered that the factories had shipped less than the required amount of arms and equipment, or when SS leaders informed the OKW and the Army High Command on their own initiative.[3]

The development of an organizational structure, devised to exercise uniform command powers over the entire Wehrmacht by means of the OKW staff, had been stopped in its initial stage. The OKW became vastly inferior to the general staffs of the Services. The demarcation of virtually all powers in the fields of command and ministerial functions was very hazy, with the result that neither the staff of OKW nor any of the high commands of the services had a clear understanding of its role. The Ministries wanted to insure their command base and in no way wanted to be subordinate to any military authority.

No chart could furnish all the interrelationships and ramifications of these agencies.[4] What Hitler created was a series of overlapping offices, whereby the Ministry of Foreign Affairs overlapped that of the military. The complicated and confused system of overlapping authorities and spheres of influence was bound to result in a dislocation of responsibilities.[5] During the course of the war there was scarcely one sphere of the entire German

war effort which was left untouched by Hitler's restless activity. The dictator's erratic interference and improvised decisions superseded carefully planned and prepared solutions. Again and again, he created new agencies under a "Plenipotentiary General" whose powers overlapped and clashed with those held by existing and experienced top-level governmental agencies.[6]

With the exception of Operation Barbarossa, there was little if any grand strategy that emerged from this structure. There were no plans in the German Army, including the OKW, in the field of military government, except those necessary for each zone of operations. Hitler, instead of conceptualizing with his military high command, alone spent a growing part of his own time working out details of organization, functions, and procedures on the battlefield.

Hitler's general attitude toward the problem of a joint command is reflected clearly and unequivocally in his attitude toward coalition warfare which he refused to recognize as one of the most important elements in strategic warfare. For example, Hitler failed to utilize a coalition with Japan which could have assisted in waging a common war against Russia. Doubtless, Hitler's three perspectives which played an important if not decisive role in the outcome of the war were:

First, the deficient world-political vision of Hitler

and also of his closest military and political advisors, who failed to recognize the great interdependence of international politics, and therefore were not able to think and plan beyond the bare strategic requirements of the expanded Fortress Europe.[7]

Second, Hitler's distrust, which appeared again and again in all fields, greatly influencing his actions. For example, the OKW was prevented from discussing strategic or operational and organizational plans at critical times with the allied general staffs with frankness and clearness which alone could bring about meaningful, united military action.[8]

Third, Hitler's view that Germany was in a position to decide the campaigns, and thereby the war, in its favor, with its own strength by quick blows. He failed to recognize the actual requirements for winning a war and avoided having his allies and neutral states acquire a moral right, by essential contributions to the common victory.[9]

As beforehand mentioned, Hitler's fundamental attitude toward the whole problem of war economy, armament and supply was based originally on a Blitzkrieg strategy. This notion that political aims could be realized in a minimum of time through swift military operations, inevitably led to shortages in supply inventories.[10] This was further complicated by Hitler's support of the self-sufficiency on

the part of each service in general, and, in particular, the Navy, Air Force, Waffen-SS, and other organizations where top authorities opposed any form of unification as a matter of principle.[11]

The drawbacks of the military organizational structure in supplying the services, made themselves felt as early as 1940. By that time not only each service, but each of the other organizations, too, began to set up its own supply machinery in the occupied territories, and to make itself independent also in spheres in which the Army alone was clothed with controlling authority. Aside from the waste of manpower, the striving toward self-sufficiency on the part of each service and the other organizations rapidly led to a distinct unbalance in the amount of supply reaching the several user agencies, as well as to an overburdening of transport facilities.

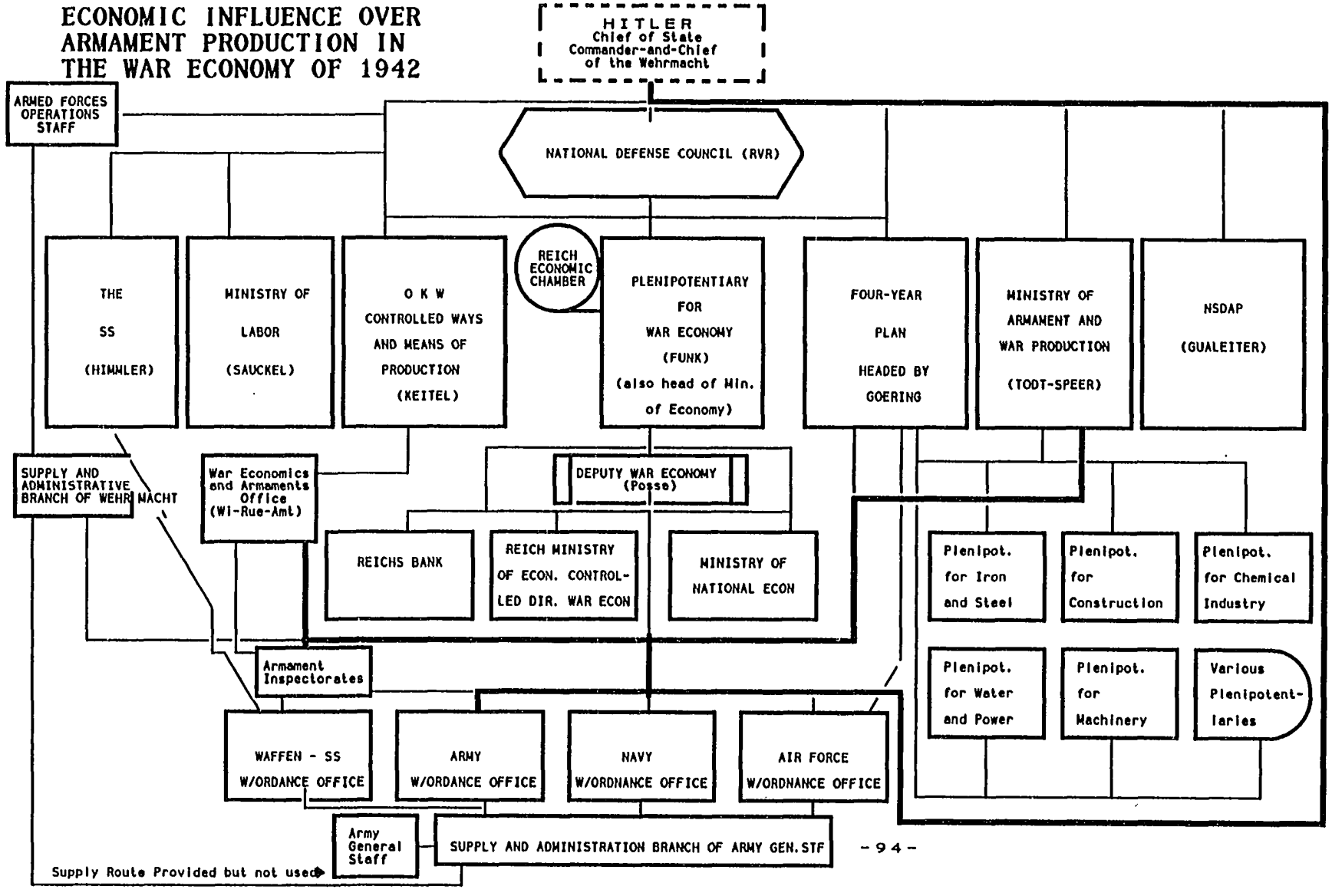
The competent authority for the Wehrmacht's needs was the Supply and Administration Branch in the Office of the Deputy Chief, Armed Forces Operations Staff. Residual authority was vested according to Army Service Regulations No. 90--in the Army, or more precisely, in the Chief of the Supply and Administration Branch of the Army General Staff.[12] The latter was responsible for certain aspects of supply of all units and administrative offices of the Armed Forces (Army, Navy, Air Force) and attached organizations (SS, Organisation Todt, Reich Labor Service,

Transport Corps Speer, etc.) employed in the theaters of operations.

The Army very soon realized the potential danger of the situation thus developing, and in 1940 voiced its apprehension in a detailed memorandum. It should have been the clue for the OKW to intervene in order to forestall the dire consequences of overloaded transport facilities, inequitable distribution, and a substantial increase in manpower requirements for the supply organizations that inevitably would materialize if the services and other organizations persisted in following their course of independent action on which they had embarked. The Armed Forces Operations Staff might at least have taken steps to enforce compliance with the uniform supply procedure.[13]

As early as 1942 such a multitude of parallel and overlapping organizations had come into being that the top authorities experienced over-increasing, difficulties in estimating current supplies, future availability of supplies, and in procuring other needed data which formed the basis of all operational planning. For example, each of the three services, each of the attached organizations, as well as the Waffen-SS had its own automotive supply carriers (later called prime cargo space). But neither the number of vehicles in use, nor their carrying capacity was known to the Chief of the Supply and Administration Branch of the Army General Staff, despite the fact that he was

ECONOMIC INFLUENCE OVER ARMAMENT PRODUCTION IN THE WAR ECONOMY OF 1942



responsible for all the services in the military supply field. Thus, the Chief of Army Transportation was forced to allocate space and quotas without having an opportunity to ascertain the bona fide nature of requests, and without being able to survey the supply situation in its entirety.[14]

Time and again the Army explicitly pointed to this state of affairs and requested corrective action. To be sure, the Chief of OKW conducted investigations and, in 1943, even appointed a special commission to review the whole problem.[15] No particular measures were adopted, however, save in the case of fuels which were rapidly falling into short supply. Nothing was done to alleviate the other conditions, despite the fact that all responsible authorities and plenipotentiaries had recommended that central control over the bulk of the supply problem be vested in the OKW. Instead, the status quo was allowed to continue even though the Armed Forces Operations Staff meanwhile had assumed operational command functions, and in that capacity had first-hand experience with the intolerable situations in the field of supply.[16]

There hardly could have been another field in which uniform and centralized direction in the hands of OKW was so necessary and, at the same time, so obvious a solution to the whole problem. The fact persists, nevertheless, that the tangled supply situation was never successfully

unraveled.

The relation between distances and available transport capacity became another factor which became particularly significant as of 1941, but which was not fully appreciated by the OKW, or, in any case, never brought home with sufficient emphasis because of the pressures exerted by the previously mentioned adverse interests. The numerous consequences flowing from the peculiar structure of the German supply organization were horrendous.[17]

The Chief of the Supply and Administration Branch of the Army General Staff, who was responsible for the entire Armed Forces in many fields of supply, was not a member of the OKW.[18] For that reason, he was unable to acquire a broad enough perspective of requirements and transport facilities to direct supply operations in a uniform and intelligent manner. The Chief of Armed Forces Transportation, who allocated rail cargo quotas, necessarily wielded decisive and controlling power over the amount of supply reaching the services, also failed to contribute towards the establishment of a uniform overall supply procedure.[19]

When, in February 1945, a last-minute project envisaged the establishment of a standard supply system at least for clothing and equipment through the creation of a general administrative office within the jurisdiction of the Commander of the Replacement Training Army, the chief

of which was to receive specific OKW powers, circumstances prevented the plan from taking effect.[20]

The solution to the problem of supply was within the OKW. A central organ should have been given the power to supply all three services of the Armed Forces and enjoy the corresponding command authority. The services might, as another alternative, have been permitted to retain their independence whereby they would cover their requirements from industry directly within the limits of an over-all program set by a superior OKW agency. Either case would require assurance of strict direction within the Armed Forces and a unified representation of their interests towards industry. A basic decision in this matter was never made. For the most varied reasons, this was probably in agreement with the tendencies of The Third Reich and Hitler. A question of personalities also stood in the way. It is certain that this contributed to the slowdown of the armament industry at the time of war which remained at disorganized production levels as late as mid-1942.[21]

As before mentioned, the allocation and distribution of fuel within the Armed Forces was the only supply function directly controlled by the Chief of the OKW. During the last three years of the war the requisitions of the services, including the Waffen-SS, and of the other organizations attached to the Armed Forces for military purposes were submitted to the Supply and Administration

Branch in the Office of the Deputy Chief, Armed Forces Operations Staff. The Chief of OKW then communicated with the Office for Industrial Planning of the Reich Minister for Armaments and War Production, in order to apportion current fuel inventories into the military and civilian contingents.

The rigid administration of the fuel supply proved its worth; it continued to function smoothly up to the last month of the war.[22] All the more inexplicable as to why the knowledge, thus acquired, was not applied in the other fields of supply, particularly since, the characteristic features of the scarce economy required sweeping measures.

Aside from the problem of uniform Armed Forces supply procedure, mention must be made also of the cooperation between the Chief of the Supply and Administration Branch of the Army General Staff, and the Armed Forces Operations Staff. De facto, of course, the Armed Forces Operations Staff submitted its supply requirements directly to the Chief of the Supply and Administration Branch of the Army General Staff through Section I of the Supply and Administration Branch in the Office of the Deputy Chief, Armed Forces Operations Staff under the OKW.[23] On one hand, however, the teamwork between the Chief of the Supply and Administration Branch of the Army General Staff and the Operations Branch of the Army General Staff dated back to peacetime, and had always been very intimate so far as

personnel and organization were concerned. On the other hand, direct cooperation with the Armed Forces Operations Staff was a procedure which had to be worked out step-by-step. Consequently, it was inevitable that the complicated top-level structure should produce a substantial amount of friction when it came to the processing of supply for the OKW theaters.[24]

A chasm developed between the Armed Forces Operations Staff and the General Staff of the Army. The chasm was underscored by Hitler's attitude. In problems of distribution of men and materials in the areas of war, Hitler turned exclusively to the Chief of the Army General Staff. Moreover, the task of the Chief of the Army Staff was made difficult by Hitler's habit of making sudden decisions after conferences with troop commanders, SS leaders, heads of the armament industry, or plenipotentiaries. These decisions, frequently not in agreement with the intentions and ideas of the Army General Staff, were mostly irrevocable.[25] Even on the most fundamental level of military management, the German military, which was the least amorphous of German political institutions, was unable to take control of the allocation of military ordnance, supplies, or their production of fuels.

The lack of balance and consistency within the military command framework was further accentuated by the dismissal of the Commander-in-Chief of the Army, General

Brauchitsch in December 1941 when Hitler personally took over its command. At the same time the number of those participating in daily army briefing conferences increased considerably as a result of the territorial and temporal expansion of the war front. The increases were also owing to the obvious intention on the part of the Reichsfuehrer-SS Himmler and Martin Bormann, the Chief of the Party Chancellery, to arrive at a point where they could decisively influence decisions in the military sphere and isolate Hitler from other decision-makers, such as Albert Speer, General Walter Dornberger, and others interested in bringing to his attention new technical advanced crucial to the war situation.

By 1943, the following picture emerges when one delineates the workings of the Supreme Command structure [26]:

Hitler...Chief of State, Commander-in-Chief of the Armed Forces, Commander and Chief of the Army;

Keitel...Chief of OKW, Reichsminister for War and Deputy Commander in Chief of the Army;

Chief, Armed Forces Operations Staff...Second Chief of the General Staff of the Army for OKW in the theaters of war;

General Staff of the Army...Operational command: Commander for entire army in East Europe, but without "command authority" to activate armies;

Armed Forces Operations Staff...General Staff for OKW theaters, but dependent on the General Staff of the Army in all problems of supply and organization;

Inspector General of Armored Troops...directly subordinate to Hitler;

Chief of the Army Staff....Liaison and information staff specialist between Commander-in-Chief of the Army and the Army High Command.

Of the three offices of Army High Command (General Staff, Personnel Office, and Equipment and Commander of the Replacement Training Army), Hitler subordinated only the General Staff directly to himself on the forced retirement of Field Marshall von Brauchitsch (1941). The Armed Forces Conscript and Recruiting Office which, in turn, controlled the Army Personnel Office was subordinate to Wilhelm Keitel and did not change until autumn 1942, when Hitler's Chief Adjutant, General Rudolf Schmundt, was placed at the head of this office, while retaining his position of adjutant with Hitler. By this personnel combination, Keitel was practically eliminated, which was no doubt exactly what Hitler wanted.[27] The OKW was to also control Motor Transportation and Medical Services for the military services.

Wilhelm Keitel, the Chief of the OKW, with the rank of

a Reich Minister, was a member of the Reich Cabinet or Government, as well as the National Defense Council.[28]

The Chief of the OKW had the following main agencies under his control:

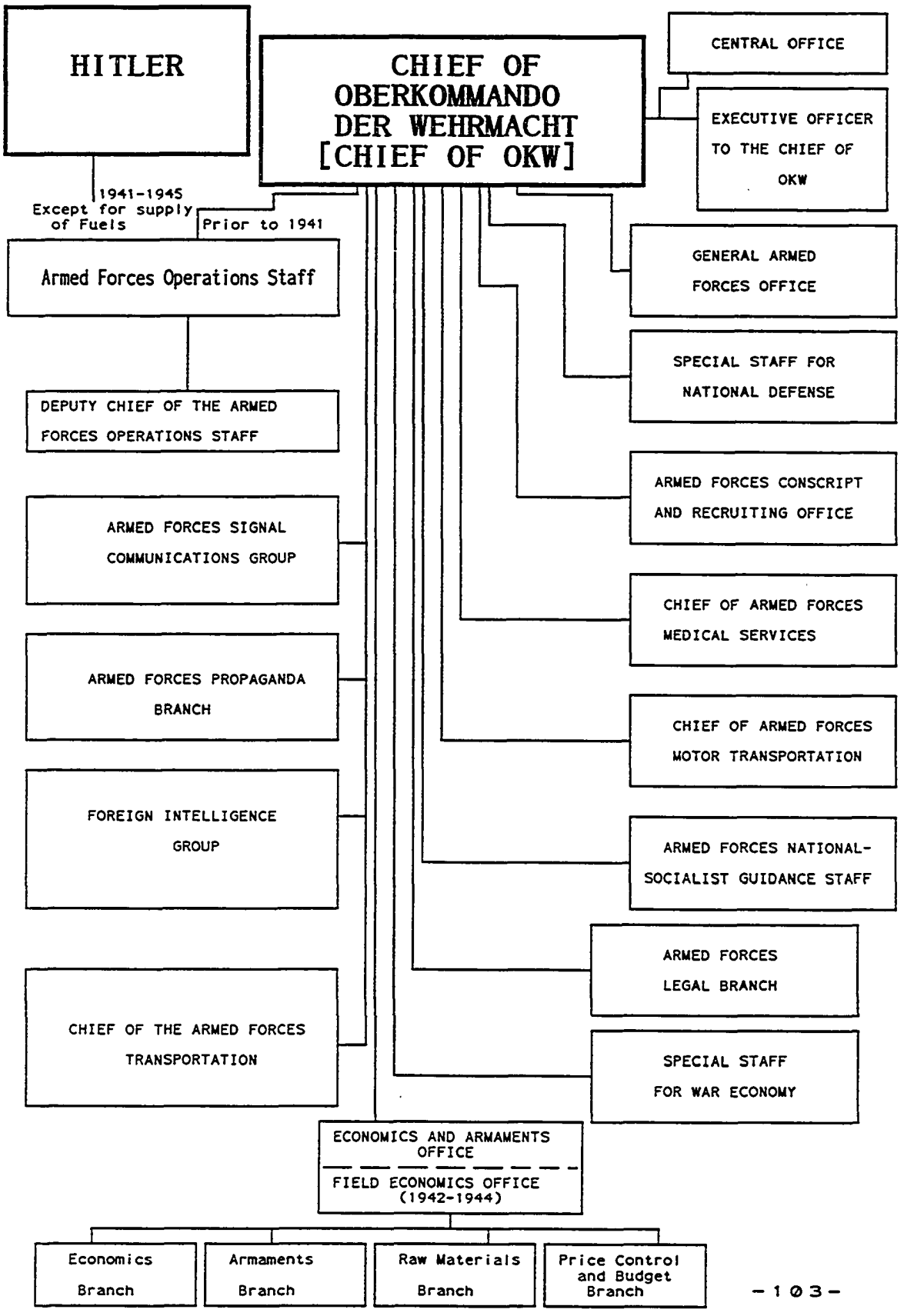
1) The Armed Forces Legal Branch, which for its part was in close contact with all the respective ministries and civil agencies.

2) The Armed Forces National Socialist Guidance Staff, which was concerned with all questions based on National Socialist propaganda to be given out to local areas.

3) The National Defense Branch. i.e., the OKW/Abt. (1), which as a military executive branch was responsible for controlling all higher matters which had to be handled for all branches of the Wehrmacht, as well as matters connected with the defense of the Reich.

4) The War Economy Office (Wehrwirtschaftliche-Dienststellen) was directly under the OKW/Economic Staff and the various branches of the Wehrmacht for the purpose of controlling and allocating the production of the armament industry, as well as for general tasks connected with the armament economy.[29]

5) The Military Economic and Armaments Office, for all matters in the field of war economy and armament. [The Military Economics and Armaments Office was dissolved at the beginning of 1942. The Armaments Branch was then transferred to the Reich Ministry for Armaments and War



Production, while the field Economics Office was created from the Economics Branch.]

The Military Economics and Armaments Office of the OKW consisted of the following four principal branches:

a) Economics Branch;

b) Armaments Branch;

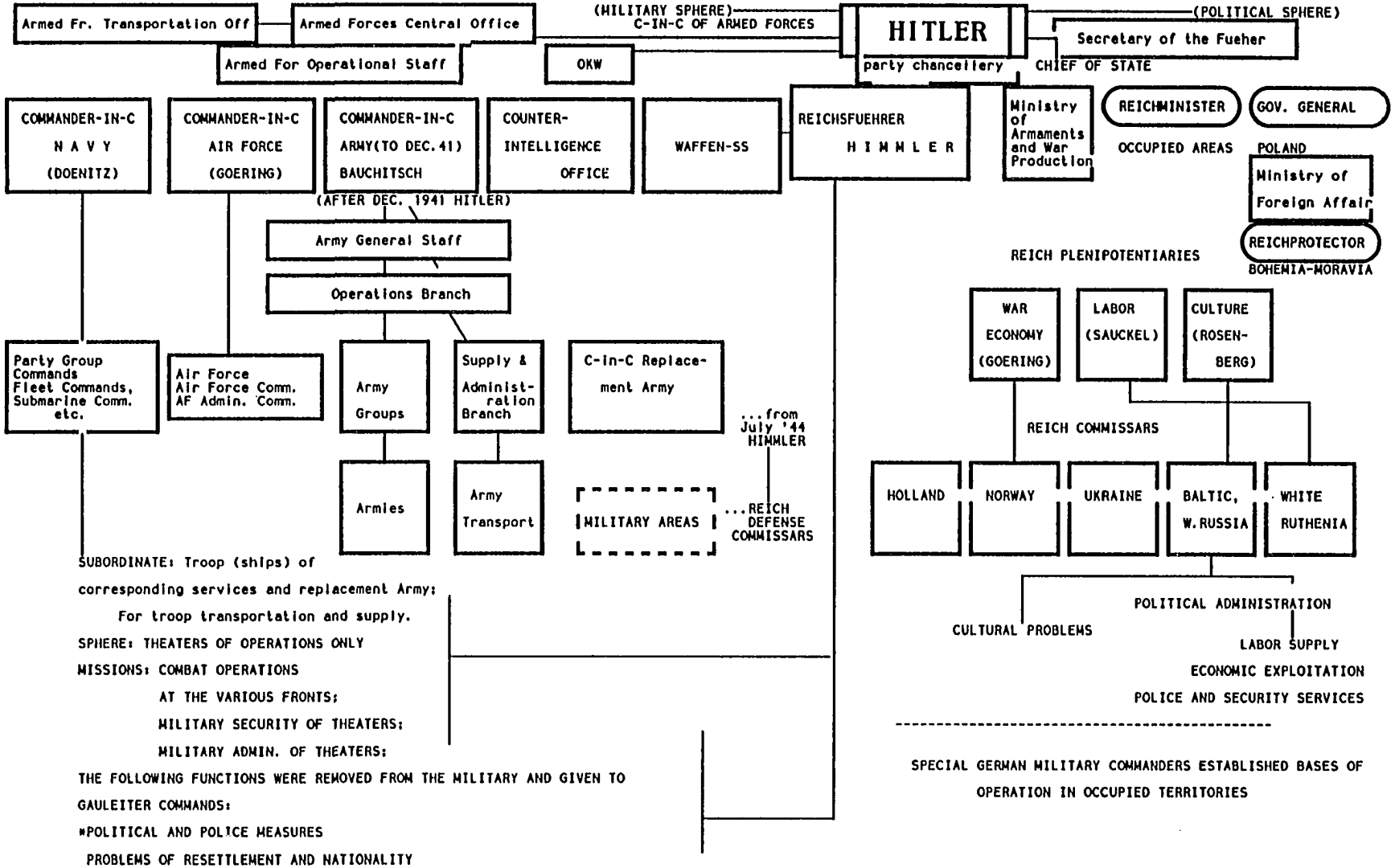
c) Raw Materials Branch, and

d) Contracts and Price Control Branch.[30] [See Appendix G.]

Soon after the end of the campaign in France (1940), the Economics and Armament Office extended its field offices to the newly occupied territories in order to relieve the German war industry. It requested from the Reich Minister for War Economy, the planned exploitation of these territories. From then on the Economics and Armament Office of the OKW continuously initiated transfers of orders in the armament industry to relieve its own manufacturing plants and to increase the efficiency of armament production.[31]

In the end, the OKW never truly directed or coordinated the German war effort except at the very end, when the Army General Staff was finally placed under OKW as a consolidation move. It did have legal, coordinating, foreign and counter-intelligence, and economics and armaments branches along with an operations component, but

it lacked the clout and official recognition as well as the apparatus to provide strategic intelligence, training, transportation, and equipment and supplies necessary for the soldiers at the front.[32]



MILITARY AGENCIES (1941-1944)

VII. BETWEEN TECHNOCRATS AND BUREAUCRATS

It was a truly curious development that in one camp, under a dictatorship and "Fuehrer" system, the legitimate requests of the armed forces were increasingly sidetracked by a multiplicity of governmental and semi-governmental agencies, whereas in the leading democracies of the West the situation was reversed. The Wehrmacht found that in many important fields the interests of the Party took precedence over its own when submitted to the Chief of State for his decision.

Eventually, a unity of command over the entire Wehrmacht and all military functions was maintained, but it was no longer in the hands of a Wehrmacht minister but solely in the person of Hitler. Hitler was simultaneously Commander-and-Chief of the Armed Forces, Chief of State, and Fuehrer of the Party with all the obligations that arose from these offices.[1]

Hitler's numerous titles of power, were probably not acquired purely as a result of the war. No later than 1937 Hitler had clearly rejected all those who had believed that the "power of the Fuehrer" and an institutionalized "authoritarian governmental hierarchy" were compatible with one another. He had also made his determination clear to oppose any constitutionally legal self-determination.[2]

The NSDAP, however, was able to establish itself as an

organic system and type of authoritarian anarchy. It further cultivated unhindered duplication of special authorities and special administrations, rival organizations and agencies, leading to the creation of increasing numbers of "government independent," "authorized representatives of the Fuehrer," working against the civil and military spheres of power.[3]

Already in the early years, Hitler and those who assisted him in directing the affairs of the Nazi Party had discovered that the establishment of parallel offices was a means of confusing everybody and everything. As time went by, they exploited this device ever more often. If the Army had a Weapons Office, the Party, under some name, created an equivalent office. Each would be annoyed by the existence of the other and would compete with the other. In the confusion of overlapping jurisdictions and competition, it was easy for the Party to maintain political supervision over both. Still another stratagem for gaining political hold on activities was to appoint a Special Representative or Commissioner or a Plenipotentiary for the designated activity.

An example of the overlapping structure that was created can easily be demonstrated: "According to current legal structure," wrote the Munich Area Commander and Bavarian Minister of the Interior, Professor J. Wagner to Reich Interior Minister W. Frick on 23 June 1943, "the

Reich Governors report to you as Minister of the Interior. Adolf Hitler is Reich Governor of Prussia. He has, however, delegated his authority to the Prussian Minister Presidents. You are also the Prussian Minister of the Interior. As Reich Interior Minister, by law, Hitler reports to you as does the Prussian Interior Minister. In that you are one and the same as the Prussian Interior Minister you report to the Prussian Minister President and to yourself as Reich Interior Minister."[4]

One does not need to be a jurist nor a historian to see that such a structure of interlocking offices shows the entangling web of Nazi bureaucracy at its worst. This curious and somewhat frightening document signals a labyrinthian relationship that led to the dissolution of State and Constitution in the so-called "Fuehrer State."

In addition to an unqualified independence, the NSDAP, also showed a more or less pronounced phobia against the military establishment. As the war continued, coordination of civil agencies, ministries, and the military became a piecemeal process. Whenever one agency instituted an organizational measure, there arose the problem of bringing that measure into focus with the interests of another agency, for example, when the National Socialist Party Chancellery created the Volkssturm. The NSDAP maintained for a long time that the Volkssturm units could perfectly well be committed in the front lines without having to be placed

under the jurisdiction of the local military commanders.[5] Conversely, measures initiated by the military establishment had to be discussed with the pertinent civil agencies (for example, the project of armed forces female auxiliaries had to be cleared with the Reich Woman's Leadership, the Labor Ministry, and other related agencies).[6]

Difficulties in negotiations with the military like those just mentioned continually arose in all organizational matters, primarily from the fact that directives from the OKW were overruled especially pertaining to issues of national defense. Solutions could have been found whereby, in matters pertaining to national defense, the OKW should have been clothed with authority not only to issue, but also to enforce directives addressed to civil agencies.[7] Instead, one always had to indulge in long-winded negotiations and to be largely dependent on the other party's group of military affairs. Another case in point was the blanket statement from certain quarters of the NSDAP that since a furlough ban had gone into effect (in 1944) for industrial workers, it would only be just if all military furloughs were likewise cancelled.

In addition to the NSDAP, Goering and Himmler were accumulating massive powers using the title of the Hermann Goering Werke and the appeal of the SS state.[8] This led to the slow dissolution of the State into a polyarchy of

particular agencies. This bloating and destructive process, which has been soundly analyzed by the research into National Socialism was characteristic of the structural development of the Nazi "new order."

The Nazi system has been described, even if simplified in conjunction with the system analysis of F. Neumann, A. Schweitzer, and others, as a "coalition of several, quasi-autonomous, vertical pillars of power and authority" (Party, bureaucracy, armed forces, market). It can also be described as a non-system where power groups, unified in the will to destroy democracy and early Reich constitution, worked through ad hoc concentrated actions and, when necessary, called upon the decisional authority of the Fuehrer himself.[9]

The demonizing of Hitler and the Fuehrer cult may be obsolete to most historians, but Albert Speer's Memoires published in 1973, reveal insights into the leadership of The Third Reich.[10] Speer, a member of the leading circle of the Nazi-regime, documents in a multifaceted and detailed manner how unbelievably dilettante this "Fuehrer" was. He details Hitler who, although unsystematically self-educated in a number of areas, was able to lead a great industrial power like a bohemian unleashing a battle for world supremacy. The Third Reich only succeeded for as long as it did because the generals, industrialists, professors, teachers, technocrats, and bureaucrats, for

whatever reasons, formed a sufficient majority and went along with it, finally tripling armaments production between 1941 and 1944.

The Fuehrer principle became the lone scapegoat for the perpetuation of the Hitler boom and the fairy tale belief in a solitary decisionary power which was said to prevail. The real players were the generals, the SS, the Party leaders, and the industrial managers. The minor actors were the agency heads whose dedication and activity arose out of a pure idealism and whose motivation was sparked by that conscience-bound sense of duty, and carried out only by indispensability, technical understanding, and functional efficiency of the various power and functional elites of The Third Reich.[11]

In conversations, Economics Minister Funk in 1942 [12], the man who had advanced from "General Administrator for Special Assignments" to "Main Division Chief" in the Economics Ministry, the former associate in the "Keppler Office," criticized the non-existence of a functioning government in an otherwise monolithically structured, totalitarian state.

According to Funk, "The majority of them [agency heads] were skeptical of, if not opposed to, the National Socialist regime. But they had promised their lives to the State. In regard to the fulfilling of their duty, only a few could be called to task."[13]

Hans Kehrl, head of the Planning and Raw Materials Agency, was skeptical of the bureaucracy and of the economic managers. He agreed with Funk as to the role and function of the bureaucrats in The Third Reich. According to Kehrl, the Prussian-German authoritarian bureaucratic tradition of service was seen by many as the reality leading to a transparty State ideal that was sought by both left-wing and right-wing extremists. Welcoming and actively supporting the national renewal and resurrection in 1933, many bureaucrats expected and hoped for a reconstitution of the strong central state complete with a strongly influential, state-carrying, and leading bureaucracy after the dissolution of parliamentarianism and democracy.[14] Hans Kehrl reported how they became disappointed at the irritating and antibureaucratic attitude Hitler presented and that which was reflected in a large segment of the Party. Furthermore, they were permanently forced to put up with storm troopers in the interest of the perpetuation of national order.[15]

Who maintained order? The upper levels of technocrats became, besides the national army, the most ardent tradition and factors of stability in the leadership coalition of The Third Reich. The civil service corps were just as much counterweight to the Nazi leadership circles as they were the executors of their wishes.

Hans Kehrl was a raw materials expert in the Four-Year

Plan organization. He stubbornly and successfully refused to become a civil servant when he entered the Economics Ministry at the beginning of 1938.[16] He mistrusted bureaucratic procedures, feared a bureaucratic attitude, and disdained the anti-innovations and anti-improvisation stance of the administrative organization.

Kehrl was a technocrat and not a bureaucrat. He saw the need for major institutional change in Germany through the use of modern technologies. During the war years of The Third Reich, the technocrat was no ally of bureaucracy, for a technocrat is one who advocates control of industrial resources, reform of financial institutions, and reorganization of the social system based on the finding of technologists and engineers.

Textile-industrialist and Special Administrator, Kehrl anticipated and personified the later melding and combining of State and market, industry management and state administration into one person. In many aspects he represented the Nazi-type of economic leader who was half functionary of the regime and half private entrepreneur, that developed through the demands of the regime for ever-increasing efficiency and ever more responsive affectivity.

Kehrl had been in the United States in the early 1920s and made his acquaintance with F.W. Taylor's "scientific management" concepts. He belonged to the second generation

of German industrialists and engineers who (since the turn of the century) traveled to the United States in order to familiarize themselves with the early, comparably highly developed management formulations (complete with its technocratic implications).[17]

Hans Kehrl reveals an interesting personal testimony as one of the circle of the uppermost leadership levels of the Nazi state in his memoirs, The Crisis of A Technocrat, where he sees himself as a servant of the regime from the middle class. In spite of his forced interconnection with a highly structured administration, according to Kehrl:

> one attains the technocratic level only when he wishes to grow beyond the bureaucracy.... When one holds, in the public or private sector, a command lever in one's hands, one suited to influencing decisional power, and when one nevertheless possesses the will to make use of this lever regardless of whatever hierarchical rules, in the spirit of independence and responsibility..., then one can recognize in this individual the technocrat.[18]

The technocrat must have the opportunity to direct, to act and to accomplish completed tasks, that can only be eliminated from the world through a decision of the highest political authority. The actions of the technocrat presuppose, in every situation, the presence of a clear will, a consciousness of responsibility, in addition to a sense of responsibility.

Kehrl, the inventor of the national clothing card, the

organizer of the increased German synthetic fabric production prior to 1939, the crisis manager of 1942 when it became necessary to produce immediately new troop clothing for the next Russian winter, this Chief of the Planning and Natural Resources Office in the Speer ministry from 1943 to 1945 was, according to his own understanding, a pure technocrat.[19]

In 1933 to 1934, the new social contract of The Third Reich was to claim it brought a supersession of the class struggle in German society by providing a higher unity for the diverse nationalisms and embryo socialisms to unite behind as a true German socialism.[20] After the elimination of such tensions, and in conjunction with Hitler's and the NSDAP's anti-bureaucratic sentiments and attitudes, the technocrats and managers, with their own aversion toward bureaucratic obstacles, especially in a Fuehrer state, saw their chance.[21]

A new alliance formed between management and Fuehrer principle. In 1936, beginning with the Four-Year Plan, and with a bundle of programs aimed at the development of the fundamental materials industries, particularly in the area of weapons and armaments, a phase of increased and strengthened state control and technocratic direction was instituted. In addition to the restrictive measures in the raw materials management and in investment control, a phase of heavy subsidies for armament-relevant industries was

established. Although military supplies were in disarray, this was controlled not by the military, but by the technocrats of the Third Reich.

In support of the technocrats were the technical advisors who made the achievements of science and technology come to pass. Most technical advisers had both an engineering and business strategy consistent with the priorities of the Reich. They aimed at lowering production costs, tightening control of existing markets, increasing the sale of by-products, and developing new technologies, especially cars and aircraft, that would no longer depend exclusively on fossil fuel, but make use of its by-products through research into synthetic fuels and fabrics. They placed National Socialist ideals first. Paul Pleiger and Fritz Todt exemplify this category of thinkers. They, like the technocrats, functioned out of professional dedication to the modernization of Germany through technology.

Although there appears to have been administrative chaos, amazingly enough there still existed the ability to push matters through, a willingness to make decisions via Goering, Speer and Himmler's dynamics. Goering, for example, wielded the prescribed "brown pencil" of critical decisions in the Economics Ministry while at the same time utilizing the "blue pencil" of the Plenipotentiary of the Four-Year Plan.

In the concrete political and social situation of The

Third Reich, under the conditions of the Fuehrer state, the rivalry between the technocrats and bureaucrats and between technical advisor and political command structures, became evident in its crassest manifestation. Paul Pleiger, Chief of the Hermann Goering Werke, was of the opinion that the Fuehrer principle of The Third Reich was just the right thing for him. When one had "total authority, one could work in a reasonable manner."[22] This was the "dialectical relationship between value-freedom and technocratic objectivity" and the "baselessness of a political-decisionistic agenda."[23]

In its tendency to identify the frictionless functioning of an apparatus and optimal affectivity with a maximum of rationality, in its belief in a factual and purposeful rationality, the technocrats and technical advisors in this regime oversaw the irrationality of the total system. The contributions that combined partial rationalism and reasonable objective decisions brought to stabilize and legitimize this system should not be underestimated.

Though the system was flexible enough for economic policies, for the cooperation between state direction and private management, it offered only minimal chance to technocrats and technical advisors who intended to achieve, rational, long-term planning and little chance for the military to make realistic use of scientific weaponry and

planning which was guarded by the industrial management structure and the Fuehrer principle.

Although the technocrats developed into a new warrior class implementing new weapon developments from early development to the production end, in the end they and their technical advisors could not keep up with an otherwise failing structure. By 1943, the development of a total war economy was never enough and all too late. Germany was facing an "all-or-nothing strategy"; Hitler had already attempted the objective of an "Eastern Empire" and was contemplating the subjugation of the Slavic peoples, all of which had brought about the anti-Hitler coalition of Allied forces, which eventually brought to an end the undertaking known as The Third Reich.[24]

VIII. THE FORMATION OF THE REICH MINISTRY FOR ARMAMENT AND MUNITIONS

Hitler, early in 1940, after taking control of the agencies of the OKW and the Wehrmacht, which were originally charged with directing the armament industry, appointed Fritz Todt as Reich Minister for Armament and Munitions. Todt was considered the best technical long-term advisor for the priorities of the Army, particularly for the execution of large productions of ammunition. Todt received the special mission to considerably increase Army manufacturing of ammunition by means of pertinent efficiency measures. He was given authority to issue orders directly to the Army Ordnance Office and, as early as spring 1940, his task was extended to include arms and tanks.[1]

Todt's new-founded authority revealed Hitler's distrust for the military which was heavily felt in the Economics and Armament Office of the OKW. From here on the OKW had lost its last influence on the direction of armament production and no longer had any direct relationship with the munitions industry.[2] There was no longer any military command authority capable of coordinating the interests of the Armed Forces Services or at least representing them jointly, even in the allocation of raw materials.[3]

Fritz Todt was a capable engineer and a veteran National Socialist who before the war had been in charge of construction of the autobahn network and the Siegfried Wall. He was initially attached to the Four-Year Plan administration under Goering. Todt had already a capable team of some of the best engineers which he had chosen from the Siegfried Wall administration's personal pool. The Organisation Todt was a kind of independent engineering force run like a military unit within the Reich.[4] In this capacity he laid the foundations for the reorganization of the entire armaments production system.

Todt introduced the first basic principles for the rationalization of the armament industry of the Army and created the organization of the Selbstverantwortung der Industrie (self-responsibility of industry).[5] In this way, Todt slowly increased his influence on the economic leadership. He became Hitler's principle adviser in armament problems. This was emphasized by the improvement of the armament situation for the Army which was maintained up to the middle of 1944.[6] Notwithstanding several attempts on the part of the Economics and Armament Office of the OKW, Todt still hesitated in executing any basic measures concerning a unified over-all long-term plan, ignoring also the problem of the labor force.

Influenced by speedy successes in Poland, France and in the Balkans, Hitler and the command authorities of the

German Military Establishment believed after the tremendous victories that the Russian campaign would be finished quickly and called for Army armaments to be considerably reduced in favor of the Air Force and the Navy in the late summer of 1941. Pursuant to the "Fuehrer Directive," the focal point of armament was shifted to the Air Force which was increased greatly while naval armament concentrated sharply on those measures which would serve the warfare against England and America.[7] As far as the Army was concerned, a considerable increase of armor was to be received, but within the scope of a strong general reduction of other army ordnance supplies.

The Blitzkrieg strategy came to an end in the fall of 1941, with the failure of the German army to capture Moscow before winter. Nevertheless, a few more months were needed to make Hitler and his generals realize that they were in for a lengthy war. In December 1941, when the United States entered the war, the Germans faced superior military, human, and economic resources, while the halt of their military advance at the gates of Moscow had put an end to their hopes of a quick victory.

The signal for the change in direction was given by the Fuehrerbefehl Ruestung.[8] On 10 January 1942, Hitler gave the economic order to increase armaments production. His instructions granted equal priority to the construction of armored vehicles for the eastern front and

of submarines for the Atlantic. Intensifying the maritime blockade of Britain was perceived as the only means of defeating the nation before the United States could mobilize all of its resources for the war effort and send substantial forces to Europe. From this point on, Hitler realized that in order to cope with all these tasks, the long-term capacity of the rearmament industries had to be expanded considerably through heavy investment in additional development projects.

With the first military reverses in the winter of 1941, Fritz Todt joined the sentiments of General Thomas' design for total war. However, Todt called not for military control of the economy, but control through his own civilian Munitions Ministry.[9]

The impressive achievements of the Ministry for Armament and Munitions are often and somewhat misleadingly attributed to the man who succeeded Todt following his death in an aircraft accident in February 1942. With the death of Todt, Albert Speer received the first authorization to bring about a coordinated leadership of the economy and armaments. Speer especially became responsible for the execution of the newly established manufacturing programs of the Army. This manufacturing program was to be increased considerably by peremptory efficiency measures, after other services had absorbed a part of its important production output which had first

been reduced pursuant to the precipitous order of the summer of 1941.[10]

Albert Speer, Hitler's architect, in fact continued Todt's work according to the organizational guidelines his predecessor had drawn up. He was nevertheless a talented administrator in his own right, and his ties with Hitler, who fully backed him, enabled Speer to circumvent bureaucratic pitfalls in order to achieve his objectives.

The organizational principles laid down by Todt and implemented with a great deal of technocratic efficiency by Speer were based on mobilization and coordination of the initiative, the know-how, and the profit motive of private industrial enterprise. Actually this was merely a continuation of the Nazi method of guiding the economy without too much rigid central planning. Yet, because circumstances had changed, it was necessary to impose more rigid restrictions on private corporate entrepreneurship, as well as to pinpoint from the top, precise objectives as they extended over longer periods of time. From 1941 on, central planning was conducted through branch committees with wide-ranging authority which determined production quotas and allocated raw materials, as well as the use of the labor force. Initially, such committees had been established only for ammunition supply, to coordinate production with the planned stages of warfare.[11]

From the end of 1941, Todt organized coordinating committees for all kinds of armaments. For example, Ferdinant Porsche was appointed chief of the committee for the production of tanks. These committees issued specific technical orders to each enterprise, supervised production of the items ordered, and ratified the transfer of skilled labor between enterprises whenever necessary, as well as provided for mechanical equipment and buildings. In the course of time, a supreme committee was added at the top to coordinate the activities of the branch committees.

Within the framework of comprehensive planning, enterprises still had fairly wide discretion. Until the end of 1941, enterprises operated on a cost-plus basis, more specifically according to the LSO (Leitsaetze fuer die Selbstkostenabrechnung fuer Oeffentliche Auftraege -- Rules for the Calculation of Cost for Government Contracts), that is, they presented cost calculations plus man-hours and added a 3 - 6 percent profit. This method, of course, neutralized any incentive to save materials and labor in order to reduce labor costs, since profits rose in accordance with expenses. Todt replaced this by a method of fixed prices determined by his department in consultation with branch coordinating committees which rationally utilized as little labor as possible.[12] The management of each enterprise was responsible for improving efficiency in production and internal administration, which from then on

was the only way to increase their profits.

Todt's successor, Speer, encouraged more centralized production in large enterprises instead of the distribution among a great number of smaller companies scattered throughout the country and in occupied regions. Although Speer achieved higher efficiency by utilizing the advantage of size, he also made production centers more vulnerable to attacks from the air once the Allies began their massive bombing campaign.[13] Gradually, the German Minister for Armament and Munitions Production gathered far-reaching authority over all economic sectors into his own hands, circumventing other government departments, including the Ministry of Economics, the Four-Year Plan administration and over-powering numerous military tasks.[14]

In the military sphere of power, Hitler was the Supreme Commander of the Army. The agencies of the Army dealing with armament tasks, that is, the Chief of Army Equipment and Commander of the Replacement Army, Ordnance Office, General Staff, Inspector General of Armored Troops, Chief of Army Staff with the Chief of the OKW, all turned to Albert Speer directly for information, sometimes without any previous consultation having taken place. Hitler also frequently issued his orders to these agencies and to Speer, or merely to Speer, whose sphere of activity for the time being was limited to the Army. In addition, the Air Force and Navy directed their armament production

independently.[15] Aerospace engineers, who had been stymied in exploring new areas of research because of the impotence of the Army, began to evolve as a powerful force under Speer's direction.

Recognizing the existing lack of coordination in the economic leadership, Speer from the beginning aimed to put the leadership of industry into the hands of experienced industrialists by extending the measure of "self-responsibility of industry" which had been initiated by Todt. Speer wanted to remove industry from the bureaucratic control of military and civilian authorities (Economics and Armament Office of the OKW, Army Ordnance Office, and Reich Ministry of Economics, respectively). One of his first steps in that direction was the complete deactivation of the OKW![16]

On 2 March 1942 Speer praised the work of the Wi-Rue-Amt (under General Thomas) and of the Armament Inspectorates, and expressed a desire to work closely with General Thomas and his organization. Speer stressed that the economy must be ruled by the needs of armament production. Speer summarized the situation with the remark that he had the power of influence with Hitler and Thomas had the great fund of experience and trained administrative apparatus.[17]

Speer succeeded in persuading Thomas to join the Speer ministry as head of a Ruestungsamt, while still remaining a

leader of the Wehrwirtschaftsamt in the OKW. Speer on the surface appeared to want to unite both military and civilian interests. Thomas' understanding was that the central and local offices of the Wehrwirtschafts- und Ruestungsamt (Wi-Rue-Amt) would remain under his sole command, substantially unchanged in structure, but that he, Thomas, would become responsible both to the OKW and Speer.

Another stepping stone was for Speer to convince Thomas that as head of the Ruestungsamt in Speer's ministry, Thomas would work out the combined armament requirements of the services, and allocate labor and raw materials for armament production. Thus, as head of the Wehrwirtschaftsamt in the OKW, Thomas would continue to keep watch over economic developments in general and the Wehrmacht's economic interests in particular so as to collect economic intelligence on foreign countries, and to advise the OKW in all economic and armament matters.

By 2 April 1942 a draft agreement had been drawn up between Thomas and Speer following closely the pattern Thomas suggested. Speer knew that regardless of the agreement, armament production would no longer be connected with the Office of the OKW. Nevertheless, the agreement caused a storm of protest to rise from the department heads in Speer's ministry, viz., Walter Schieber of the Armament Sub-Contracts Office and Karl Otto Saur of the Technical Office. Their protests were supported by Speer's deputy,

State Secretary Guenter Schulze-Fielitz.

By 10 April 1942 Thomas' learned that Speer had in mind a complete dismemberment of the Wi-Rue-Amt. The Wehrwirtschaftsamt and the Ruestungsamt were to be physically separate offices, each with their own personnel, the staff of one to be subordinate only to the Speer ministry, while the staff of the other to be subordinate to the OKW. Only Thomas himself, as head of both offices, could, for a time, secure coordinated action by both offices.[18]

The Economics and Armament Office was dissolved in the summer of 1942 due to Speer's initiative. One part went to Speer as the "Armament Office" and the other as the "Field Economics Office" remained with the OKW; but this Field Economics Office no longer had anything to do with leading or directing the munitions industry. Its work included, in addition to the very important war economy interests in the occupied and operational areas (in the East as part of the Four-Year Plan), the war economic cooperation with satellite and friendly foreign countries, inventories and distribution of powder, explosives and fuel, and as a whole, the supervision of the economy in foreign countries.

Speer now had Thomas within his own ministry, but it is clear that Speer felt that Thomas' trained administrative apparatus and fund of experience might turn

him into a serious rival if invited into the top echelon of Speer's system.[19]

The following months were marked by growing conflict between Thomas and Saur and Schieber--the other department heads in the Speer ministry. On 16 November 1942 Speer wrote to inform Thomas of Hitler's final decision to allow for the rearranging of the offices of the OKW. Speer also acknowledged Thomas' great services to Todt and then to him since the creation of their Ministry of Weapons and Munitions.

By December, Speer already demanded that Thomas give him a major share of control over the Armament Inspectorates, and certain other functions which had remained with the Wehrwirtschaftsamt since the Spring of 1942. Thereafter, the OKW's economic office was gradually restricted to foreign economic intelligence, representation of the Wehrmacht's economic interests outside of Germany, and technical support for the troops in the field.

The War Economics and Armament Inspectorates, like the Economics and Armament Office, were divided up and the recently originated Armament Inspectorates were subordinated to the Speer Ministry. At the same time the War Economics Inspectorates in the zone of the Interior, corresponding to their limited sphere of activity, were changed to War Economy Officers of the military area headquarters.[20]

With the death warrant of his organization, Thomas secured Keitel's permission that the final negotiations with Speer be carried out via his deputy in December 1942 and that he, Thomas, be relieved of his post. The Wehrwirtschaftsamt was reduced to the level of a Wehrwirtschaftsstab to be commanded by Brigadefuehrer Karl Becker. The following year, the Field Economic Office, was hardly recognizable as successor to Thomas' Wi-Rue-Amt.[21]

The Field Economic Office of the OKW was left with the mission to present the Armed Forces' point of view and interests in filling the Armed Forces' requirements of certain raw materials, commercial material, transportation and manpower to the competent governmental authorities (Reich Ministries for Economy, Rail and Road Communications, Armaments and War Productions, as well as the Plenipotentiary General for Labor Requirements) within the Reich territory and the occupied areas. They also presented the same interests to the Reich Ministry for Foreign Affairs with regard to the exploitation of the economy of allied satellite and neutral countries in order to secure the Armed Forces requirements.[22]

The functions of filling the requirements of weapons, ammunition and other war material were now within the jurisdictional sphere of the Speer Ministry; the ration requirements of the Armed Forces were taken care of by the

Army Administration Office.

In the relations with the Reich Ministries for Economy, for Rail and Road Communications, and for Armaments and War Production, the Field Economics Office had to register and present the Wehrmacht requirements of coal, lumber, fuel, building materials, commercial equipment and transportation space in accordance with the requisitions from the services.

In its relations with the Plenipotentiary General for Labor Requirements, the Field Economics Office was given the opportunity of discussing the possibilities of drafting labor forces into the military service and of establishing deferment quotas.[23]

The Field Economics Office was also responsible for integrating the requirements of the three services into the quotas required for a particular theater of war and for distributing to the services the quotas.[24] The German deliveries of war material to allied satellite and neutral countries were an essential component of the commercial treaties and economic agreements. By order of the Chief of OKW, the Field Economics Office carried on negotiations with the military authorities of those countries to whom war materials were sold. The negotiations with the Turkish General Staff on the subject of deliveries of guns in exchange for Turkish supplies of chromium was accomplished by the Field Economics Office. Furthermore, verification

of the delivery agreements drawn up with the German firms selected for the deliveries, and supervision of the execution of the deliveries in accordance with the treaties were arranged by the Office.[25]

Speer was not satisfied. He felt he needed powers far beyond those granted to Todt and he believed they could be secured if Goering would appoint him Plenipotentiary for Armament Tasks under the Four-Year Plan. Goering was reluctant to do this, but he could not block Speer's moves since Speer had Hitler's backing. On 1 March 1942 Goering finally signed the decree giving Speer the position he had demanded in the Four-Year Plan. Although Goering was going to renounce Speer's new endeavor and his economic strategy, Speer maintained that he needed Goering's backing for support and persuaded Goering to allow him to carry out that work under Goering's own authority. In turn, Speer placed Paul Kroener and Erhard Milch, Goering's top aides in economic and armament affairs, in Speer's Zentrale Planung.

To block Goering's control, Speer himself was Plenipotentiary for Control of Construction, and his deputy, Schulze-Fielitz was Plenipotentiary for Water and Power. In addition, Kurt Lange as Plenipotentiary for Machinery, was brought into Speer's fold by appointing him head of the Main Committee for Machinery (though this increased Lange's power more than it did Speer's).

Chaos still reigned in the leadership of the military, as well as the civilian sector of armament production and frictions were mounting. Hitler again blamed this chaos on the Services of the Armed Forces. Only in September 1943, after having taken over Navy production in July 1943, Speer was successful in gaining entire control over the home industry and over the allotment of raw materials as Plenipotentiary General for War Economy.[26]

Beginning in 1944 Air Force production also was slowly transferred to Speer's after Goering's influence had diminished considerably. From that time on, the Ministry for Armaments and Munitions and all its manufacturing became the Ministerium fuer Ruestung und Kriegsproduktion (Ministry for Armament and War Production).[27]

At last a coordinated economy and munitions production had been created which the Economics Staff of the OKW had demanded from the beginning of the war. However, the military aspects of the problem remained unsolved. Only toward the end of 1944, after a production increase at the beginning of 1943 which surpassed all expectations, was it clear that there would be a speedy distribution of production and that this would bring to the fore again the purely military requirements and their representation within industry.

The coordination of the demands of the services of the German military establishment frequently required rapid

decisions. At Speer's suggestion, Hitler ordered the installation of a "Chief of Armed Forces Armament." The ordnance offices of the services were to be subordinated to this Armed Forces Chief of Armament; the Chief of Army Staff received this appointment. He was put in charge of the joint representation of the Armed Forces and the Reich Minister for Armament and War Production. But this position did not become active before the end of the war.[28] The aim of this organization was a strict leadership of the Armed Forces imposing strict limitation on the independence of the Services in all problems covering development, procurement and acceptance, while construction and manufacture was to be strictly the affair of the Reich Minister for Armament and War Production in cooperation with the self-responsibility of industry (or industrial self-responsbility.[29]

Thus, the greatest mobilization of industry in conjunction with military needs came only under Speer. Correctly estimating the situation, it is true that the Economics Staff of the OKW attempted very soon after the outbreak of the war to achieve, even though belatedly, a coordinated economics leadership.[30] Its viewpoint did not prevail perhaps because, among other reasons, the OKW/Economics Staff, again and again, attempted to unite the total leadership of industry in its own hand. Neither knowledge nor ability, however, entitled it to this.

The OKW/Economics Staff which had the opportunity, in the pre-war and early-war years, should have recognized immediately Hitler's authoritative role which clouded the relationships between the OKW, the Services, and Industry. The OKW Economic Staff should have focused only on its leadership role in armament affairs within the Armed Forces, and on the representation of these interests within Industry.

Hitler believed that industrial direction, as a matter of principle, was not the affair of the military, but that its duty consisted in the giving out of industrial orders, testing (research and development), and the acceptance of the manufactured industrial product. This problem was, in practice, never decided in principle, or rather it was decided only belatedly with the appointment of Speer as Plenipotentiary for War Economy in place of Funk.[31]

In the fall of 1943, Funk was invited to join Speer's Zentrale Planung, but at the same time most of the important decisions about allocations were turned over to Kehrl's new Planungsamt, within the Speer Ministry. Zentrale Planung remained as an appeal board against the decisions of the Planungsamt. In effect, Speer took over the effective direction of the Reich agencies, and acquired the right to command all the lower organs of Funk's ministry: the Economic Groups, the District Economic Offices, the Gau Economic Chambers, and so forth. All this

was too late.[32]

The lack of self-awareness of the Armed Forces leadership where armament production was concerned was not the only reason for failures in armament production, a reason can also be found in the fact that Hitler, completely mistaken, had counted on a Blitzkrieg strategy for war. The complications arising from poor decision-making from the leadership are difficult to estimate. Much of Speer's efforts to achieve a coordinated industrial leadership are deserving of praise, as are his successes concerning production.[33]

Speer's changes made in planning and direction at the beginning of 1942 to organize the economy for a drawn-out war effort yielded immediate results. The output of the armaments industries had already risen by 55 percent between February and July 1942, but only partly at the expense of civilian production--proof that previously unexploited reserves still existed. Mid-1944 figures of ammunition production rates, when compared to 1941 had increased by 3.5 times and tank production six times their 1941 levels.[34] Production of other armaments increased 3.6 times over the same period.[35] A great part of this success could be attributed to Speer's galvanizing of administrative leadership under one central control, the Zentrale Planung and the Planungsamt.

Between Speer's assumption of his duties (1942) and

the apogee of armaments production in mid-1944, Germany's gross national product had risen by only about 6 percent and the share spent on weapons output increased by only about 5 percent.[36] Production of raw materials rose by just 7 percent. Moreover, civilian consumer goods output had not been drastically curtailed until after Speer wrested control of the raw materials and consumer goods industries from Funk's Economics Ministry in September 1943.[37] Even under Speer, no major restructuring of the German economy took place. Increases in armaments output had been won with other more subtle methods.

Central planning was Speer's main approach to reforming the chaotic methods of production in armaments and raw materials allocation. Steel production was the long-term model. This was perceived as a short-cut to reforming the entire war economy because steel was the basic commodity in armaments production. Controlling it would determine what weapons could be built and in what volume. It would also shape the distribution of other basic materials such as coal, iron ore, and also of transportation. Reallocation of resources within industry was another means used by Speer to create greater efficiency in research and production.[38] By reviewing military needs through Rings and Committees, resources of both raw materials and manpower were reallocated to provide logistical support for the war effort.

Employment in armaments factories also increased by 30.7 percent between 30 June 1941 and 31 March 1944. Measured in terms of value of output, the production figures for armaments in relationship to overall industrial output rose from 19 percent in 1941 to approximately 50 percent in 1944.[39] But neither the increase in GNP nor the transfer of factors of production to military purposes was sufficient to propel the needed massive output and achieve the desired growth between 1942 and 1944. Speer's ultimate goal required the elimination of the confusion arising, for example, from the competition among the twelve entities that then had a hand in allocating iron by superseding them.[40]

The secret of Speer's success lay in a myriad of individual efficiencies that together permitted massive savings of all factors of production. A clue appears in the "Newsletter of the Reich Minister for Armaments and War Production" of 9 June 1944. A metal hammering works is discussed at which in the year between 1 April 1943 and 31 March 1944 production had risen by 85 percent while coal consumption had sunk by 41 percent. Energy consumption per ton of finished steel had fallen 40 percent. This development was typical. Between 1941 and 1944 the ratio of unit of raw material input to unit of finished output, measured by weight, had fallen dramatically from 4.1 to 2.1.[41]

Labor productivity had also risen. In the metal-

working industries, value added by each worker per ton of raw material had climbed during Speer's tenure by 18 percent. Labor productivity in the final production of all types of goods rose by a third. Most important, labor productivity in the crucial armaments sector improved greatly, even spectacularly.

The index of labor productivity in the armaments industry is compared as follows: [42]

1941/42	1942/43	1943/44	June-July 1944
100	157	189	234

Although disagreeing on certain particulars, various authors have described how Hitler swept both himself and The Third Reich into the final tragedy ignoring the advice of Reichsminister Todt in 1941 that a war with Russia would doom Germany to destruction. What is not generally known, however, is that from 1942 to 1944 the technical advisors through the genius of Speer and the SS "state machine" managed to preserve the lead in the modern weaponry programs and keep Germany in the war for two additional years due to feverish and brilliant use of managerial tactics and scientific knowledge. In the end, it was Speer's administration returns that made possible the brilliant success of German war production between the spring of 1942 and the summer of 1944 and so confounded Germany's opponents.

IX. THE SPEER MANAGERIAL PLAN

From the beginning Albert Speer realized that he needed to obtain the wholehearted support of the industrial leadership to perform effectively as Minister of Armaments and Munitions, and being fully aware of the political biases and industrial ineptness of the existing heads of the business groups, he sought means of circumventing their influence. He did this by organizing the Main Committees and Rings and giving the heads of these groups full authority and responsibility for industrial performance.

Thus, the first thing Speer did upon taking office was to establish (20 March 1942) the Hauptausschuesse und Hauptringe (Main Committees and Main Rings) and developed Entwicklungs Kommissionen (Development Commissions). These non-political organizations are generally conceded to have been the principal reasons for the relative successes of the Speer Ministry over his predecessors. This concession was made by nearly all members of the Speer Ministry interviewed after the war, and indeed, so considered by Speer himself. Many of the innovations in organization established by Hjalmar Schacht in the Ministry of Economics and by Todt in the Organisation Todt bear a great similarity to the Main Committees and Rings of Speer.[1]

The Rings (Ringe) were controlled by technical managers who worked by means of a multi-layering of data

which they interfaced with a wide range of subjects and indexes of performances, and lists of the most prominent scientists and technicians to help make sound judgments about Ordnance and war-related issues. Each "Ring" or circle was under the command of a Professor or Ph.D "manager" who, in turn, had a series of hand-picked Ph.D's and university or research facilities under him for the theory and practice of planning a given war product.

When Speer first took over he discovered that departments often had no liaison among themselves, being organized vertically only. The Rings were created to coordinate parallel interests and similar fields of work for different vertical organizations. For instance, large corporations like Krupp and Rheinmetall-Borsig (who monitored armament technology under Todt) were very leery of traditional scientific research schedules. They would seize upon a development and attend to it so as to carry it through to completion and only then turn it over to scientists, when they were in a cul de sac. When they were forced to turn to scientists, they would ask only for specific measurements or tests, and would not reveal the broad phases of the problem. It led to self-centered cells of interest and inefficient practices of little cross-talk during the first part of the war, 1939 to 1942.[2]

The German scientists themselves, in turn, were largely underfunded but not without guile. When given

lavish governmental funding in the war, they also took advantage of the lack of scientific understanding by those in authority, by engaging in futuristic research under the guise of the war programs, that could not hope to be functional in the war efforts. Their research was almost entirely civilian until late 1941.[3] Speer began to run his own mini-corporate capitalism which consisted of a far-ranging system of privately funded projects that had future economic bonuses. Moreover, Speer opened the door to scientific dialogue between industrial and military groups by his overlapping of Rings and Committees.

The only solution that Speer could see to the problem of low armament production from the entire German industry (at the beginning of 1942) and lack of support for key scientific projects and aerospace weapons was to press forward with his policy of expansion and centralization.

Speer's Plan of self-administration and self-responsibility was extremely well received at the industrial level because it meant maintaining non-interference from military and governmental bureaucrats.[4] Before that time air armaments industrialists who had not fulfilled their quotas were threatened with court actions. When Speer took over he called off all court martial proceedings against the industrialists.

The Speer ministry maintained, from 1942 to 1945, large staffs to manage crisis-solving through immediate

feed-back on all fronts. These staffs had to take into account myriad variables. More than forty major Ring areas and numerous think-tanks were employed by Speer for technical and economic problem-solving.

Managers were frequently aware of factors which would influence future planning quotas through special direct access to Speer himself. Unlike most other Ministries, where organizational staffers and information specialists did not usually hear about planning meetings or receive notices due to "confidential" control of information, Speer's organization efficiently informed all related parties while still maintaining adequate security.[5]

The major management task of the Speer Air Ministry alliance was to know what actually was taking place within its organization. One critical, but seldom examined, function was the manner in which key managers assess the performance of Rings under their supervision. Within the large industrial Rings, managers operated both within horizontal and vertical movements.

Moreover, the Speer organizations were vitally concerned with studying how their managers actually assessed subunit performance. Until Speer took over armament production, criticism was not permitted within the rank and file of the armament industry. Immediately, Speer asked all plant managers for their criticism. At first the request bore no fruit. Nobody believed that personal

disadvantage would not result, but the procedure later proved invaluable.

In the absence of knowledge of the function of the Speer Rings and Committees, numerous myths and assumptions have abounded. Signs of mistrust were reflected in the NSDAP trends toward more statistics. With Speer and the non-SS chain-of-command, more information specialists and more centralized informational systems were put into action with greater creative adaptability.[6] The fact that the American government kept Speer and von Braun's team from Peenemuende and Braunschweig intact shows the high credibility and reliability this engineering branch of the German Ordnance Industry was able to demonstrate in spite of losing the war by successfully initating the American space program.

Speer's management was based on the premise that managers can generally agree with each other about the current effectiveness and performance trends of subunits under them and that managers who agree most with their colleagues tend to come from levels closest to the field, work in smaller divisions, use more commonly shared criteria, and rely more on qualitative than on quantitative criteria. Speer's premise was also that a common cultural "ideological basis" is less powerful than a long, traditional management team of those who worked closely together over a series of many projects.[7] Under no

circumstances could orders or directives for guiding production attempt to by-pass the managers.

The Committees (Ausscheusse) controlled final production of particular types of weapons while the Rings (Ringe) organized the production of important, widely used components. The Committees and Rings possessed no executive power. They were to embody the principle of industrial self-responsibility in hopes of unlocking the energy and creativity of industry and harnessing it to the war effort. As of 1 June 1942, there were 178 Special Rings and Committees subordinated to an ever-changing number of Main Rings and Committees.[8]

In Speer's opinion, the Main Committees and Rings were of principal importance in his success in increasing the performance of the German armament industry and the reason why his plan worked when other similar forms of organization failed. Apart from the Main Committees and Rings, a few agencies were created for the development of weapons in which plant engineers and representatives of the armed forces sat together on equal terms. These Commissions (Kommissionen) were usually presided over by outstanding industrial engineers. They had the last work regarding the development of the weapons. Only the Supreme Commanders of the Armed Forces together with Speer, or the Fuehrer himself could reverse their decisions.[9]

Speer also created, for the first time in the Third

Reich, two effective bodies for central planning: Planungsamt and the Zentrale Planung. His bodies were ready to use the allocation of resources to meet the needs of war production, as defined by the Wehrmacht and Hitler.

The Zentrale Planung was the Board of Directors for the Planungsamt which effectively, under Kehrl's management was able to seek an overview of actual production, production capacity, resources, and requirements in the Germany economy. The Zentrale Planung established rules through which the industrial cartels could achieve full reciprocity within the war economy. The Planungsamt was to assign resources to requirements in global quotas (large-scale allocations to major production branches), which were then assigned in more detail to other production programs of the Committees and Rings. [See Appendix H for correspondence within the sphere of the Zentrale Planung.][10]

Speer's organization was far more comprehensive than anything that General Thomas of the OKW Economics Staff had ever attempted. By contrast to Thomas' design where the military establishment was to control the economy, in Speer's economic structure, civilians controlled all war production, even the decisions on the specifications of armaments with certainty planning for the whole economy. Speer achieved a western-like increase in his production charts by aiming for high levels of production efficiency through: construction simplicity, simplification of

necessity, relaxing of weights and measures standards, revision of accords, and a wider sharing of patents and knowledge up to the limits of the security of fabrication.

Studies even went on within the group itself where, within the limits of wartime operations, top management in the Speer team performed a study of Ordnance operations analyzing the reliability of their performances. Despite their access to quantitative performance criteria, Speer's organization readily acknowledged that their overall performance depended, in the final analysis, on subjective judgment.

Moreover, the evidence from company archives (e.g. BMW, Walter Kommanditwerk in Kiel, Luftwaffe Forschungs Verein in Peenemuende and Braunschweig) indicates that informed managers relied much more on qualitative precision engineering than quantitative criteria in appraising performance, even when the quantitative measures were available and in use.[11] This tended to create a stronger interest in super-weapons, but put an end to the guesswork that was used early on that could not find a proper match between field conditions and sophisticated armaments. This guesswork had resulted many times in production of too highly calibrated ordnances, such as gun barrels that did not operate during the horrors of the Russian winters. Elaborate synthetic-fuels (e.g.,

hydrogen peroxide) that were being designed also needed special carriers which were difficult to manufacture.

In the past, the military requested the equipment, but industrial-based managers and scientists were allowed to determine the exact specifications of the equipment without sufficiently coordinating their work with the military.

By 1944, Speer and his technical advisors were able to use German patriotism (the importance of maintaining German culture and its contributions to civilization) rather than Hitler-devotion (with its emphasis on loyalty to the Leader) to inspire a clearer sense of purpose in meeting industrial needs and in bringing about scientific accomplishments. It was this tactic that induced the extraordinary production of super-weapons that were to augment the German war effort in the later stages.

It is clear that from the beginning of The Third Reich, Hitler and Nazi officialdom delayed crucial economic support for Total War Ordnance projects. Together with the military, who remained provincial, they failed to develop new jet fighters and sufficient numbers of modern bombers and rockets like the V-1s and V-2s until 1943. One of the great ironies is that Speer, contrary to the inclination of his Commander-in-Chief and Fuehrer found ingenious ways to privately fund the V-2 and many of these modern aircraft weapon systems that would have died through attrition.

The Speer Plan provided the institutional framework

for small and mid-level industrial firms to continue needed scientific research with the proper economic backing.[12] In reality, this allowed each scientific research team to pursue its own projects. Each research team was a consortium of all parts put into it--with fundamental engineering objectives. It was a e.V. (Eingetragener Verein), an organization that parties could buy into and participate.[13]

Speer's organization was not as unique as it might appear. Well before Speer became Minister for Armaments and War Production, as early as 1934, Schacht had begun a reorganization of the economy. Industry was divided into seven national groups, which were, in turn, subdivided into many commercial and technical subgroups. In addition, there were the oversight agencies created by the Commerce Ministry in 1939. In the wake of an organizational streamlining in 1942, the country was divided into twenty economic districts and forty-two national defense districts. Only twenty-two of the defense districts were congruent with the new economic districts which overlapped, in many instances, the jurisdiction of armament inspection offices of the military.[14]

The halt in Schacht's reorganization ordered at the beginning of the war had, however, only produced negative effects. All businesses or divisions remained members of the industrial groupings they had belonged to in the fall

of 1939. Piano factories that made munitions casings remained affiliated with the industry group for musical instruments. Chocolate factories that produced hand grenades still belonged to the candy industry. These examples could be continued through a long list.[15]

The disorganization became quite significant as Speer took over civilian production in 1943 and provided only the minimal of materials and manpower to such misguided undertakings. Under these conditions, every planning and oversight statistic must have pointed to shortcomings of some kind.

Speer, who had conceived of his new organizational form only days after being appointed to his post, managed to establish his Committees and Rings very quickly, without dissolving the already existing leading economic agencies. This was due, in part, to the fact that he had his new Committees consider the old organizations meaningless, and also to the fact that the agencies did not report to his ministry, so he had little to do with them. These economic agencies, with their technical but not production-oriented groupings, existed side-by-side with the new Committees and Rings.[16]

Speer was able to make good use of them even though he had very little influence upon the management of these administrative bodies. By contrast, Speer claimed that during the First World War the directing body of German war

industry, WUMBA, had a staff of fifty to sixty experts who directed the entire field of war production.

In addition to the already existing economic organizational structure, Speer created the national unified groupings, of which the unified group for iron production impinged most heavily upon the executive Committees for the iron industry. It was only owing to the fact that both groups were run by the same people that any kind of complimentary action could be taken.

Speer originally conceived his Committees and Rings to be smaller technical advisory bodies. But even these were not the best organized groups. Many factories did not know whether they belonged at all to a Committee or to a Ring, and conversely there were only few Committees and Rings which had a clear picture of the number of their member firms and which could direct them accordingly.[17] According to a memo from the Personnel Director Felix Bohr, dated 7 June 1944, there were only 218 civil servants up to the rank of Inspector and 348 office personnel employed in the Berlin Central Office; in the Committees and Rings, though, there were about four thousand full-time, and ten thousand part-time and voluntary members, as well as an additional six thousand who were in possession of a ministry identification card.[18]

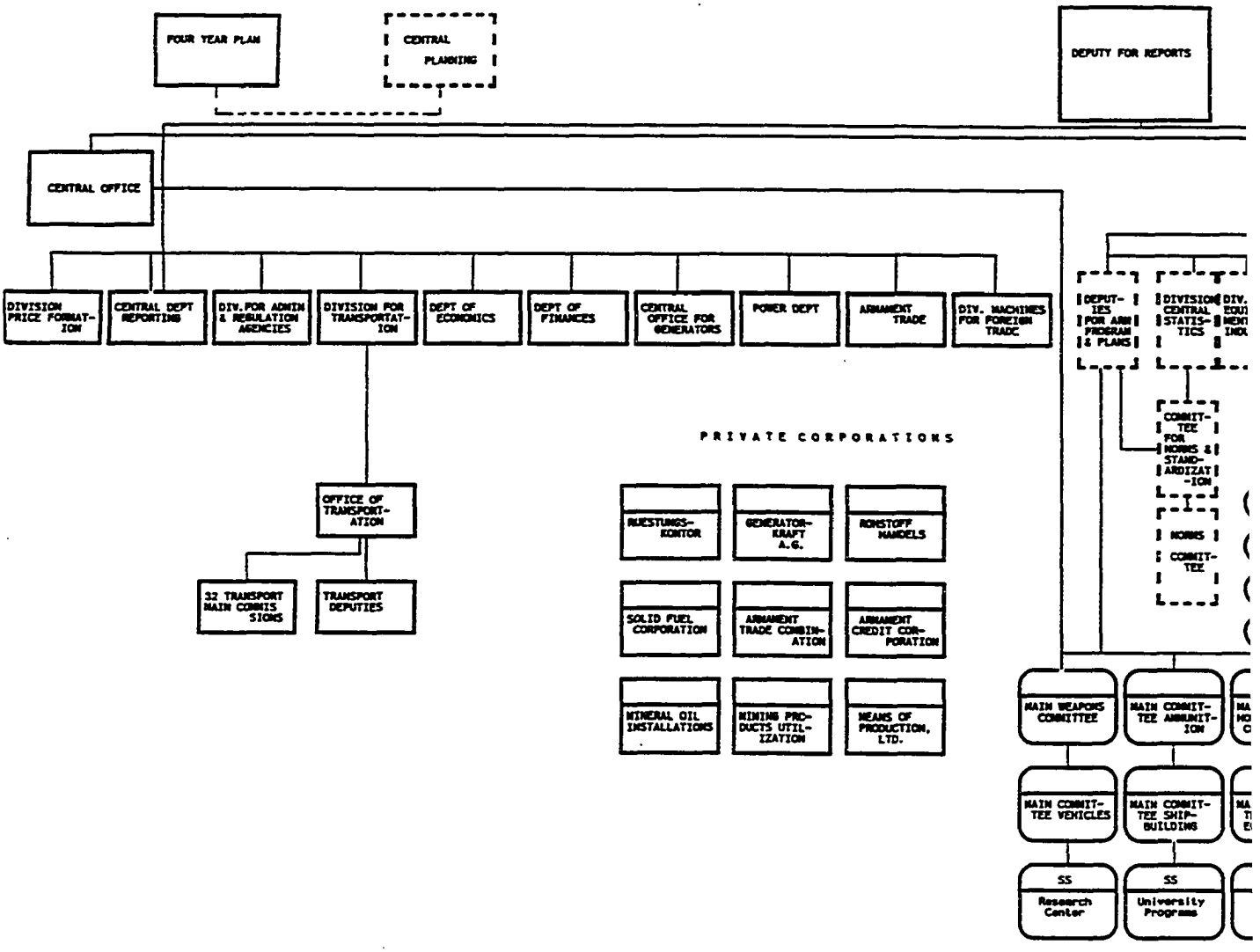
While it had been possible in 1942 to oversee easily the Committees related to Karl Otto Saur's and Hans

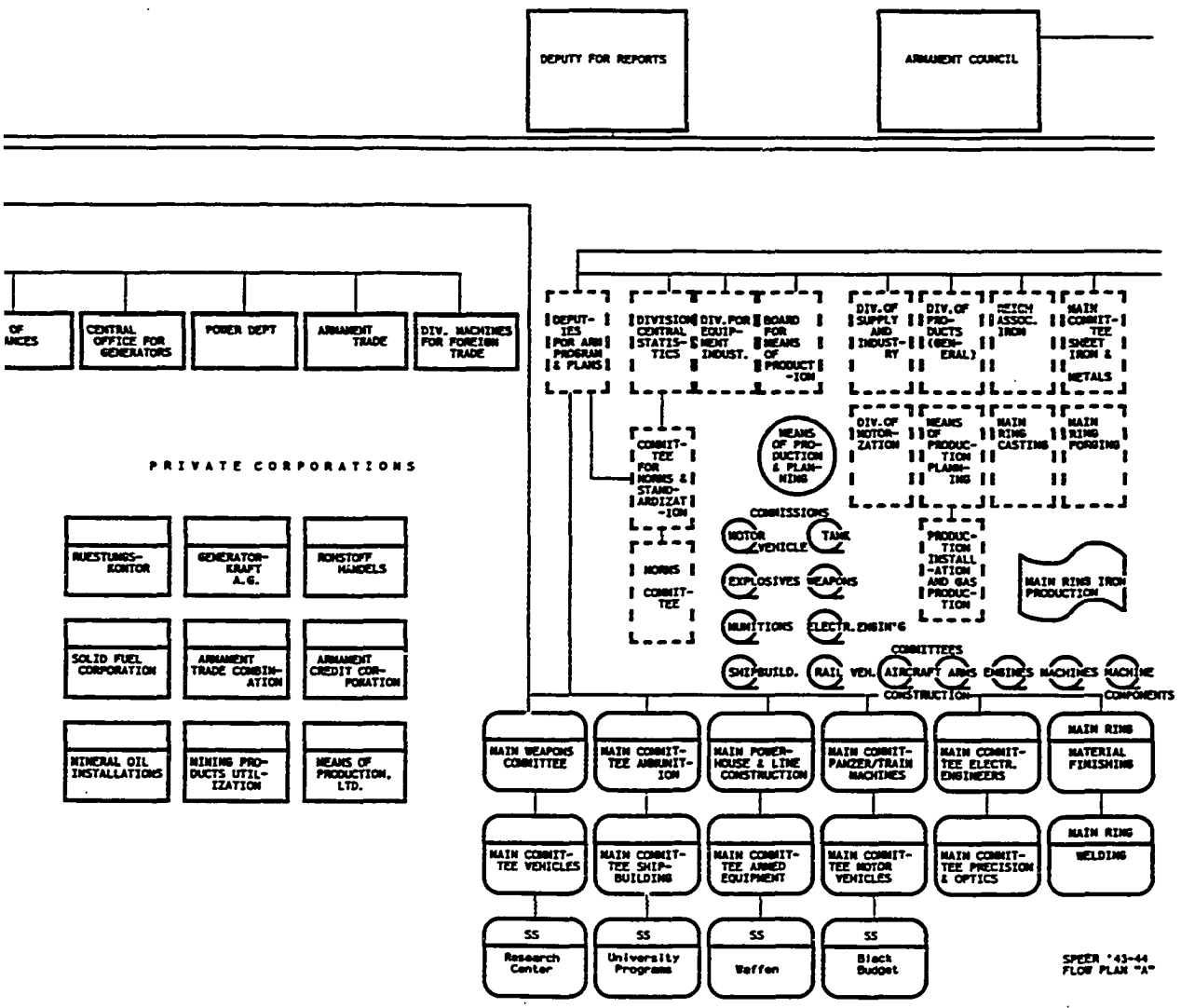
Schieber's agencies, by 1944 this was only possible by using an organizational overview provided by Speer's office. The twenty-one Main Committees responsible for final armaments production oversaw the work of hundreds of special Commissions and working groups. There were also twelve Main Rings in charge of materials and parts that were essential for production. These two main groups directed the most important armaments and war production.

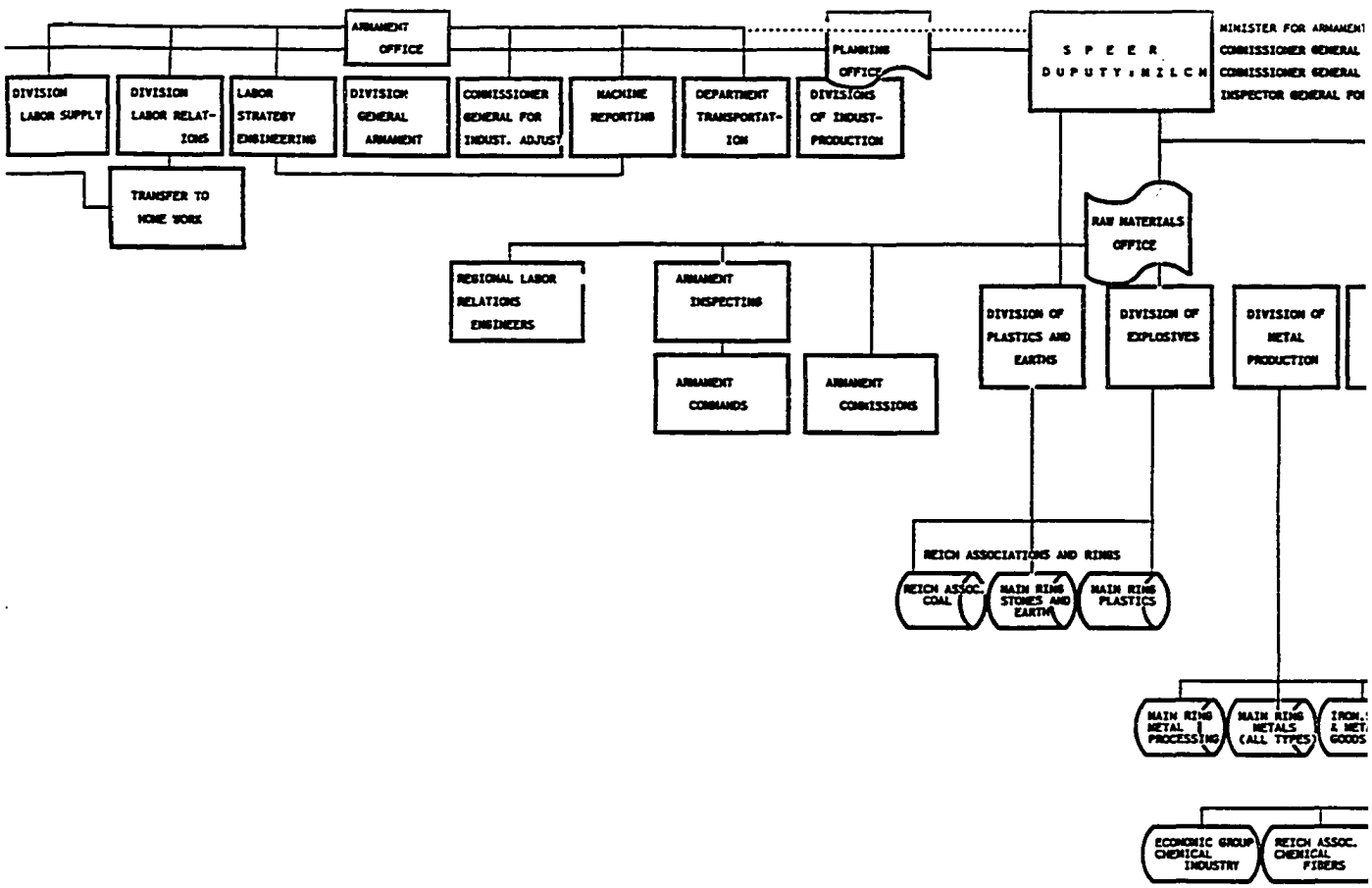
However, between the Main Rings and Committee there was a constant reorganizational effort going on in the various groups, that continued up until the final months of the war. This made the creation of any real organizational charts impossible. When on 13 March 1944 special Committees and Commissions were established to set the dates and times for meetings and to discuss trivial matters, however, Speer stepped in that same day and put an end to the mania for reorganization.[19]

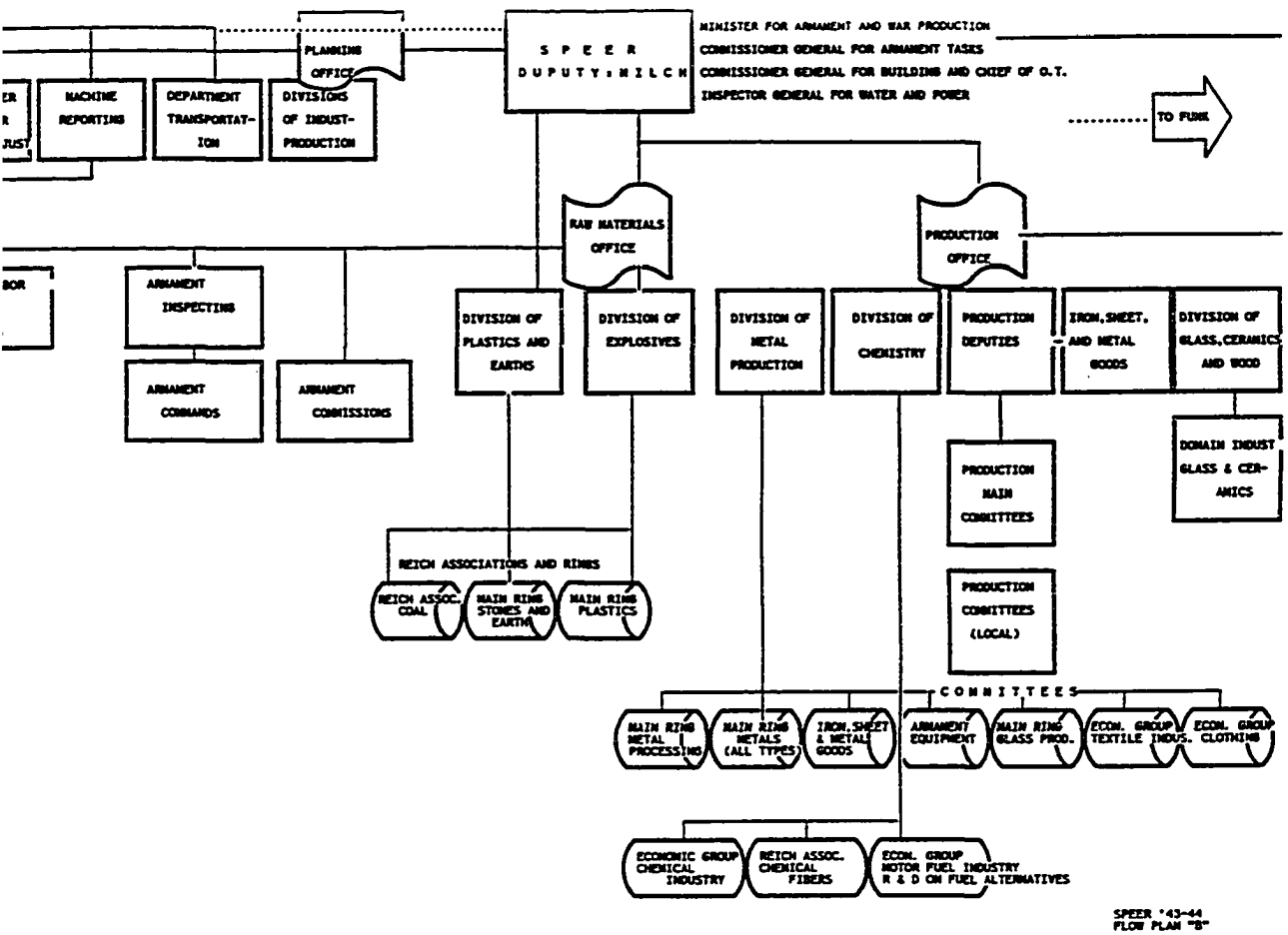
The working manner of the Committees and Rings was, as Speer liked to emphasize, unbureaucratic, and for that same reason was often unsystematic. A view of the big picture was often missing. The Commission or Committee chairmen often thought only in terms of tanks, submarines, forgings, and similar ordnance, without considering other necessities.

In Speer's view, the Committees were to coordinate the efforts of the final armaments production; the Rings were

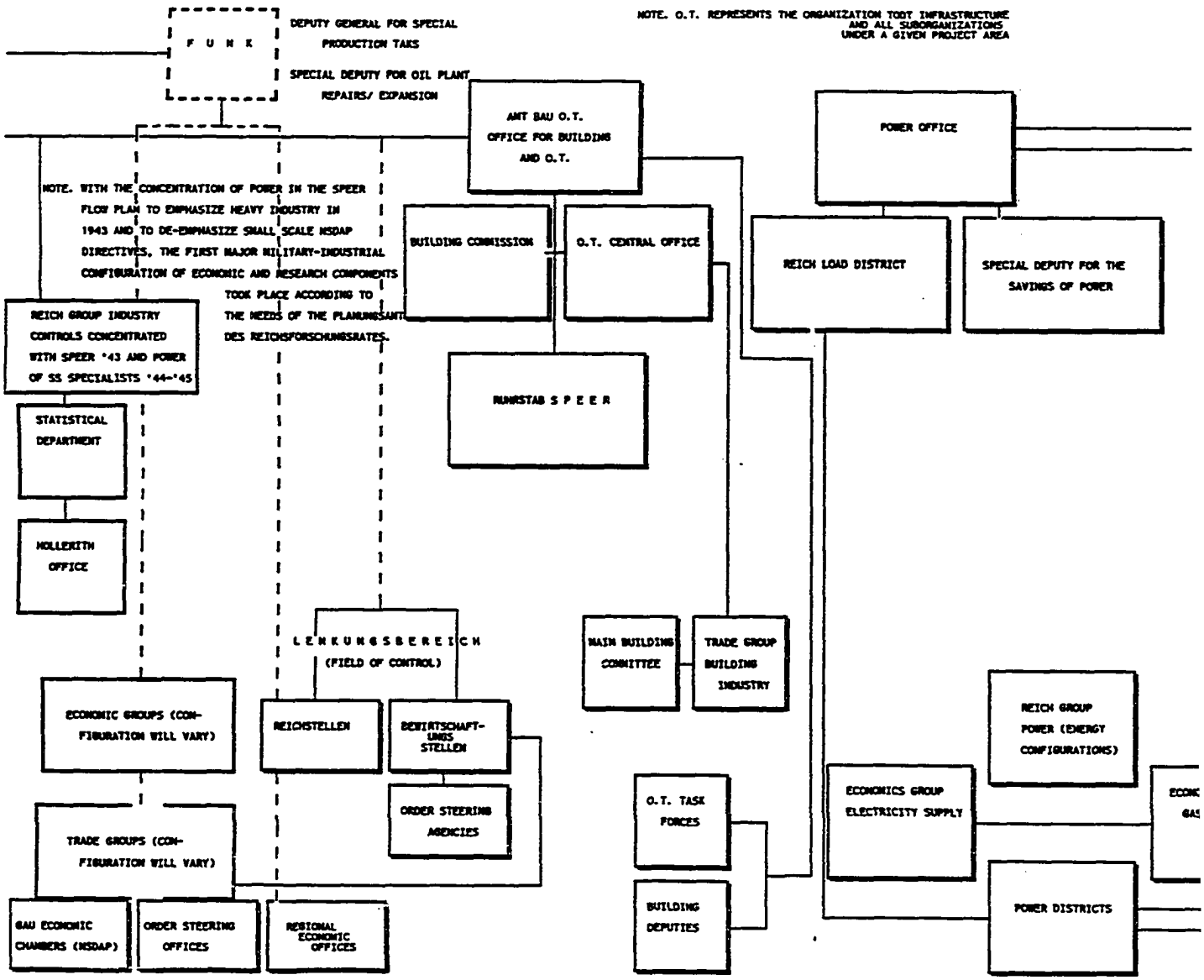




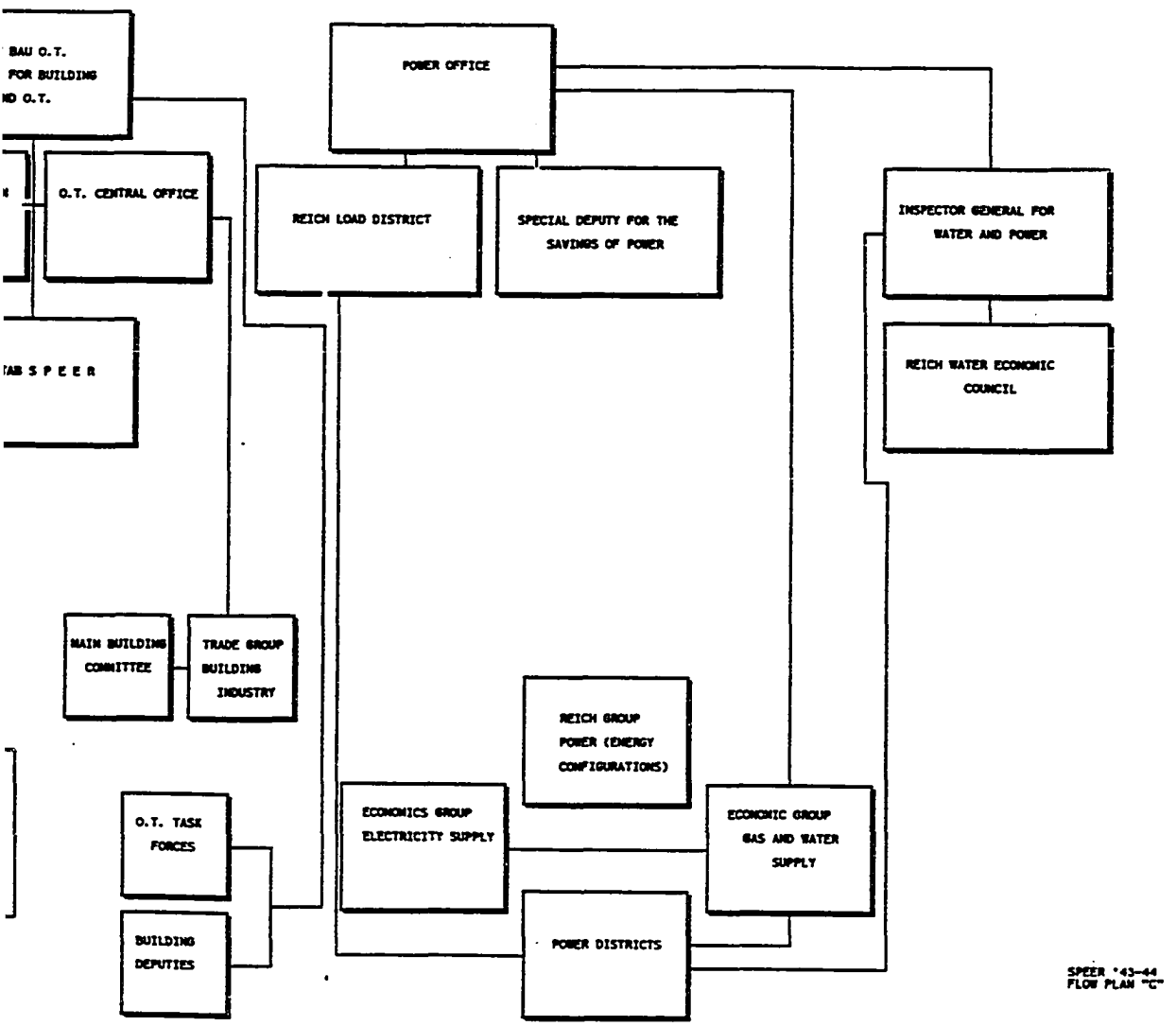




SPEER '43-44
FLOW PLAN "B"



NOTE. O.T. REPRESENTS THE ORGANIZATION TODT INFRASTRUCTURE AND ALL SUBORGANIZATIONS UNDER A GIVEN PROJECT AREA



SPEER '43-44
FLOW PLAN "C"

to coordinate the suppliers' efforts. Each Committee and supplier had to get in contact with the appropriate Ring; the Ring was then able to determine its own capabilities for production. This information was then disseminated to the relevant Committees.

In reality, the Committees and Rings often worked at cross-purposes. The main Committee for aircraft armaments was actually a Commission that had been carved out of the areas of responsibility of several other Rings. The main Committee for precision-machining optics had the character of a Ring in that it was almost solely responsible for supply. Gerhard Degenkolb's Committee for industrial transportation had incorporated its entire supplier base and made them into subdivisions and thereby no longer had any supplier responsibilities. A similar situation arose with Karl Holzhuer, head of the motor vehicle committee.[20] Under such guidance, Committees, such as the Weapons Committee, which depended upon a number of Rings, were simply pushed aside. Seen in this light, the entire leadership that Speer liked to draw attention to had little effect below the Committee and Ring level.

The situation for the companies themselves was even more unclear, since they had no insight into how things were operating, owing to security considerations. The blame, when a matter was handled by more than one Committee or Ring, was placed by Speer on the shoulders of the

factory manager who did not wish to commit to a particular quota. This unjust criticism shows, though, how little insight Speer had himself into the detailed operations, unlike Saur.[21] The fact that effective organizations could be formed only in those areas where the newer structure could be coupled to a previously existing one, such as in the areas of tool and die, precision-machining, and optics, shows that the all-too-rapid growth of Speer's changes in the spring of 1942 burdened the industries which were self-responsible with the problem of not having clearly defined areas of responsibility.

That Speer had to begin building a streamlined organization for war production in the fourth year of the war shows how grievous were the mistakes of the early years of the war. Chief among those mistakes was the failure to stockpile critical parts and fuel supplies for the possibility of a protracted war. Given the parlous conditions that he had to overcome, one cannot blame Speer for the organizational and operating difficulties and shortcomings. He, probably more than any body else, was acutely aware just how risky the rapid growth of his program of industrial self-responsibility was; but, by then he believed it to be necessary, despite the risk.[22]

The Speer machinery, to his credit, made it possible for the larger corporations to maximize contact without middle bureaucrats and military authorities which, in turn,

allowed for a wider spectrum of creative research as in the aerospace field with the development of missiles and rockets. Speer's efficiency drive was made possible by his marriage of regional executive mechanisms to his central policy-making bureaucracy. Throughout, he used young engineers and businessmen to manage their own branches of the economy.

While reaping enormous advantages in expertise, industrial self-responsibility permitted the most powerful corporations and cartels, notably the industrial leaders in iron and coal, et sic passim, to retain a degree of independence that enabled them to wield massive, direct influence over economic policy.[23] Because neither the Party nor Speer could replace them, Speer was forced to harness them through self-governing mechanisms--the Committees and Rings culminating in Central Planning--to steer the entire German economy.

Speer's organizational functionality was put to the test under high and low agreements with the NSDAP. Throughout the German territories NSDAP Gau (district) offices were controlled by Party leaders.[24] The Gau employed twice as many people as any of the Ring units of Speer, but reached lower levels of agreement. These large divisions in each Gau, regardless of their level in the organization, seemed to have particular difficulty in assessing improvements in performance over time. Unlike

the flexibility of the Todt-Speer organization using smaller units, managers in the larger Gau divisions were often physically and organizationally separated; they also became more specialized in their job functions.[25] As a result, their communications were likely to be less frequent and conducted from narrower frames of reference. Further evidence of this breakdown in communications was found in the fact that large division-panels from the national Party headquarters disagreed with their counterpart panels at the regional offices.[26]

Why was Speer's organization so effective? It worked with qualitative factors and understood the underlying strengths of Germany's industrial background. It was clear that Hitler had to be convinced to support the new technologies (such as the V-2 rocket) by extensive files of information and presentations of films showing successful testing which heralded the possibilities of practical military applications. Statistical analyses gave good indication of needed increases in armament production, e.g., of Air Force planes to counter the horrendous attacks by the Allies. Underground factories and foreign labor were also needed to make up for the destruction of the traditional industrial centers in the Ruhr.

Speer had engineered production booms in armaments booms to occur in 1942 and the first half of 1944 while staying within the psychological and technological

parameters of the administrative and industrial systems. The organism was very finely balanced, with industry and the Reichsbahn both operating at or near maximum attainable efficiency, allowing a steady flow of resources and ordnance products to supply the military services. Yet, evaluations of quality showed the need to introduce technologies such as the new Messerschmidt super-fighter (Me 263-A and -B) and the von Braun Vengeance rocket (V-2) which were twenty to thirty years ahead of what the Americans and Soviets were able to achieve with their respective engineering capabilities of Robert Goddard and Sergei Korelev.[27]

A significant example of the astonishing demands made on German industry in the prosecution of the war, despite the catastrophic worsening of the military situation, is offered by the fact that only forty-eight days before the German surrender, a general meeting on air weaponry was called for 20 March 1945 at Bad Eilsen.[28] This was the last of a long series of such meetings, and the technical authorities of the Luftwaffe and the chief designers of Focke-Wulf, Arado, Dornier, Gothaer-Waggon-Fabrik, Junkers, Horten, and Blohm-Voss were all present.[29] The plans of these firms for the urgent building of a heavy supersonic fighter were examined and discussed at the meeting. This was to be an all-weather night-fighter of twelve tons, designed to take the latest types of jet engines and the

new seven-barreled machine guns, which had been devised in order to reduce to a fraction of a second the maximum time of ballistic contact necessary for an effective enemy hit. Speer had inspired his industrial designers to plan for deliveries of the new jet aircraft with their electric ignition through the projected periods of 1945, 1946 and 1947.[30] All of this shows that, finally, the German High Command was able to formulate a unified direction to initiate new technical achievements in spite of the internal conflicts within the military and the bureaucratization of the Party.

X. THE ASSAULT ON THE SPEER ORGANIZATION

With signs of achievement coming from Speer's ministry, early signs of problems were in the making between Speer and the NSDAP (and later the SS). The expansion of the Speer Ministry was looked at with mixed feelings by several circles in the Party, such as Martin Bormann the Fuehrer's Deputy, and by most of the District Economic Counselors (Gauwirtschaftsberater) and the Gauleiter (Party district leaders).[1]

A sudden increase in power in any high-level ministry meets always its obstacles and this was true in The Third Reich where there were struggles among too many independent agencies dealing with a given product or commodity and no effective coordination. The reason why the Speer ministry could assure itself that a complete reorganization of the military-industrial complex was necessary was that, since February 1942, the Kriegswirtschaft showed it had the competence to achieve one production victory after another by exploiting the established institutions.[2] Speer argued for his views as demonstrated by the necessities of the war--viz., the military misfortunates of the Wehrmacht, and the need to keep up with the overwhelming superiority of the Allied war machines.

Speer was successful, too, because of his good relationship with Hitler. Speer was extremely talented, in

that he was able to take the knowledge of industry forward into increasing production levels to the highest levels of the Reich period, and could successfully demonstrate how he converted ciphers into real quotas and real goals. Therefore, the opposition against his person and his systematic directing of the war industry remained cautious and was kept in check.

In the apparatus of the Reichswirtschaftsministerium (RWM), the Party leaders saw Speer as their organizational rival as early as 1942. They feared a loss of power and status in areas that could overlap with Speer's realm of activity. Yet there were two different approaches about how to meet the challenges imposed by the Speer ministry.

First, the RWM chief of the Hauptabteilung No. 2, President Hans Kehrl,[3] preferred to imitate the direction and methods of Speer to maintain a close connection to this always faster moving train of the Kriegswirtschaft. Kehrl was the responsible chief of this Main Division of the RWM as the production-link with the Gauleiter and industry, and for him it was necessary to have a close cooperation with the Speer ministry.

Kehrl had equally strong feelings and thoughts about the necessities of increasing the war economy by moving the war industry out of the hands of the bureaucrats and petty ideologues. As a technocrat, Kehrl always looked for efficiency, but was also a risk-taker willing to take the

inevitable blames and economic falls in pursuit of greater economic goals, as long as they served the aim to increase production of armaments.[4]

In the Reichsministerium fuer Bewaffnung und Munition, Kehrl was looked on as Speer's man in the Reichswirtschaftsministerium.[5] And, consequently, Kehrl was seen by the old Party guard as going over to Speer's side and following him in the direction of cartel capitalism.

The main group which opposed Speer was represented by the Secretary of State in the Reichswirtschaftsministerium, Friedrich Landfried, who was an adversary of Speer's new direction to concentrate raw materials and expedite production schedules within his own ministry. Landfried feared the omnidirectional nature of Speer's economic planning, that is, by establishing new proceedings and norms, there could be effected a major change in the Wirtschaftsordnung, moving all divisions of the economy in the direction of a Zentralverwaltungswirtschaft, a central administration of the economy.

Landfried misjudged the subtle interconnections of the State and the German economy and feared the awe-inspiring twist that Speer's plan would cause by putting together all types of industry under a central administrational function.[6] This interconnection, as he feared correctly, would disadvantage the smaller and middle-range companies

in their operations. Landfried was much in the tradition of the policy of the Reichswirtschaftsministerium which was friendly to these middle-range companies with their small production lines of goods as models of National Socialism in the early 1930s.

In the following year the conflict between Landfried and Kehrl about the organization and planning of the direction of massive production reached its culminating point.[7] Landfried gave his opinions to the Gauleiter to find their backing for his position. Kehrl refused to go along with Landfried's narrow ideological interpretation of business, and Landfried in front of the Gauleiter said: "[Kehrl] should have refused to live in a world where one sits on a uniform seat, to be clerked with a uniform-custom, and to sit at a uniform table in order to eat a uniform meal."[8]

When looking for allies, Landfried had made connections with the Gauleiter and with SS ideologues Franz Hayler and Otto Ohlendorf. Their talk was not about the new direction of war economy, but only discussions of the Abwehr against ideological attacks on the traditional role of the "economic free-acting agents and dealers" in the German economy.[9] Ohlendorf, in this case, was predestined to be an ally, because as Haupt-geschaeftsfuehrer (main division chief) of the Reich's group for small manufacturers, and as a chief of the

Sicherheitsdienst (intelligence service) for the interior of the country, he was obliged to defend small business.[10] On the other hand, he had enough ideological authority to do this successfully. So the anti-Speer coalition subsequently forged a large consensus.

With the green light given by Reinhard Heydrich and Heinrich Himmler, Ohlendorf went to the Marketing Department to plan with Regelfuehrer Heiler a "consciousness politik" against Speer.[11] The approach would not be pure economic politics, but simply touch on Blut und Boden topics as relating to the ideals of the small landowners and small businessmen.

Conflicts mounted when Ohlendorf returned from his SS command in Russia in June 1942. Landfried immediately talked to him about forging a new alliance. The Secretary of State seemed to be of the opinion that the tasks said to have genuine political power could not be given to persons from industry operating under the principles of quasi-capitalism practiced by Speer. At any rate, Ohlendorf reported the principle problem immediately to Himmler on 26 August 1942 and, sometime later, to Bormann. In the middle of October, Landfried addressed himself anew to Himmler with a concrete demand, now to allow Ohlendorf to enter the Reichswirtschaftsministerium (RWM). Landfried told Himmler in a discussion that he wanted to propose to Minister Funk a counter to the serious problems that Speer was creating.

What he proposed was that the RWM should be transferred to Ohlendorf with the rank of an Undersecretary of State. Moreover, he should be in a rank above the main divisions of the RWM as an assistant to Landfried. Thus, Ohlendorf's position in the Reichssicherheitshauptamt (RSHA) would allow Ohlendorf to oppose Speer, as well as to use the RWM as a "covering" or "concealing" for the real Machtpolitik of the SS.[12]

The discussions that were made by Ohlendorf, Landfried, and Funk had been reported to Himmler in a way so that there was no doubt that the perceived crisis of the RWM could only be overcome by new arrangements of personnel. The proposed position for Ohlendorf, as Undersecretary of State, which was not yet available in the RWM was to be connected with a new arrangement of the Geschaeftsverteilung (Business Distribution). This would give Ohlendorf the power and the possibility of a clear economic-political guidance within the Wirschafts-ministerium and strengthen the SS to operate deeper within the lines of the technocrats.[13]

Landfried and Ohlendorf also agreed on a one-minded approach and opinion about the economic-political guidelines of this new arrangement and how this new political RWM would be a model to the other Reich ministries. The economic-political chiefs of the RWM would be activated according to the ideals of what could be

called the SS State. One does not know whether Hitler was told about this type of SS infiltration in the work of Hitler's young favorite, Speer. What is clear is that there was an agreement in principle among Ohlendorf, Landfried and Funk regarding the political situation of the war front and their feelings towards Speer, who was clearly resented for changing the direction of heavy industry to an emphasis on monopoly capitalism. However, the call for a renewed socialist economy did not lead to a positive answer. Himmler refused to allow Ohlendorf to go to the RWM in order to initiate change, but he did not renounce the principle of sacrificial work and a return to ideals.[14]

There was a note in the files of Reichsfuehrer SS Himmler about his telephone call with Ohlendorf:

> During the war we have discussed a change about our totally capitalistic economy which would not be possible even by the Reichssicherheitshauptamt Ohlendorf becoming Ministerial Director in the RWM. He only could run with idealistic impossibilities and he would, during the war, try to seize those things which were of interest, but then there would be a chasing against him and each lack and misfunction of the war economy would be attributed to him and the SS. One would say, 'friend, you have disturbed the war economy and the production' or, on the other hand, if he should not try to make principle [ideological] changes and agree to the former stages as they were before, he would then be as exhausted as all the others [directors] within a few months.[15]

The opposition against Speer and Kehrl continued among

the rank and file Party and military leaders who were of a similar personal fabric in their emphasis on the common features of National Socialism. Funk also supported the need for a counterposition to Speer, because of his competition with the Speer ministry. Funk stressed the necessity of the total war approach for the new war economy, as well as the need to hire certain SS troubleshooters which he continued to stress to Speer and Kehrl. Funk concentrated first on installing Franz Hayler as the new Secretary of State in the RWM. Hayler had been already nominated also by Himmler. Later Funk also favored Ohlendorf in a secondary position, but on the inside, separated himself completely from Landfried and because of this separation came to Himmler who approached Hitler and got full agreement.

Ohlendorf began to play a key function in the reorganization of the Reichswirtschaftsministerium. He took over the leading sub-office under Kehrl in the Main Division No.2 that involved areas of general economic-politics, and supply for the population of the Reich. A new position was never created for him with the title Undersecretary of State, but he received the position of the Assistant Deputy to the Secretary of State, instead. If Secretary of State Franz Hayler, was not there, he, Ohlendorf, would be the substitute. Moreover, the health of Hayler was very bad while he was Secretary of State.

Ohlendorf and Himmler accepted Hayler while Ohlendorf stayed on as Hauptabteilungsleiter in the Reichssicherheitshauptamt where he would be able, with his influence on project timing, to slow down Speer's works.[16] Ohlendorf now had the exact power which Landfried would have attributed to him, but Landfried had to leave the RWM since he was fighting against the coalition of power forged between Speer, Kehrl, and the heavy industries. The Reichswirtschaftsministerium had now practically no power in official critical decision-making, but this did not mean that the SS could not eventually regain certain functions by its own engagement in the RWM.[17]

Himmler clearly wanted to use the crisis in the RWM to give the SS a starting position in economic-politics. Also, it was important for the SS to make a counterposition in its Weltanschauung, as well as have a counterposition against the Speer ministry.[18]

The entry of Hayler and Ohlendorf into the Reichswirtschaftsministerium was seen as a spectacular encouragement of the Weltanschauung's element in the Wirtschaftspolitik. In the circles of the Party, Gauleiter and SS affirmed Ohlendorf's and Hayler's position in the weakening of Speer accomplished through typical tactics of the SS State.[19]

Speer, aware of the contention surrounding him, in his

memoirs gives an ironic reflection which states that if "Himmler might have killed him [Speer]. The SS doctor and good friend of Himmler, Professor Karl Gebhardt, would have cured him to death [viz., bled him to death]."[20] His personal papers indicate that he, Speer, always feared that he would be wrongfully removed when he reached the highest managerial level in the Kriegwirtschaft. Nevertheless, he continued his efforts to overtake civilian production and, simultaneously close the gap between the real and the romantic with regard to the goals of production.

With the empowerment of Speer there seemed to have arrived a new dualism in the formation of his adversaries and the limitation of their power was sensed. Gauleiter and Reichsleiter fought his innovations. He was still confronted with a Reichswirtschaftsministerium which could give guidelines and little else.[21] In the inner sanctum, he was opposed by Himmler's men who had no comprehension of macroeconomics and the needs of expanding technology and by the newly endowed Ohlendorf who, in the situation of war, no more could hinder Speer, but, in the promised coming peace time, saw himself as the bearer of NSDAP change of economy.

Indeed, if Speer was interested in power and politics, he was also inspired with the future reconstruction of a new Germany. As early as October 1943, he wanted to have the tasks of resurrecting the destroyed cities.[22] On the

culminating points of the war, this Ruestungsminister of Hitler saw himself being forced to assert his status on many fronts. Speer's intention was to make clear for his opponents in the Party that after the war they were dependent on him.[23]

Since the Third Reich had maintained parallel offices of party leaders for every government position, it was up to the Speer managers to war openly not only with Gauleiter (Party district commanders), but a whole infrastructure of Ober- Untergruppenfuehrer who were essentially anti-scientific and anti-high technology. The district commanders continued to look for ways to overpower Speer's aggressive authority and bargaining power with the Fuehrer. Many feared Speer as the probable successor to Hitler.[24] This rising star who first became a member of the Party in 1932, and without ever holding a Party office, rose rapidly into circles of leadership and the most inner circle around Hitler. For a long time they had dared not oppose Hitler's favorite child.

As the war progressed, those in the NSDAP wanted to subordinate events, people and activities to the authoritarian principles of the Fuehrerprinzip. On the other hand, Speer accepted people who were not under the influence of the ideology of the Nazis.

As the tension between Pariser Platz [the SS HQ] and Organisation Todt-Central [Speer HQ] forced themselves into

the open, Speer's invulnerability finally fell. Even the moving of Speer's associates out of the City Planning Office into the Munitions Ministry was observed with some skepticism in the Berlin District; the construction staffers Karl Stobbe-Dethleffsen and Edward Schoenleben were considered to be true to the Party line only outwardly, and did not stand "without qualification behind the State and the Movement." [25] Their names, as well as the other Speer associates, Marshall and Paul Brese, were continually on the black lists of the political controller Seeberg.[26]

From the criticism of Speer's associates it was a very small step to stamp Speer's entire Ministry as enemies of the Party, which as a propaganda attack was most likely inaccurate. One need only remember Hitler's old compatriots, such as the Nuremberg Mayor Willy Liebel and the fanatic agency-head Karl Otto Saur.

A constant aggravation to the Gauleiter was the stubbornness with which Speer protected his authority in all armament matters. Not only had he successfully fended off an infiltration by Himmler's SS for the longest time, but he also diverted Party functionaries from interference in his areas of responsibility. His argument that these individuals did not have the necessary technical qualifications was undoubtedly true, but was, as would be expected, not recognized by his opponents.[27]

In the wake of the air attacks on German cities the Party became more and more involved in damage restoration, including repairs to the armament factories. As long as the Party people did not interfere with the actual production work, Speer was grateful for their assistance, but as the Gauleiter in the summer of 1943 attempted to repair damages to the detriment of production and interfered with armament production, Speer reacted harshly. He reminded the commanders of his directives from Hitler, himself, which Speer fully intended to carry out.

As Speer had to leave Berlin for a prolonged time at the beginning of 1944, the Gauleiter moved into open attack. Fritz Sauckel, who had prepared the way with his aggressive disagreements over the Speer factories, was the first Gauleiter to drop all reserve in his opposition to Speer. At the beginning of January he called upon all of the armament workers of his district to devote themselves to the "total war" effort. Speer, who read of Sauckel's speech in the Weimar newspapers, chastised Commander Sauckel saying:

> it was his [Speer's] duty to determine the time for the final dedication to the effort, as well as the 'how' for accomplishing it.[28]

Speer requested that Hitler "notify party comrade Sauckel that any future planning for such rallies required

my [Speer's] approval."[29] He reacted in a similar way to Reichsminister Robert Ley's escapades, who missed no opportunity to pour out his pathetic speeches over his workers. Through Hitler, Speer thought he could demand that the Press Secretary Otto Dietrich provide him with advance copy of all statements that were to be made in regard to the armaments industry.

While Speer could deal with these overt attacks on his authority, he was personally hit by the rumors being spread in the upper echelons of the army command. These rumors attributed the lack of weapons on the front to a failure of the Speer-directed armaments industry.[30] In that the armament production figures that were being circulated were always the same, Speer could correctly conclude that the attacks on his ministry were being systematically proliferated.

The Party contributed to the significance of these rumors in that it continually emphasized that Speer opposed an increase in production quotas and that weapons production increased more due to the work of Gauleiter and less as a result of Speer's intermediary function.[31]

Throughout 1944, Speer's dispute with the Gauleiter continued behind closed doors and both sides attempted to wage their campaigns through Hitler while still maintaining the appearance of solidarity toward the outside world. Speer dropped his usual practice of restraint. In the

following weeks and months, he defended his point of view in numerous speeches before armament workers, officers and Party officials.[32]

The continual criticism of his person, his system, and his ministry forced Speer, even though he was ill, to formulate a performance report that he could present to the Fuehrer's headquarters in Berlin. Hitler's approval would give the report official character. Central point of the argument was to be that the increased growth, expressed in terms of rapidly increasing production quotas, was only possible by Speer's plan of industrial self-responsibility.[33] And it was exactly this system, the last remnant of freedom in a totalitarian state, that was the preferred target of Party attacks. In spite of all the economic-political orchestration, the Party never succeeded in bringing Speer's system to fall, because Hitler himself had given it his stamp of approval.

With the increased radicalization of Hitler's dictatorship, however, Speer's industrial self-responsibility was drawn more and more into the turbulence of continued attacks, that were most often prepared by Bormann and furthered by the Gauleiter. Martin Bormann, the Party chairman, with whom Speer got along well until he assumed his new post, became Speer's most influential critic. This caused Speer to become more reliant on his mutual relationships with Himmler. The Party

further considered the iron pact of Speer and Himmler as threats to their acquired privileges.[34]

Since Speer was not able to defend himself successfully against these attacks, he asked Hitler to defend him against the Gauleiter, and he declared that he was willing to make some concessions to the Party. He was not able to prevent the Party offices from interfering in his weapons production so he attempted to direct a cooperative effort along easily controllable paths.[35]

A directive was to regulate the work with Sauckel. He asked Saur, with NSDAP managers Hans Lammers and Martin Bormann, to work up a draft.[36] As Speer and Sauckel signed the directive, the Allied invasion of France had already begun, which rather negated the effect of their disagreement. As Speer recovered from his illness at the beginning of May 1944, he immediately sought out Hitler in Berchtesgaden and requested permission to present his report regarding the success of the armaments industry to a larger circle of the Party. In regard to his discussions with Hitler, Speer noted on 13 May 1944: "The Fuehrer is in agreement that a district commander convention should take place as soon as possible under the theme of armaments."[37]

The report was to be presented in a context of weapons demonstrations, which in itself was no novelty, but it was to make a special impression on the Gauleiter. Bormann and

his Gauleiter were less than enthusiastic at the prospects of being dressed down again, as was the case in October 1943. This type of talk was obvious to Speer and so Speer decided to put all his cards on the table with Hitler.

> The Fuehrer was made aware of the fact that my speech to the Gauleiter in Posen had caused some of these commanders to take offense. I offered to read the text of the speech. The Fuehrer was satisfied with my explanation, that I had spoken sharply, but that I had in no way attacked the district commanders, and that Commander Bormann had assured me afterwards that the speech had not been too aggressive. The Fuehrer explained that he had received complaints from the district commanders, but as far as he was concerned, the matter was closed.[38]

While Speer was only intimating his arguments in his speeches to the armaments workers, he used his addresses in Essen and Linz, followed by a comprehensive memo to Hitler, to review the high points of his defense against his critics. On 9 June 1944 he spoke in Essen, a city where his success was most apparent, not because he particularly valued the Krupp works, but because many who were there were ready to believe what he had to say. To the Party officials, representatives of the government armament offices, and factory managers, he showed a series of slides portraying sharply rising production curves.

As Speer put it, "that these slopes were maintained up until May of this year and the fact that the bombing terror has not caused serious setbacks is, in my opinion, the most

amazing and most fantastic accomplishment of our armament and war production effort."[39] And in support of his armament miracle he attributed the following well-known reasons: the accomplishments of the German workers and his own system of industrial self-responsibility that he introduced in 1942. He reported this in great detail, because he was well aware that there was much criticism of this particular organizational form.[40]

In comparing his own dynamic production process to the old process by the military he drew the conclusion: "The conducting of comprehensive industrial tasks can only be directed by individuals who have come out of that particular industry."[41] This hit the military and the Party officials in the same manner. Here he was in agreement with Hitler; the war must be run by technical managers. He was able to augment productions programs in the spring of 1942, because he was "convinced that there were large non-utilized reserves in our factories that could only be utilized if these companies were run in an unbureaucratic and revolutionary manner and if new methods for achieving increased production and program management were introduced."[42]

To this he appended his obligatory praise for the unbureaucratic working methods of his loyal associates, whom he must now protect against unwarranted attacks:

> I will in no way tolerate that the men who have so selflessly placed themselves in the service of the German armament and war production effort should be subjected to malicious accusations that have no substance in fact and thereby discredited. The work these men have to accomplish is too important and the burden they carry, voluntarily, is too heavy to allow this abuse.... [43]

The question of which economic form would be put in place after the war was one he left open, thereby offering some consolation to the Party functionaries:

> The current form of industrial self-responsibility is determined purely by the war.... All of us, who have placed ourselves in the service of the destiny of our nation, so that we may obtain the highest possible results from our German production, consider this a war-determined task.[44]

From the power struggles of the preceding months it became clear that Speer had spoken against the Gauleiter. On 10 June 1944, the next day, the press celebrated its leaders of industry and, at their head, Speer, the young Minister and close associate of the Fuehrer. The press directed their praise solely towards Speer and his system to the exclusion of the military armaments officers. On the same evening, a number of civilian officers, among them Speer's staff officer for the Ruhr, Erdmann, demanded an explanation from Speer as to why his speech the previous day was aimed against the military. The assurance from

Willy Liebel that Speer's original draft delivered in Meran was even more aggressive was not enough to calm the incensed officers.[45]

Speer then assured them that had he ever to do with armaments again, not a single military officer would have anything to do with the effort. Erdmann resigned. The numerous Gauleiter who had gathered there, correctly understood Speer. "Today, industry has had its great day,"[46] lamented Duesseldorf's district head Friedrich K. Florian.

For the last third of June, Speer called together his entire armaments organization in Linz. Out of the many armaments conferences, that began with a small circle in the Frankish Plassenburg and ended on 1 December 1944 in Rechlin, the conference at Linz stands out in regard to both its size and meaning.[47] This meeting, planned well and long in advance and held under the guise of a directors' conference, was Speer's largest display of power. Hitler, who did not attend Bormann's district commanders' conference himself, accepted the invitation to speak to Speer's armaments organization up in Obersalzberg. The speakers before Speer were to be the host, Gauleiter August Eigruber, then Riecke, State Secretary from the Nutrition Ministry. Hitler was scheduled to speak right after Speer.

The speech that Speer gave on the morning of 24 June

1944 was more moderate in tone than the speech he had developed in Essen; still the fundamental concept had not changed. Besides the fact that he overwhelmed his technical audience with list after list of his production accomplishments and gave detailed reports of all the various branches of the armament industry, the two speeches were hardly different in substance. Afterwards there was a veritable deluge of awards presented to various participants. The conference ended with some disharmony since Hitler mentioned, somewhat in passing at the Platterhof, that he was thinking of replacing the ailing Speer with Milch.[48]

After his speeches in June, Speer tried to immunize himself against Bormann's influence on Hitler and sent a comprehensive memorandum to headquarters on 20 September 1944. Since this document reveals more about Speer's view of his own work more than almost any other, it is only fitting that it is given appropriate space:

> 20 September 1944
>
> My Fuehrer,
>
> When I, following your counsel, gathered together from the armaments industry the leading technicians and factory managers in order to form an organization that would be capable of qualified armaments production independent of the army's armament bureaucracy, I brought to your attention that this organization could only be formed by bringing together men who had no affiliation to the Party.[49]
>
> I do not believe that the second system

> which could be applied to the economy -- a system of force against the factory commissars or generalized coercion or punishments when production quotas are not met can be successful.... So, I now find myself confronted with the fact that in the present stage of the war where everyone is searching diligently to identify others' short comings my ministry and my policy of 'Industrial self-responsibility' are being characterized as untrue to the Party or even 'opposed to the Party' (remarks of Dr. Joseph Goebbels and Reichsleiter Bormann).
>
> The task which I have to accomplish is non-political. I have felt comfortable in this job as long as my work and my person were evaluated according to technical standards.... I do not feel strong enough to be able to direct my technical work and the work of my associates successfully if I am to be judged according to Party-political criteria.... It is completely clear to me that in the present stage of the war we cannot tolerate any unnecessary disagreement between the Party offices and the policy of industrial self-responsibility and that it is my job to attempt a unifying synthesis and to prevent the development of an attitude of resignation in the industrial self-responsibility program even though the Party wages skirmishes against my organization.
>
> Industry has a unique opportunity to assemble its best personnel in this agency of industrial self-responsibility. If industry misses this opportunity, then I feel certain that the developments will inevitably take the direction--undesirable to all of us--of far stricter government control of industry.[50]

Even if Speer had truly wanted to make concessions of responsibility to the Party, and one is reminded of his offer of his willingness to participate with the Gauleiter, on 25 January 1944, he still, wisely, made the following demands:

1. The Gauleiter were to serve his armaments organization and not the area economic offices.
2. There was to be no interference in the authority of the factory managers.
3. The technical direction must be the responsibility of his ministry, its Committees and Rings.[51]

Although Speer had offered limited participation to the Gauleiter organization on 25 January 1944, he most probably was not convinced that was the correct way to go. He believed the more the Party overtook the responsibility for functions that were previously relegated to the State, the greater the danger that it will be blamed for all the difficulties and unwelcome situations that arise (such as shadow employment [Schwarzarbeit], evacuations or displacements).

Speer's letter to Hitler continued:

> I am, however, convinced that the district commanders could also do much to assist me in the armament effort, but only if a clear chain-of-command exists. In my case these must be newly developed for the Party in order to reflect the newly acquired responsibility it would have in the armament effort. Otherwise, it would be clear that more damage than aid would be effected by the fact that a purely technical and objectively directed task would be unduly influenced by political dynamics.
>
> What is required is a clear decision (for the future [of the War]); the system of trust that we have built up until now with the factory leaders should be continued. In my opinion, the responsibility for their undertakings should remain in the hands of the company heads and should be developed as fully as possible, because it is out of this responsibility that the

greatest accomplishments will be achieved. It is my personal position that this system [i.e., the Ring] should not be changed in any way at this point, especially since it has proved itself up until now. I do believe it is necessary, though, that you issue a clear decision.

Heil, my Fuehrer!"
signed Speer[52]

At the beginning of July 1944, Hitler agreed to call an area commander convention in a few weeks. Color film footage of the secret weapons Aggregate 4 and Fieseler 103, better known as V-1 and V-2, as well as the jet fighter Me 262, provided the backdrop for Speer's speech. Speer gave his speech regarding the German armaments production in Posen at this August conference, shortly after the attempted assassination of Hitler on 20 July. The fact that Speer's name was on the ministry list of conspirators had seriously damaged his image once more. The figures with which Speer had hoped to impress his listeners and the conciliatory tone toward the cooperation of the Party in armaments matters did not achieve the intended effect.[53]

Inasmuch as Speer was suspect to the Nazi political hierarchy of Gauleiter, his production totals were considered exaggerated and discredited as fiction. The reaction by the heads of the propaganda apparatus to whom he presented his production curves on 29 August was no different. Two days later he stood before the Party leaders and armament overseers gathered in Berlin. If the Ring

directors and managers behind his intermediary position (Reichsminister fuer Bewaffnung und Munition) would now collapse, his position would be devoid of all support. For this reason he energetically opposed the criticism directed toward him by the chairman of the Munitions Commission by stating at the Berlin conference:

> The enthusiasm with which the Gauleiter are prepared to support our efforts unconditionally, in order to yoke themselves to our cart, is exceptional. At the same time, the measures we intend to implement are only possible with the assistance of the Party.[54]

Speer tried to accommodate the consolidated front of the Gauleiter. Only when the interference from the Party too seriously affected armaments production, did Speer take action individually against the Gauleiter. He did this without first waiting for Hitler's final decision regarding the responsibility of the Party in these affairs. And only when the fight for the sustaining of the German industrial capacity broke out, did Speer insist again on his singular responsibility for German industry.

Against the contentions that the failures at the front could be attributed to failures in the armaments industry, Speer presented the steep production curves that the armaments fabrication had achieved since his taking over the leadership in this area. He left no doubt as to what made the armament miracle possible: first, the German

workers, which was in no way flattery on his part; and second, owing to his system of industrial self-responsibility.[55] In most of his similarly phrased speeches he promised the workers a rapid reconstruction of their apartments after the war, which was the largest concern of his audience. More and more he became as a preacher of his system: "I am convinced that the concept of industrial self-responsibility is one of the most priceless concepts that we have developed in the economic sector out of the necessity created by the war...."[56]

Speer openly admitted that this idea did not always fall on fertile soil, for in the construction industry, from which Speer himself had come, and in the naval armaments sector, the strongest opposition to him had developed. In his opinion, however, the system had not failed, rather shipbuilding and the construction industry had failed within the system. The air force still produced its own weapons under its own direction.[57] Speer felt that his system had only reached its true realization in regard to army armaments, the longest armaments program that he had personally directed.

Even when the differences of opinion between himself on one side, and the leaders of the industrial associations for iron and coal, directors Ernst Rechling and Hermann Roechling, as well as Paul Pleiger, on the other, escalated to the level of making them personal enemies of one

another, Speer would not step aside from supporting industrial self-responsibility.[58] Instead, Speer brought the irreconcilable opponents together, sat them around one table, and managed to get them to drop the apparent, externally visible feud, thereby neutralizing tensions.

In spite of certain shortcomings in his system, Speer was not willing to reduce any fundamental expectations:

> As long as ... the war continues and the harshness increases from month-to-month, it is an unquestionable requirement of the leadership of the nation that the industrial self-responsibility be expanded and imbued with more authority than before. We cannot leave the path that we have set for ourselves.[59]

Speer clearly rejected the Party's desire for change and was supported by the fact that the Fuehrer himself observed with satisfaction how industry itself has continually improved upon its own accomplishments.[60] He had not been successful in convincing the Party, but by means of the speeches made in his own defense he did succeed in silencing his critics for a while. When Hitler, who would not step in on either side, signed a decree for all armament workers on 23 September 1944, it appeared that Speer had emerged as the victor: the production figures for August has proven that the organic industrial self-responsibility had shown its best. However, since Hitler was not prepared to support Speer's system openly,

the Gauleiter were ready to continue their attacks within the armament sector until Hitler ordered them in March 1945 to begin with the destruction of the German factories.

What was Hitler's position in regard to his Munitions Minister and how did Speer stand in regard to his Fuehrer? Speer was continuously suspicious of the leading functionaries of Party and the state, since he felt that he was being unjustly criticized for his work. The close relationship between Hitler and Speer did suffer under the influence of Xavier Dorsch and Martin Bormann.[61] As the Gauleiter began their rear attacks on Speer, he expected a public statement from Hitler. The only assistance, however, that Hitler gave his minister was that he did not support the Gauleiter either. That was all that remained from their once close relationship. That it once again revived in the terrible atmosphere of the last days in the Fuehrer's bunker is something that will forever remain a mystery.

XI. THE USE OF FOREIGN AND FORCED LABOR: THE HIDDEN ECONOMIC EQUATION FOR THE ORGANIZATION OF THE AIR INDUSTRY

The first heavy bombing raid on Luftwaffe synthetic fuel sites and related industrial targets was achieved by sixty-four British Lancasters. It was expressly ordered by Churchill on the recommendation of the Central Interpretation Unit, Photographic Intelligence, and took place on 20 June 1943. The British Intelligence Objectives Sub-committee reports pointed to key targets in Germany such as the Zeppelin Werke production.[1] This was a follow-through of earlier strategy that placed Germany's aircraft industry as a high priority for target bombing.

A movement was started to relocate production facilities to areas safe from air attacks as early as 1942. However, it was not until after the big week of bombing (19-25 February 1944) known as Operation Argument, that Speer put his full determination behind the reconstruction of German industry and its dispersal to new locations through the program known as Untertages-Verlagerung which had already been initiated in 1943.

Speer, initially in 1942, had concentrated German industry into twenty-seven large facilities arranged along production, technical, and economical lines. However, by 1943, owing to the bombing raids, he was forced to spread military production over 729 medium and very small plants.

All these facilities were to have great autonomy and were not to be under the strict control of the German General Staff. According to the official documents from many of these facilities, even Hitler was oblivious to many of the revolutionary weapon-systems that were being developed in these locations. The new facilities were to be situated in tunnels, caves, or unused mines, some were hidden in forests, ravines, and villages.[2]

The aircraft industry was the first manufacturing industry picked for relocation to underground facilities. Autumn 1943 saw the first conceptual planning take effect. Just as with any decision to locate a factory, the decision to transfer entire industrial branches to underground facilities was influenced by a number of factors. The aircraft engine expert William Werner, from the Auto Union AG, who had spent a great deal of time in America, was able to couple the state requirements for underground relocation of facilities, with economic rationalization strategies, utilizing for the construction foreign forced labor and Konzentrations-Haeftlinge (KZ-inmates) that were already being utilized in some companies.

In William Werner's opinion, the most pressing matter at the time was the introduction of the assembly line modeled after American industry. Werner also advocated the demand and immediate construction of underground munitions production facilities as long as they met the requirements

of rational production methods, that is, assembly line production, having a minimum requirement of one hundred thousand square meters of space.[3]

Although the firms themselves were often quite aggressive when it came to inspecting and acquiring secure underground locations, such as coal and salt mines, as well as underground quarries, in most cases, it was the planning departments of the companies themselves that had to make the final decisions which often proved problematic. Often, the underground areas selected were poorly connected to arteries of transportation. Moreover, damp and corrosion-promoting environments of the mines, for example, would have threatened the expensive machinery that was to be used. Shortages of the required gas and other forms of energy in these areas did not support adequate production. Finally, the amount of effort that was needed to move completed fighter wings, through the narrow mine shafts became another problematic factor that was discovered too late.

A clear contradiction existed between what the company owners said they were trying to do to support the overall underground war effort and what they were actually selecting as sites for relocation. The opposition from industry, however, quickly was worn down by the fragile economic state of the nation created by the war. Many obstacles were quickly and unbureaucratically removed by

governmental agencies both through the use of thinly veiled threats and the increased use of forced labor of all kinds. Once industries saw that they could not avoid the move to underground facilities they made a better attempt to effect the necessary construction through the use of their own companies' internal planning departments.[4]

Until October 1944, the job of putting the industries and the new experimental centers underground, in order to protect facilities and meet delivery transport time had been arranged between competing governmental offices and individual firms or directly between the latter and various private excavation contractors. Subsequently in 1944, these efforts were unified by Reichsminister Speer under a state enterprise, the Industriekontor G.m.b.H. under the Reich Industry Office, which had control over those who were to use the underground complexes.[5]

Contractors under the Organisation Todt had the job of adapting already existent caves or excavating the underground facilities. The underground facilities were used both for the storage of missiles and the building of vast underground infrastructures which could carry on the rapid assembly and make-shift launching of very advanced technological weapons. Part of the radical change to improve the functions of the Untertages-Verlagerung was initiated by the formation of a Jäger Staff in February 1944. This staff, composed of members from both government

and industry, was the central coordinating agency for the creation of new facilities and was nicknamed the Miniatur-ministerium (mini-ministry) by Alan S. Milward.[6]

Foreign workers were also drafted into the German labor force, owing to shortages caused by the military need for German fighting power on the frontlines.[7] Until the spring of 1942, the supply of workmen in the war industries was no problem. In May 1939 about 1.4 million men were drafted into the army; in 1940, 5.6 million; in 1941, at the beginning of the Russian offensive, some 7.4 million men in all had been drafted. In 1942, the total reduction of working people now drafted was still only eight percent of available workers and could be easily compensated for by war-related reductions. In fact, the number of working women had actually shrunk at that time by one-half million.[8]

However, as a consequence of the menacing end of the Russian expedition which resulted in the containment of the Wehrmacht before the gates of Moscow with the loss of approximately 700,000 men that were dead, wounded or captured. This military force had to be compensated for. Between May 1941 and May 1942 another two million men were drafted from the labor force.[9]

Soon after Speer had taken over the management of armaments, he was influenced by many industrialists who had been affected by the sudden enlistments and the problem the

demand for a vital workforce was having on the economy. The shortage of the workforce, especially skilled workers, was a problem which industry constantly faced. Although there were shortages of raw materials, energy, coal, transportation and storage capacity, one of the most serious problems soon became the shortage of labor.

Hitler's proposition was quite simple: since Germany ruled over a population of 250 million people in Europe, the very notion of labor shortages was manifest nonsense.[10] Speer asked, in the first month of his administration, from Hitler and Goering, the full power of authority over the work-force to work dramatically for the distribution of the available workers through a Plenipotentiary for Labor Allocation. This would not be part of the Labor Ministry, but was supposed to give the latter directions. The job would be to define the need for workers, find them and distribute them to other respective businesses within the ordnance industry.[11] In order to direct the flow of required labor, in particular forced labor from the occupied territories, Speer had suggested for this job Gauleiter Karl Hanke, but Hitler finally decided on the Gauleiter of Thuringia, Fritz Sauckel, as General Plenipotentiary for Labor Allocation.

The relationship between Speer and Sauckel was not good from the beginning and only got tenser as time went by. They had a contrasting way of working and thinking.

Speer tried to limit Sauckel's job to the finding of the necessary workforce for industry and wanted the Zentrale Planung to decide where to send them. This move Sauckel rejected from the beginning. In his opinion things should be left as they were. There should not be a third authority in this matter. He was, as was Speer also, directly responsible to the Fuehrer and Goering; therefore they were equals.

Sauckel agreed with most of Speer's wishes as Minister of Armaments and agreed to Speer's general directions, but he was not willing to give Central Planning more influence; consequently, as a member, he did not attend meetings and let himself be represented by somebody else or not by anyone.[12]

Loyal to Hitler, Sauckel tried to exploit the labor pool ruthlessly and through all possible means, fully coordinating his activities with Speer and his Committees. For this he was condemned to death at the Nuremberg trials. The separation of labor force supervision from the authority of the Minister for Armament and Munitions Production may have caused functional difficulties at the time, but it enabled, or at least aided, Albert Speer to come out of his trial with no more than a period of imprisonment.[13]

Since the beginning of the war, German management was confronted with the question of the employment of the

workforce. The regional offices of the Wirtschaftsamt, Agricultural Ministry, submitted material proving that the most important industries had a more than adequate number of workers.[14] On the other hand, the consumer industry confirmed over and over that if the threatened manpower reductions would occur, they could not fulfill the demand for goods. When workers were drafted, the demand was expected to be fulfilled anyway.

Sauckel was of the opinion that retraining German workers for the armament industry would not be sufficient and as it was not the will of the Fuehrer to draft more women, in the long run, only a huge amount of foreign workers brought into Germany from occupied territories would be available. The German civilian workers who were drafted were, thus, by the end of 1942, replaced by three million foreigners of which 2.5 million were civilians.[15]

In Kehrl's opinion, Sauckel's forced drafting of foreign labor forces distorted all the wisdom acquired during the first war years and it was the worst mistake of the leadership.[16] Wherever it was possible, the work should be brought to the workers in their own country. It was documented that a workman living at home would produce much more than one not living at home.

In his report of 15 April 1943, Sauckel informed Hitler that during 1942 he had brought 3,638,056 men and women to Germany, of whom 1,568,801 were employed in

armaments.[17] While Speer's colleagues viewed these figures as exaggerated, the numbers show the vast scope of the undertaking.

In August 1943, all departments in the occupied West besieged the government to stop the forced drafting of foreign labor as Sauckel practiced it. When this was brought to Minister Funk's attention, he claimed that he could not do anything in this matter. It was not his department.[18]

Since, the total war economy was assembled in Speer's hands, it was logical that Speer should be convinced to stop Sauckel's forced labor tactics. By October 1943, Speer and Jean Bichelonne, French Minister of Industrial Production, signed an agreement that workers in Speerbetriebe could not be sent to workplaces in Germany.[19] At a meeting with Hitler, Speer told him about a new method of increased production without creating problems for a large pool of foreign labor within the Reich. The idea was to transfer production from the Reich into the occupied countries.

The goal was to create large industrial conclaves in foreign countries to allow assembly to be done more quickly. Speer designated Kehrl as the spokesmen of the ministry and coordinator of all work at the ministry within the occupied western theatres.[20] At the same time, Walter Schieber was ordered to represent the Speer Ministry

for work in Italy and Karl Otto Saur was ordered to create industry in the protectorate area of Bohemia-Moravia. It was also discussed that the military commander and the commissar of the regime in the Netherlands should determine his area's ability to produce German industrial needs using forced labor.[21]

On 3 December 1943, Speer signed two orders in which the principal axiom and method used for the contract displacement of labor from occupied territories was measured against availability and efficiency of German labor on the home front and judged by the costs of importing labor from other countries and the contract displacement against high prices in the occupied theatres.[22]

Although industry was now being supported by production in occupied countries, labor shortages still existed for the construction of new underground facilities. With few exceptions, in the years prior to 1942, Konzentrations-Haeftlinge (KZ-inmates) were used almost exclusively in the construction industry. But by the end of 1941, KZ-inmates were also used in production branches of industry.[23] For example, in the city of Allach, selected inmates with a technical background (or those who could make a convincing case that they had one) were trained in BMW's own training centers under the direction of the SS.[24] The training lasted ten weeks, and was aimed

primarily at skilled machinists and the like. The inmates could also qualify themselves then for more specialized positions such as quality assurance. In this manner the company was able to balance out the ratio between skilled and unskilled labor within a year. By the end of the war, about two thousand inmates had undergone this training. By increasing the incentive premiums as well, BMW was able to increase collective and individual production steadily up until the end of 1944.[25] It should be noted, however, that at the same time the number of security personnel employed at this particular plant increased by a third over the same period of time. In a similar manner, other large-scale production branches were able to adapt in their own ways between 1942 and 1944.

From 1942 on, the Reich Minister Speer and his Chief-of-Staff, Karl Otto Saur, were responsible for the use of this special labor force under Sauckel's command. Ernst Heinkel was one of the first to utilize KZ-labor in his Oranienburg factory. Eventually the number of inmates utilized by Heinkel rose to as high as 6,000.[26] Junkers and Messerschmitt industries started using KZ-labor much later. In 1943, Junkers employed about 1,300 inmates and Messerschmitt had in all its factories about 3,600. The difference in numbers can be explained by the fact that Heinkel already had an integrated concept for the use of diverse labor forces, while Junkers was in the conceptual

planning phase. The early efforts to construct rockets and missiles required massive use of inmate labor under the direction of Rudolph Otto which made it possible to make great economic savings on the production of new weapons systems.

On the other hand, there was a huge expansion in the use of KZ-inmates in the construction of the underground production facilities for the aircraft industry that was begun in the winter of 1943 for which ten thousand inmates were appropriated.[27] Since inmates were continually being diverted to construction sites, away from production lines, the factories were faced with a decreasing stream of labor. The supervisory and skilled labor layers in many factories were so thinned out that it was almost impossible to maintain the initial training programs for the inmates.[28] Industry therefore tried to keep the fluctuation of personnel to a minimum. In addition, the simplification of the assembly processes and the introduction of lucrative incentive programs enabled industry in many instances to achieve productive work from the inmates after training of only a few days or weeks.

The utilization of forced foreign labor and KZ-inmates between 1942 and 1944 was also regulated by the Office of Supervision of Labor Deployment (Generalbevollmächtigten für den Arbeitseinsatz) and its subordinate Employment Offices (Arbeitsämter).[29] Irrespective of these agencies,

the utilization of KZ-inmates required the additional approval of the Amtsgruppe D (Agency Group D) of the SS-WVHA (Administrative Management Office).

The manpower (both political and war prisoners) for the job of excavation was supplied and overseen by the SS taken from population regions in all occupied territories. Between 1937 and 1941 there had already been an increased use of KZ-inmates in favor of those undertakings that were owned by the SS, primarily in mines and quarries.[30] Being in control of both mines and KZ-labor, eventually gave the SS more and more control over the entire operation of excavation and construction of the new underground industrial facilities.

The SS often operated certain areas of industry for its own ends, seizing power from the Industry Office and taking over from Fritz Todt. Sometimes it took over for reasons of private speculation, other times in order to better hide secret laboratories of particular interest to the SS, like St. Georgen (near Linz) in upper Austria.[31]

One great obstacle to the cooperation between the SS and industry was the attitude in the main Economic Planning Office of the SS that the use of KZ-inmates should coincide with the expansion of the SS-owned factories first, that is, in conjunction with their independent weapons and munitions production.[32] When the head of the Construction Division of the SS-WVHA, Dr. Hans Kammler, was appointed to

the commission for relocation of industry and underground construction, the SS began to have a strong representation in the decision-making process. Within the first few weeks, the underground relocation projects were redirected and in part assigned to new companies for execution and the SS maneuvered itself into position to receive a number of these reassignments.

A new era of cooperation began, however, after the battle of Stalingrad. The exigencies of total war provided the necessary impetus for industry to maintain their own interests in the face of SS demands. Once the relocation of factories to underground facilities began around the end of 1943, private industry found itself in a more favorable position to oppose successfully the SS requirements for codetermination in planning questions.[33]

Nevertheless, by the end of March 1944, the SS was the second largest contractor in the process of relocation after the Organisation Todt.[34] How did the SS manage in such a short time to acquire such an influence after years of frustration at the hands of both industry and government? For one, there were points of connection through the previous cooperation between SS and industry in the initial underground projects. Since 1933, the SS under Himmler had begun to build a vast economic empire. Its successes included the construction of large underground factories near Nordhausen for the production of rocket,

Messerschmitt, and Junker planes. Yet, neither of these reasons were primary, rather it was the ever-more-apparent inability of the responsible civil authorities to garner sufficient numbers of workers for the required projects and the SS had the power to use KZ-labor.[35]

The actual genesis of the underground projects has only been outlined up until now with few internal studies published in great detail.[36] Both the Construction Division of the Air Ministry and the Construction Office of the Weapons Ministry were responsible for the construction and relocation operations. This led to reduced efficiency and fierce competition between companies who sought to use governmental influence to get the choicest projects.

As more and more underground facilities were needed, more and more labor was required. In Himmler's presence in January 1944, the Gauleiter from Thüringia, Fritz Sauckel, the responsible officer in the Generalbevollmächtigten für den Arbeitseinsatz (GBA) promised Hitler in excess of four million new workers for the war economy.[37] Two months later, in spite of forced recruiting techniques, only a few thousand workers had been provided, these primarily from the Soviet Union and Italy. On the 1 March 1944, Sauckel was forced to admit publicly to the failure of his policies. The appointment of Dr. Hans Kammler of the SS was not coincidental with Sauckel's confession, because at that moment the only organization that could hope to

provide the necessary labor force was the SS. The appointment of the SS to this function was seen as the only way out of the apparent crisis.

The SS certainly took advantage of this situation. In no time the SS had established their own construction staffs (so-called SS leadership staffs) for the coordination of KZ-inmates.[38] Regular construction worker activities, and the procurement of the necessary equipment and materials, as well as four Special Inspector General Groups (SS-Sonderinspektionen), were created each of which was directed by an architect or civil engineer holding an SS-officer rank. A close cooperation soon developed between the SS and the heads of those companies that were to benefit from the transfer of facilities to secure underground areas. The companies provided fundamental planning and some of the necessary materials while the SS accelerated the procurement of the necessary labor in part by eliminating various bureaucratic hurdles.

As the Jäger Staff approved its interim construction plan (costing about 1.1 billion RM [Reichsmark]), the SS had firmly established itself at the center of the team's work. This does not mean that the SS was in charge of all underground construction; quite the contrary in terms of the estimated 170 underground relocation projects in this phase, only twenty were under the direct supervision of the SS.[39] However, the SS projects were perhaps the most

significant and crucial, demanding a high volume of labor.

KZ-inmates, in the number of 250,000 were soon demanded for new industrial construction sites. This demand coincided relatively well with the 200,000 inmates who had been diverted from concentration camps as decided by Himmler and Hitler just shortly before this time. Since the SS sites could not use all of these inmates, the majority were to be utilized in the construction sites overseen by the Organisation Todt, who had been commissioned to build the mega-bunkers.[40]

The assignment to a construction commando team meant in most cases (unless one was a trustee or had some other functional position) a life expectancy of only a couple of weeks. The tight schedules and relentless driving by supervisors was combined with long marches to the sites and often a fifteen- or sixteen-hour work day.

The leadership of the concerned companies sanctioned this terror and solidified a system of oppression and work stress that was continually refined and expanded. Special study groups developed scientific systems to increase the productivity of labor capacities of those working underground which included, of course, also the work of KZ-inmates. Incentive Troops (Akkordstosstrupps) were also established and reported to SS-technical expert Dr. Kurt Hegner. Yet, no one seemed to take into consideration the high death rate of this important source of conscripted

labor.[41]

Who actually was behind this undertaking? The list of the board of directors that met on 7 December 1944 in Ampfing, in spite of fuel scarcity and traffic chaos, reads like a Who's Who of German industry: Director Fritz Rudorf of the German Air Industry Bank (Bank der Deutschen Luftfahrt), the majority stockholder in "Vineyard I"; Dr. Hans Heyne, Director of AEG and Chairman of the Committee for Aircraft Armament in the Armament Ministry; Reichsbank Vice President Kurt Lange; Dr. Friedrich Lüschen, Director of Siemens and Chairman of the Electronics Committee; Ministry Director Dr. Carl Birkenholz from the Speer Ministry and member of the Armament Staff responsible for special services and distribution of armament industry labor; General Director Hellmuth Roehnert, representing, among others, interests of Rheinmetall-Borsig, Junkers and Daimler-Benz; and from the political realm, the County Commander (Kreisleiter) of the NSDAP.[42] Among the guests were Hermann Bücher, Chairman of the Board for AEG and who played a central role in the formation of the Mittelwerke, two representatives of the Organisation Todt, and Dr. Krengel from the German Air Industry Bank.[43]

Yet, there is no evidence that the companies whose facilities were being built by these inmates ever intervened on their behalf, even though they were constantly confronted with their plight at the construction

sites. On the contrary, they contributed to the inmates misery by levying additional planning requirements and compressed schedules on them.

Any means to expedite the construction was considered legitimate. To their advantage was the high priority that had been placed on the relocation of these weapons production facilities so that regardless of the high death rate among the inmates, a steady stream of new personnel could always be supplied up until the end of the war.[44]

"Vineyard I" (Weingut I) at Mühldorf was a mega-bunker (Grossbunker) built in the summer of 1944 through the efforts of the Organisation Todt with the assistance of KZ-inmates. The benefactors from this particular facility were, among others, AEG, Siemens and Halske, Siemens-Schukert, Carl Zeiss-Jena. More than ten thousand workers were utilized in this project, including foreign forced labor, prisoners of war, and approximately 4,500 KZ-inmates. The inmates were quartered in four camps from which they were removed to work in the underground facilities of rocket assembly and component preparation for the four main lines of missile development that were given top priority in the summer of 1944.[45]

The Vineyard Company, Inc. (Weinguts-Betrieb G.m.b.H.), the cover name for a forty-two company consortium, was founded by the Armament Ministry in mid-October 1944.[46] General Engineer Günther Tscherisch, was

named Chief Executive Officer. The consortium, in the form of a war industry association (Kriegsbetriebsgemeinschaft) was to produce a variety of military products.

The cooperation between industry and SS reached a level of intensity that had not been seen before. The WVHA appointed SS-Commander Martin Weiss as Special Deputy at Mühldorf, and it was his job to accelerate the construction of quarters and to make the necessary preparations for the assignment of the planned thirty thousand inmates for this project. The project was never completed and the utilization of inmates occurred only during the construction phase. Nevertheless, large scale planning was being conducted for their use in production. The Vineyard Company had their own department for Inmate Affairs that, according to an organizational plan, was responsible for the following:

1. Coordination of inmate assignments with the camp commandery.
2. Selection and distribution of inmates to the various companies of the consortium. In this case, since most of the work was skilled machine labor, qualification tests were planned.
3. Coordination with the company leadership in the acquisition of housing and rations.
4. Acquisition of work clothes and premium materials.
5. Database maintenance for inmates (with entries for personal information and length and type of utilization).[47]

The Inmate Affairs department together with six other

departments belonged to the Administrative Directorate. The era of separation of SS and industry in the question of KZ-inmates was over. The utilization of inmates had become an integral part of the operations of the Vineyard Company.

The power of the SS continued to increase reaching its height in Hitler's approval of Himmler's proposal to build an SS-owned industrial concern in order to make the SS permanently independent of the state budget.[48] At this stage of the war (1942), Hitler wanted to secure a position for the SS that would keep it independent of the State and the Party, in case a successor should try to use the state budget as an instrument to curtail the power of the SS. Such reflections were in keeping with the overall organization of the Reich.[49]

Even the notion of an independent SS down to its own budget originated in Hitler's tendency always to promote opposition in order to create conflicting forces in domestic politics. The conflicting forces would then be bound to struggle under a higher authority.

The concept of the SS controlling its own industry was in direct opposition to the projects under Speer's command and Himmler was continually plotting ways to achieve greater power and control over Speer's jurisdiction.[50] On 12 September 1942, Saur (Speer's staff member) wrote to the SS representative for Economic and Administrative affairs, Oswald Pohl, conceding as agreed that three

factories would employ Jews and be taken over as SS armaments factories for manufacturing of the special armaments. These three factories were: the 3.7 cm anti-aircraft artillery factory in Riga; the heavy anti-aircraft factory near Katowice; and a gear-transmission factory, under contract with the Z.F. Friedrichshafen firm in Passau. This would utilize almost 15,000 workers.[51]

Himmler was never satisfied and continually came up with new ideas to take over the armaments factories and since the SS controlled most of the KZ-labor, Speer's hands were tied. In a meeting with Speer's agency and staffers, Himmler had requested armaments production to be carried out right in the middle of the concentration camps. His request had already been approved on a trial basis.[52] Engineers and specialists were to be available to train the inmates.

Manufacturing in the concentration camps was to be overseen by the appropriate industrial firms involved, not only in terms of the production interests, but also economically as well. The necessary machines were to be obtained by the armaments ministry. The overall task of employing the concentration camps for production of armaments was given to the State Councillor Dr. Walter Schieber. Himmler wanted to attempt this experiment in two facilities: the Buchenwald camp, near Weimar, and Neuengamme near Hamburg [53].

Speer knew only too well that any promise made in Hitler's Reich was valid only so long as Hitler did not utter an opposing opinion. Thus, Speer did not wait long to contact Hitler himself. Two days later he drove to Hitler's Headquarters. There, supported by Saur, Speer got Hitler to make a decision that turned all previous agreements topsy-turvy. His entourage consisted of representatives from the Army Ordnance Office, leaders of various main committees, and members of the Speer Ministry.[54] Also present were Gauleiter Sauckel, in charge of forced labor. They brought with them plans and statistics concerning the construction of self-propelled assault guns, as well as a new tank program. In fact, matters involving tank production were in the foreground of this discussion. In all forty-nine items were treated in three days (20-22 September 1942).[55]

Under point No. 36 of this session, it was tersely recorded that Speer had pointed out to the Fuehrer that it would not be possible to set up armaments manufactures in the concentration camps for lack of the necessary machine tools and the necessary buildings; whereas in the armaments industry both were available through the use of a second shift. Hitler agreed.[56]

In the long run, the SS industry failed not simply because of Speer's tactics to maintain control, but because of the inability of SS leaders to analyze industrial

processes and to translate their findings into organization. Hence, despite its huge power, the SS remained peripheral to armaments and wartime production.[57]

However, when the total war program was announced (1944), Reichsminister Joseph Goebbels became the new Reich Representative for Total War. Appointed as his second in command was State Secretary and SS Squad Commander Werner Naumann. Roughly four weeks to the day after Speer's memorandum for Total War, Gottlob Berger, head of SS headquarters, submitted a large-scale plan to Werner Naumann for organizing the work of the Reich Representative for Total War.

The offices of the New Order would include:

1. The Reich Minister for Armaments and War Production was to set up the production program.
2. The working groups and committees were to establish the machine capacity of the factories.
3. The general representative for labor was to construct the production structure of the factories.
4. The central registration office for all people in Germany who are able-bodied and subject to military service was to release the volunteers for the war front; it will receive its orders from the planning division of the Reich Representative for Total War.[58]

Examined more closely, point three meant that Speer would be deprived of responsibility for factory processes,

the most important factor in an armaments' industry.

Nevertheless, in the last year of the war throughout the vast circles of industry, the construction of mega-bunkers above ground and the renovation of reinforced tunnel facilities (Stollenanlagen) at ground level kept Speer's ministry occupied.[59] Owing to provisions of the Untertages-Verlagerung by 1944, plants were being constructed to manufacture the latest heavy equipment, such as the Messerschmitt factory at Construction Plant No. 1 in Augsburg, with assembly lines for the new Messerschmitt 163 (Me 163) jet fighters and the Messerschmitt 262 (Me 262) turbine fighters having a combined projected production rate of nine hundred units per month. In the same area of the German Alps and enclosed by a thick vertical block of concrete, were also installed the tools for repairing and refitting the aircraft, in the southern portion of the facility. In the center, a cement runway would permit the Me 163s, with their short runs, to take off. The Me 262s, with their longer runs and auxiliary rocket boosters, had to be transported until plans to lengthen the runway outside and protect it with a bombproof canopy were completed. The facilities were, in the main, free from Allied bomber attack and gave the new German aircraft some opportunity to delay the imminent Battle for Berlin.[60]

Therefore, beginning in the fall of 1944, the underground relocation of German industry, the rear

deployment of facilities from front areas, and the concentration of post-war planning efforts within the Armament Ministry and its agencies combined into a single focus. Earlier that summer, there had already been an increasing tendency of large companies and factories to request relocation to Bavaria and other areas of southern Germany. These plans were closely coupled with the separation of armament factories from previously private branches of industry, exemplified by relocation under technical guidance from the aircraft industry.[61]

The closer the war front came, the more branches of industry made demands for underground production facilities. Consortia like "Vineyard" functioned as a cover for industry's self-interest to survive beyond the end of the war. For the KZ-inmates though, it mattered little whether the planning was for armament production or the survival of industry as a whole. In either case, it cost tens of thousands of them their lives.

Coincidental with the last wave of relocations in January and February 1945 there was a fairly thorough "wiping the tracks clean" within German industry. As the front edged closer, the Reich made its last efforts in response to the scorched earth orders to remove all foreign workers, prisoners of war and KZ-inmates from the underground facilities. The question arises, though, at what point the leaders of industry closed the book on the

subject of KZ-inmate utilization and went over to a planning for the post-war period. Only the fewest of firms had the ability coolly to calculate the costs of clearing the forced labor camps, as was the case with Daimler-Benz who estimated their accumulated costs in excess of 10,000 RM.[62]

It was the rationality of purpose that kept the system intact. The industrial perspective that has been reviewed here in conjunction with the utilization of KZ-inmates in the armament production industry is one that is unique in the modern industrial community. Through the KZ-program heavy industry realized the particular advantages of cooperation with the SS and succeeded in fulfilling unbelievable production quotas made possible by the most meticulous large-scale planning of underground industry ever undertaken.

TECHNICAL ADVISERS AND TECHNOCRATS

IN THE CORRIDORS OF POWER

THE DIALECTIC BETWEEN SCIENCE AND TECHNOLOGY IN THE BUILDING OF AN AEROSPACE PROGRAM IN THE THIRD REICH

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
Dr. William Wright, Faculty Adviser

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XII. PEENEMUENDE AND THE DEVELOPMENT OF THE V-2

Amidst all of the revolutionary technologies developed under the Reich War Ministry, the saga of the A-4, later known as the V-2 rocket, stands out. The actual story of Hitler's involvement with the rocket program at the small Baltic site called Peenemuende and the building of the V-1 and V-2 is more of a historic error in the annals of Western scholars than it is a scientific fact. Nobody, except some of the rocket experts and Hitler's closest advisers, knew that Hitler wasn't even interested in the rocket aspirations of his own scientists.

Hitler looked at rocket development, just once, in March of 1939 at Kummersdorf.[1] Wernher von Braun showed him diagrams and drawings, and Colonel Walter Dornberger gave a report on the situation. Hitler was then taken out to the test range to observe some rocket launchings. After Dr. von Braun gave a technical lecture, several prototype V-2s (originally called the A-3) rockets were fired. Much to the surprise of the researchers, Hitler said nothing during the explanation. They knew that when he was shown a new gun or new tank, he spent numerous hours asking questions about every smallest detail. At Kummersdorf, however, he watched the firings without speaking a word.

According to von Braun the firings created enormous and terrifying noise: "People who see--and especially

hear--a large rocket motor for the first time usually turn white and cry 'Stop!'[2] Only they cannot make themselves heard. Most bubble over with enthusiasm as soon as their ears have adjusted to the relative silence again." Nobody fails to be profoundly impressed, but Hitler stood and stared and did not say a word.

Only later, at lunch, he uttered one sentence on the firing tests: "Es war doch gewaltig."[3] Perhaps Hitler bestowed such tepid praise because of his previous experience with the rocket pioneer Max Valier. Hitler, in his Munich period, had known Valier quite well. Hitler called him a dreamer and apparently he thought the same of the Kummersdorf group.

Regardless of Hitler's lack of enthusiasm, the original rocket team from Kummersdorf, located fifteen miles south of Berlin, eventually moved to large test facilities in the Baltic. The first rockets tested were relatively small, with engines that produced about six hundred pounds of thrust. When they performed well, the Germans had the confidence to make the quantum leap to the V-2 (A-4), but Kummersdorf was too small a place to build such a big rocket. The roar and vibrations would have disturbed the suburban peace.

The predecessors of the V-2 were the smaller A-3s, which were launched from a test platform on an island in the Baltic. During one test in 1936, a storm trapped von

Braun, Arthur Rudolph and Army Colonel Walter Dornberger on the island for several days, "which gave us time to talk and think," Rudolph recalls.[4] Dornberger had tolerated a lot of fanciful discussion about space flight from his two top brains. Now it was time to remember who was paying the bills, and get serious about making a weapon. Dornberger said he wanted to build a pilot production plant for the next stage of development, the V-2 (A-4), and he wanted Rudolph to do it at Peenemuende.

Rudolph remembers:

> Both von Braun and I almost fell out of our chairs, Dornberger wanted that pilot production plant, for the A-4 [V-2] at Peenemuende and he wanted Rudolph to do it which was pretty courageous with the A-4 just an outline drawing and the rest more or less in our minds. We argued with him and argued with him. "Leave the production to industry! We are development fellows; let us stick to that!" He said, "Rudolph, you are going to build that plant! And you will make it big enough not only for the A-4, but for the next big missile, which will have 100 tons of thrust! So I was told to build a factory for weapons."[5]

The army was not the only agency interested in the missile program in 1936. The Luftwaffe, Hitler's rapidly developing military machine, wanted to participate in the contracts for rocket development. Dornberger had introduced the technology to General Werner von Fritsch (then Supreme Commander of the German Army) and to General Albert Kesselring (then Planning Chief of the Luftwaffe) and

explained the existing condition and future possibilities with such convincing vigor and enthusiasm that his proposals were easily approved. The Air Force thought rockets placed in airplanes would make fighters go faster and lift bombers with extremely heavy loads off the ground.

After von Braun got the Army and the Air Force into a bidding war on the basis of 1935 launch successes, both services joined forces to build one of the world's first military-industrial complexes, the space city of Peenemuende.[6] A large area at Peenemuende, near Usedom on the Baltic, was selected. Three considerations were decisive in the choice of the site for rocket development work. It was secluded, yet accessible; it had favorable weather conditions; and it was satisfactory for land and sea communications.[7]

In the early planning for the experimental establishment, it was recognized that the rocket development was of tremendous importance and had far reaching application in two fields of military endeavor, artillery and aeronautics.[8] It was therefore decided to build two separate establishments at Peenemuende, one for the Army and one for the Air Force. At Peenemuende East, headed by Dr. von Braun, the Army would set up facilities for the construction and testing of large liquid-fueled ballistic rockets, including their controls, drives and

appurtenances. At Peenemuende West, the Air Force would construct a center for testing rocket-propelled aircraft in both the manned and unmanned categories. Shops and hangars would be erected at the field for handling the planes and their equipment. The close relationship between these two stations, with the missile and aeronautical developments side-by-side, would account for the great success of the entire establishment.[9]

The necessary developmental facilities were erected quickly at Peenemuende and were eventually to cost over 300 million gold Reichsmarks. The facilities included supersonic wind tunnels, work shops, electronic laboratories and rocket test stands. Peenemuende had a Fertigungshalle which was the largest hanger in the world at that time. It was more than two hundred and fifty yards long and nearly as wide. Its center was an elliptical enclosure surrounded by a high sloping, earthen wall, not unlike an American football stadium or Roman amphitheater. At one focus of the ellipse was a large circular flame deflector, installed in a wide concrete-lined pit. A missile to be tested was first placed in a moveable structure which was then rolled into the arena and positioned over the pit. The missile's pneumatic instruments and power lines were then attached to the matching permanent connections at the pit's edge. Finally, the missile was tanked, checked, and fired.

As the first space city complex, Peenemuende had grown, but not without grief. The acute attack of generosity from the German Army had not lasted very long. At the beginning of 1940, some 550 million Reichsmarks ($13.75 million equivalent in U.S. dollars) had been expended on Peenemuende in its first two years of operation. Not quite a year later, after France surrendered in June 1940, Hitler ordered that Peenemuende be stricken from the priority list. The budget for 1940 to 1941 was set at 50.4 million Reichsmarks ($12,000,000) and then halved.[10]

Colonel Dornberger went to Berlin on petitioning expeditions, as he called them later. Of course nobody could countermand an order from Hitler, who was Commander-in-Chief, but Field Marshall Walter von Brauchitsch could issue a few orders of his own: he ordered four thousand soldiers (mostly trained artisans and specialists) to the area of Peenemuende, classifying them as being on front-line duty so they could not be removed by anybody lower in rank than a Field Marshall.[11]

Manpower was not the only problem of resource at Peenemuende. In March 1941, the steel allotment to Peenemuende was reduced. By July, the installation was not even on the list of military facilities with any priority for national resources. In August, high priority was unexpectedly restored and, in October, it was just as

unexpectedly removed. Such an oscillation in funding by the military played havoc with contract negotiations in an organization that greatly depended on the support of industry.[See Appendix I.][12]

In 1942, the Reich War Ministry could not allot to Peenemuende the necessary quantities of materials which were under the jurisdiction of Albert Speer's Munitions Ministry. Dornberger went directly to Speer's Ministry, and he even succeeded in personally seeing Speer. Speer regretted that Hitler was not convinced of the value of aerospace weapons, but Speer would do something for Dornberger. He recommended a man who had made a name for himself as a very successful expediter in the field of production. This was a man who could help Dornberger and he was available. Who was he? SS officer Dr. Gerhardt Degenkolb, Chairman of the Locomotive Special Committee who, by 1943, had succeeded in increasing the yearly production of locomotives from 1,918 in 1941 to 5,243.

Almost simultaneously in February 1942, the Fieseler Aircraft Company set up a demonstration of the Argus pulse-jet engine [13] at the Argus-Moteren Gesellschaft in Berlin for representatives of the Air Ministry. In attendance was a young aeronautical engineer, Robert Lusser, who was transferring from the Heinkel Aircraft Company to the Fieseler Aircraft Company. The demonstration of the extremely noisy and heavily vibrating missile engine

impressed all viewers with its simplicity, and therefore, ease of manufacture, but alarmed most with the obvious problems of harnessing the beast to a plane.[14] That afternoon, at a meeting in the Air Ministry in Berlin, Lusser was asked if he thought he could use the power plant in a design of a flying bomb which would use an existing autopilot [15] and be launched by a catapult. Lusser promised to give it a lot of thought and departed for Kassel.

While on the train, Lusser kept revolving the problem over in his mind, especially how to mount a heavily vibrating, red hot, pulse jet engine to an airframe. After many preliminary sketches, he hit upon what appeared to be the most promising configuration. With few changes his configuration became the Flak Ziel Geraet 76 (FZG 76), later known as the V-1 or buzz bomb. With the engine mounted above the fuselage, the combustion air could enter the engine freely, the tube could be cooled and the vibrations could be isolated through shock mounting from the fuselage. This left the fuselage free to carry the warhead, the autopilot, and the fuel tank.[16] During the next five weeks the Fieseler Company put a number of good designers under Lusser's direction to work up a complete design and soon Lusser was able to report to the Air Ministry that the flying bomb could be built and quickly despatched.

On the night of 28 March 1942, the city of Luebeck was laid in ashes by a thousand British bombers and the urgency of this new vengeance weapon was great indeed. The following morning, Lusser was summoned to Berlin for a briefing of the top officials in the Air Ministry on the status of the flying bomb project.

On 19 June 1942, Lusser briefed the Chief of the Air Ministry, General Field Marshall Erhard Milch. After an hour's display of drawings and discussions covering the technical details and the range and accuracy, Marshall Milch placed Lusser in charge of the project. The project was called Projekt Erfurt-Kirschkern (Cherrystone) because the missile was to be launched from a pneumatic catapult like a small stone.[17]

In September 1942 the first V-1 dummy missile known as the Fieseler 103 (Fi 103) was launched from Peenemuende West.[18] Lusser did not feel that the missile was yet ready for production, but nonetheless plans were being made at Peenemuende for future production.[19]

While Lusser's V-1 was getting underway, von Braun's V-2 continued to develop problems in technical design. It became apparent that the V-2 missile as envisioned could not function properly at the speeds and maneuvers required. The propellants would tend to gather around the sides of their tanks during the "high G" turns instead of flowing into the motor. To inspire designers, Dornberger

offered a prize of 1,000 Reichsmarks ($250) for the one who solved the problem. It went to engineer Walter Dahm, who devised an interior funnel-like feed system that ensured the propellants would find their way to the motor under any conditions of flight. Dahm, however, never collected his prize because there was little he could buy with it.[20]

Like the V-1, Dornberger, Degenkolb and others began thinking of the V-2 in terms of mass production. However, the missile still remained very much in the research and development stage and did not enjoy the top priority rating that Speer and Dornberger knew was indispensable. Following a meeting with Hitler on 8 January 1943, Speer had to report to his colleagues at Peenemuende that "the Fuehrer cannot give your project higher priority yet. He is still not convinced that your plan will succeed."[21]

In February 1943 something else happened that was important for the rocket development industry. Dornberger was asked to go to the Munitions Ministry to see Professor Karl Maria Hettlage, chief of its financial department. There he was told that Peenemuende was to be converted into a private stock company. After all, it would soon produce something and should therefore be converted into an industrial establishment under the management of a large industrial firm, with the state temporarily owning all the shares.

When Dornberger objected, a Mr. Mackels, the Stettin

representative of the Munitions Ministry, started to make charges of poor management and other accusations. Dornberger remained firm and eventually triumphed, though he had to put up with a few visits to Peenemuende by men who openly stated that they came to see whether anything was wrong. The NSDAP's Technical Office, hiding behind industrial firms, was also determined to take the establishment away from the Army.[22]

In March 1943 the big bunker at Atten was under construction, and Speer, prodded by Dornberger, promised to see Hitler once more about the long-range rockets. The result was negative for a reason nobody could have foreseen. A few days later Dornberger was informed: "The Fuhrer has dreamed that no V-2 will ever reach England."[23]

On 26 May 1943, the new era for the V-2 began. Ironically, it was the day when the top brass of the Army Commission for Long-Range Weapons came to evaluate the V-1. Before the Commission started debating over the V-1, they enjoyed a different and spectacular demonstration. On this unusually clear day, two V-2s thundered into the deep blue sky over the Baltic, each ranging about one hundred sixty miles. The Commission as a whole decided to recommend the development and production of both weapons and to recommend also that they should be used in conjunction.

Two days later Speer called Peenemuende, asking for

the now General Walter Dornberger in order to set up a meeting with the Fuehrer. The audience with Hitler took place on 7 July 1943, at his headquarters in Rastenburg, East Prussia. During the course of the meeting on 7 July 1943, Hitler saw for the first time the films of the 12 October 1942 V-2 test flight and his imagination was kindled. Here was an exciting new weapon that could retaliate against the devastating bombing of German cities.[24] Without the benefit of anything approaching an operations research study on the probable effectiveness of the device, and without a realistic estimate of when it could be ready and in what quantities, the supreme warlord of Germany made one of his many essentially capricious decisions. The V-2 was to be put on the assembly line immediately. However, a stroke of the Fuehrer's pen could not compensate for years of irretrievably lost time. Final V-2 production drawings were not ready, nor could they be, for the missile had struggled along hampered by shortages of manpower and materials. And now, suddenly and unexpectedly, Hitler was beginning to pin exaggerated hopes on a problem-plagued, untried weapon.[25]

On 25 July 1943, Hitler signed an edict prepared by Speer:

> The greatest output of A-4 [V-2] missiles is to be attained as swiftly as possible.... The German plants that manufacture the A-4 missile, as well as those supplying the component parts, must instantly be supplied with skilled German

workers.... The Reich Minister for Armaments and Munitions is to direct the A-4 program.[26]

Although Dr. Gerhardt Degenkolb, director and overseer of the V-2 (A-4) schedules, had clearly announced his ambitious production goal for the V-2, engineers at Peenemuende were not able to deliver a production-ready design to him. In response to pressure from his superiors and the SS in 1943, Degenkolb, Speer's assistant in charge of the V-2 program, was anxious to begin mass production of the V-2 immediately. Recent successful tests at Peenemuende had been mistakenly interpreted as a sign that the rocket was ready for production. Each rocket was still being hand-crafted and the missile's design required further refinement. Despite Dornberger's efforts to point this out, in July 1943 three facilities were ordered to prepare for production of the V-2.[27]

The proposed factories were: Peenemuende, the Zepplin Werke in Friederichshafen, and the Rax-Werke in Wiener-Neustadt. Degenkolb set a production goal of 900 rockets per month from the three factories. Karl Otto Saur, chief of armament production and development in the Ruestungskontor, insisted that 2,000 missiles be produced each month. The official target figure was finally set at 1,800 missiles per month and planning proceeded accordingly.[28]

Very high monthly rates of production were also

planned for the V-1 and the Volkswagenwerk was picked by the Air Ministry to handle the job. A mass production line was quickly set up and by September 1943 the first one hundred missiles arrived at Peenemuende and were fired in rapid succession.[29] All failed as the fuselages broke apart, the wings fell off and fins broke away shortly after launching.

After heart-breaking months of investigation, it was found that the wing angles differed a few degrees after a controlled deceleration of twenty G's on a test track.[30] In searching for the cause, it was found that the Volkswagenwerk had run out of the steel specified for the wing ribs and had substituted sheet steel just twenty percent thinner.[31] This was enough to cause buckling and consequent misalignment of the wings under catapulting.

After this discovery, a large conference, presided over by Marshall Milch and Hermann Goering, decided to scrap all 750 Volkswagenwerk V-1 missiles and start an entirely new production line.[32] Three months later, in February 1944, mass production based on new drawings started again and this time with excellent results. The missiles flew well and a 75 percent over-all reliability was eventually achieved.

Gigantic Peenemuende was much too big to hide; for several years, intelligence reports hinted that secret weapons were being built and tested there, but it was not

until the spring of 1943 that V-1s and V-2s began to show up on aerial reconnaissance photographs.[33] On the night of 17 August 1943, the air raid sirens at Peenemuende sounded. This time the target was not Berlin or some other major city; the British Royal Air Force (RAF) intended to disrupt the activities at Peenemuende.

One of the principal targets of the raid on Peenemuende was the settlement area where most of the key personnel lived. The British Pathfinder aircraft was slightly off-target, so the heaviest bombing occurred instead in the Trassenheide foreign prisoners camp. Overall, damage throughout the installation was heavy, but many critical facilities such as the supersonic wind tunnel, the measurements laboratory, and the liquid oxygen plant were undamaged. Dr. Walther Thiel and Chief Engineer Helmut Walther were dead, along with 732 others. More than 550 of the casualties were foreign prisoners, who were locked in their barracks to prevent their escape during the raid.[34]

Recovery from the raid was surprisingly swift. Within six weeks, work resumed at the research station. Ruins of many demolished buildings were allowed to stand and subsequent construction was carefully camouflaged, giving the illusion that Peenemuende was abandoned. This ruse was successful for about nine months, during which time the facility worked unmolested, but because of the bombings in

August 1943, plans for mass production or even pilot production at Peenemuende were abandoned. At Hitler's behest, Himmler gave the order that production at Peenemuende was to be considered a temporary expedient only, until production could be resumed in factories safe from air attack.[35]

In spite of the air raids, the remaining equipment permitted a small yet effective tactical research group to continue their work. Maintaining the site had the additional advantage of holding the Allies attention while the actual production work was carried on elsewhere.

Although neglected at the start of the war, by 1943 the V-1 and V-2 had become the most important secret weapons in the face of the two-fronted war. Moreover, the V-2 was destined to become the prototype of all man-made vehicles to enter the space frontier; its development initiated modern, push-button rocket warfare. And until the work of men like von Braun, the world had never seen anything like this massive forty-six-foot rocket that carried a one-ton warhead and flew at supersonic speeds, so fast that it was silent.[36]

XIII. MITTELWERK AND THE DEPLOYMENT OF THE V-WEAPONS

Peenemuende was not the only proposed V-2 assembly plant to be attacked by the Allies. Friederichshafen and Wiener-Neustadt were also heavily bombed during August 1943. These raids showed the vulnerability of surface installations to air attack, so Hitler decided to disperse V-2 production to a third facility which would be underground. He directed Degenkolb to find a site for the plant.[1] During the search for an underground missile factory, Degenkolb found a ready-made area in the Harz mountains next to the village of Niedersachenwerfen near Nordhausen in central Germany.

In 1935, the War Productions Commission of the Reich Ministry of Commerce had been given the job of locating sources of strategic raw materials and of establishing a centralized fuel and chemical depot safe from bomber attack. An economic research organization known as the Wirtschaftliche Forschungsgesellschaft--Wifo for short, had been charged with the responsibility of locating the depot.[2]

In the summer of 1935, at the suggestion of I.G. Farben, Wifo management had selected the Kohnstein tunnels. The site, originally consisting of two parallel tunnels through a mountain, was expanded with forty-seven cross galleries in 1936. During the early part of the war, the

tunnels served as storage depots for oil, gasoline, and chemicals. In 1943, Degenkolb selected the Kohnstein tunnels to be converted to the production and assembly facility for the V-2.[3]

The establishment of the V-2 factory provided an opportunity for both the SS and the Ministry of Munitions to assume greater control over the missile program. A state-owned corporation, Mittelwerk, was formed to manufacture V-2s.[4] September 1943 saw the appointment of SS Brigadefuehrer Hans Kammler to oversee the construction of Mittelwerk. Kammler, who was originally trained as an architect and had once supervised construction projects for the Luftwaffe, was already well known within the Nazi hierarchy for his involvement in the design and construction of the concentration camps. Speer described him as a "cold, ruthless schemer, a fanatic in the pursuit of a goal."[5] Appointing Kammler to this position created a new layer of bureaucracy in the V-2 organization, a layer controlled by the SS.

Instead of eighteen thousand missiles for the first year's production, a contract for a total of eleven thousand missiles or approximately nine hundred per month was awarded to Mittelwerk on 19 October 1943. This figure was finally dropped to only six thousand missiles for the first year. The total value of the contract was 400 million Reichsmarks with a unit price (subject to adjustment by

Mittelwerk) of 40,000 Reichsmarks.[6]

In addition to the basic cost of the V-2, the missile budget called for a tooling and equipment investment of 11.5 million Reichsmarks ($ 2.75 million USD) a high percentage of which was subject to equipment depreciation.[7]

About a month after the contract was awarded to Mittelwerk, the board of directors submitted the delivery price for the V-2 to the Ruestungskontor (Ruk). The price for the missiles had risen considerably: the first thousand produced would cost 100,000 Reichsmarks each, after which the unit price decreased in increments of 10,000 Reichsmarks for every thousand V-2s produced until it reached 50,000 Reichsmarks per missile.[8]

The contract awarded to Mittelwerk seemed more for the purpose of corporate profit than to accomplish a wartime victory. As before mentioned, Professor Karl Maria Hettlage of the Munitions Ministry had suggested to Dornberger that Peenemuende should become a private stock company. Though his plan was defeated, it was not unexpected that Hettlage should take an early role in establishing the Mittelwerk Corporation somewhat along the lines he had earlier outlined for Peenemuende. In 1943, a planning meeting was held in Berlin to determine how best to finance the Mittelwerk organization. The conclusion of the meeting was that Mittelwerk was to operate on funds supplied from

Hettlage's Ruestungskontor G.m.b.H, Amt fuer Wirtschaft und Finanzen Munitionsministerium, a sort of war production fund.[9]

The following month, Hettlage prepared a memo on behalf of Speer advising Degenkolb, Dornberger, Saur, and Kammler, as well as representative Hermann Bucher of the Allgemeine Elektrizitaetsgesellschaft and Director Wehling of Wifo (Wirtschaftliche Forschungsgesellschaft) that an organizational, economic, and financial meeting for "Project Mittelwerk" would take place on Tuesday, 21 September 1943. Minister Speer was to be briefed afterwards on its results.[10]

The new "Mittelwerk Corporation" headquarters was to be in Berlin. A branch of the Ruk selected a board of directors for Mittelwerk consisting of Dr. Ing. Kurt Kettler, SS Sturmbannfuehrer Otto Forschner, and Otto Bersch. A fund of 10 million Reichsmarks was placed at their disposal to establish the factory. (This later proved insufficient, so a fund for an additional 50 million Reichsmarks was established by the German Trust Company for War Industries to be drawn from this fund at the interest rate of 3.25 percent.)[11]

A personnel director was to be assigned to the Mittelwerk Corporation by General Hans Kammler of the SS to function in close concert with the commandant of the local Dora (labor) camp. In addition, a small council would be

established under the chairmanship of Degenkolb. Its other members were to be Hettlage, Dornberger, Kammler, and Schmidt-Lossberg. A memo also noted that Wifo would be charged with providing the missile manufacturing plant, and that the Mittelwerk Corporation would rent the facility from them. Government-furnished machinery would be used. Contracts would be awarded by the army; the prime contractor would be Mittelwerk according to Kettler.[12]

The initial layout of Mittelwerk was based on the earlier production target of 1,800 missiles per month, so after the contract was awarded, space within the tunnels was reallocated. Cross tunnels No. 20 through No.47 and the adjacent main tunnels were assigned to Mittelwerk specifically for V-1 and V-2 production. The remaining space was used for manufacturing Junkers aircraft engines.

Orders for component parts were placed with German industry in the late fall of 1943. To avoid bottlenecks caused by Allied bombing, the Speer Ministry directed that war production be dispersed throughout the Reich and that a minimum of two firms be contracted to supply each component. One notable exception to the latter policy was the construction of the steam turbine. The Ernst Heinkel Company in Jenbach, Tirol, was the only firm that could meet the specifications for that assembly.[13]

Armed with coveted top priority (coded "DE"), the blessing of Hitler, and the favor of Speer, V-2 component

production was initiated in companies all across the spectrum of the German armaments industry. Almost immediately, there was reaction from production directors whose programs were being adversely affected by the rising star of Peenemuende. Plants turning out vital components for aircraft and tanks soon found part of their manpower and materials being diverted.

The Air Ministry, and particularly its armaments chief Field Marshall Erhard Milch, became alarmed not only at the effect the V-2 was having on the production of night-fighters (which could counter massive British bomber attacks against German cities), but also on the production of the much simpler and cheaper V-1 flying buzz-bomb which required only a fraction of the labor and materials consumed by its big brother. Speer himself soon became convinced that, important as the V-2 was, it should not be allowed to interfere with the program for aircraft production.[14] However, in accordance with agreements later reached between the Army War Office, the Peenemuende establishment, Degenkolb's Special V-2 Committee, the SS, and others, Mittelwerk would control all component production and assembly contracts throughout the country.[15]

The first four missiles built by the Mittelwerk rolled off the assembly line on New Year's Eve 1943, and another fifty rockets were completed in the first months of 1944.

The completed rockets were brought to a cross-tunnel which had a fifty-foot ceiling for vertical tests. Upon completion of these tests, the rockets were lowered to a horizontal position and placed on rail cars for shipment. When production began at Mittelwerk, it took fifteen thousand man-hours to build each rocket. This figure was cut nearly in half to eight thousand man-hours when the factory began operating at full capacity.

Degenkolb began to suffer from a tremendous inferiority complex: he had earlier achieved a production quota of four hundred locomotives a month, so if anyone could reach the goal of six thousand missiles for the first year he was thought to be the man. To Detmar Stahlknecht, special commissioner in the Munitions Ministry and a member of Degenkolb's new committee, the six thousand missile-goal was too ambitious, and in February 1943 he had already offered a scaled-down program calling for only 5,150 V-2 rockets. Starting with an output of five in April 1943, he looked forward to a maximum monthly production of six hundred missiles for the month of September 1944.[16]

Stahlknecht's plans did not suit the ambitions of Degenkolb, who in April, with Munitions Ministry blessings, set his sights on monthly outputs rising from six hundred fifty missiles in October 1943 to nine hundred in November and then a peak of nine hundred fifty in December.[17]

In the first quarter of 1944, solutions to all the

difficulties began to manifest themselves, but General Dornberger objected strenuously to the use of the V-2 in combat until it was carefully perfected. Yet, Hitler required the employment of a sensationally new weapon to buoy the hopes and bury the fears of the homeland and to strike new terror in the hearts of the enemy.

Dr. Georg J. Rickhey became general manager of Mittelwerk in April 1944. In this capacity he was superior to the previously appointed board of directors and reported directly to Professor Karl Hettlage. Hettlage, head of the Ruestungskontor, bore sole responsibility for the Mittelwerk project in the financial and organizational planning section of the Ruk.[18]

Monthly output climbed steadily throughout 1944. Production was slowed for two months in the summer of 1944 until several problems with the missile's design (discovered during test firing in Poland) were corrected. According to the calculations from the Central Works the following V-2 missiles were produced at Mittelwerk in the first seven months of 1944:[19]

January	50
February	86
March	170
April	253
May	437
June	132
July	76

Any delays, such as those in June and July, were immediately seized upon by SS Reichsfuehrer Himmler to gain

increasing control over the V-2 development. Knowing that Degenkolb would inevitably face a severe labor shortage in attempting to manufacture nearly a thousand missiles a month, the Reichsfuehrer proposed assigning massive numbers of prisoners and technicians who were under SS control for this gigantic task.[20] Himmler's plan to takeover worked. Himmler soon demanded that his SS forces take over the entire V-2 production and send researchers like von Braun back to their laboratories.

After 20 July 1944, the total responsibility for the production of the weapon and its employment was placed in the hands of the SS. General Dornberger became a technical advisor to the SS and was permitted to continue in command of the developmental groups at Peenemuende.

Himmler played out the triumph of the V-2 project to the hilt in a memorandum to Speer:

> This time, I require a first-class staff of engineers, who will be responsible to both of us for the strict execution of the Fuehrer's orders. On my side, I have assigned Kammler, one of my most capable SS commanders. I ask you [Speer] to reflect on whom you wish to place at his side. I would agree to Degenkolb. For the SS and myself, it is an obligation to translate the Fuehrer's will into action. I gave him my promise and I keep my promises! I expect that you will contribute your share to the solution.[21]

According to Himmler, Hitler had placed his hand on Himmler's shoulder when saying good-bye and had

emphasized:

> I am relying particularly on you and your energy. You are my guarantee for a punctual, precise implementation of my orders.[22]

What Hitler did establish was that all measures were to be taken in tandem by the SS Reichsfuehrer and the Minister of Armaments. However, Himmler categorically established that he would take sole responsibility for carrying out the Fuehrer's assignment. Himmler continued:

> Today, I have discussed the entire assignment with my men and I am convinced that we can absolutely carry out the promise to deliver five thousand A-4s [V-2s] in the shortest possible time.[23]

It turned out that Himmler's "shortest possible time" was to stretch out to eighteen months. The five thousand V-2s were not completed until January 1945 even using SS deployment teams.[24]

Since Germany had no reserves of manpower, Speer's hands were tied without an available labor force. SS Brigadefuehrer Hans Kammler took responsibility for this industrial incapacity. Like Speer, Kammler was an architect whose fortunes rose with the coming of The Third Reich. Speer could see that Kammler was being put in place by the SS to succeed him.[25]

Himmler and the SS's method for acquiring power was

attractive for its simplicity: the SS intervened wherever there was a gap where it could either offer assistance or remedy a defect. And indeed, Himmler succeeded with his decisive stroke against Speer's previously unchallenged authority by the circuitous route of developing and manufacturing the new rocket.

Kammler, who made an extremely fresh and energetic impression, began by taking over relatively small tasks of the V-2 production within the overall armament area. Next, he assumed responsibility for rocket launchings, which were actually a military task. He acquired charge of the production of all special weapons based on rockets; and, at the close of the war, he also received responsibility for manufacturing all jet airplanes. In the last days of the war, Hitler put Dr. Kammler in charge of all air armaments. Thus, just a few weeks before the end of the war, Kammler became Commissioner General for all important weapons.[26]

Speer continued to lose ground to the SS. On 12 May 1944, after several months of illness, Speer tried to reduce the influence of the SS on his offices. At this time, Speer had recently reconciled with Hitler, and his new, stronger position allowed him to act tougher with Himmler.[27] He attempted to rearrange the distribution of assignments in the V-2 program. The final outcome was that the development and testing of the V-2 was returned to the

Supreme Command of the Army, namely the Army Ordnance Office, under General Dornberger's aegis.[28] The special V-2 committee of Speer's ministry, chaired by Degenkolb, set up the production program; it secured the technical requirements of production requirements and provided for the punctual allocation of machines, components, and materials. In contrast to Himmler's unauthorized control, manufacturing was placed under the management of the Zentrale Planung, which reported to the management provided by the organizations of industrial self-responsibility, which was, in turn, responsible to Director Georg Rickhey.[29]

Nevertheless, attempts by Speer to reduce the power of the SS leaders over the entire manufacturing process failed. After the 20 July 1944 attempt on Hitler's life by a well-organized seditious movement, Himmler succeeded General Otto Fromm as Commander-in-Chief of the Reserve Army and Head of Army Armaments. On 6 August 1944, Himmler was able to put Kammler in charge of all preparations for achieving the employability of the V-2. "You are responsible only to me as well as to SS Obergruppenfuehrer Juettner [Chief of Staff of the Commander-in-Chief of the Reserve Army and Chief of Staff of army armaments]."[30]

In his new wealth of power, Himmler did not even consider it necessary to bother maintaining protocol by sending Speer a copy of the new order of control. The

political game was far from over. On 28 September 1944, Himmler got Hitler to approve the Knight's Cross for Dornberger and two of his colleagues in the V-2 project, Walter Riedel and Heinz Kunze. Haughty and disdainfully, Himmler added in a wire to Speer: "I think it would be best if the formal suggestions were handed in by you."[31] Speer wrote, "I let Himmler wait six weeks for my answer: So far, the following have been suggested for the V-2: Herr Georg Rickhey [director of the Central Works] and Herr Kunze, plus, from the area of the head of army armaments, General Dornberger and Dr. Thiel, one of the designers (who died in action)."[32] However, Speer's suggestions were ignored.

On 31 December 1944, Himmler no longer considered it necessary to reach an agreement with Speer's agencies on his delineation of the work areas at Mittelwerk and other responsibility in the production-area of the V-2 program. The distribution list for distribution of the official order did not even include Speer's ministry. The order was only to be sent to Speer "by way of a postscript." This seemingly insignificant detail is more important for understanding the decree than its long-winded content. An obvious insult when translated from officialese, it meant that Speer was not to deal with the matter. Further decrees from Himmler and Kammler reinforced the total takeover of the V-2 production by the SS.[33]

In spite of the political turmoil surrounding the factory at Mittelwerk, large-scale production increased from August 1944 and continued until March 1945: [34]

August '44	374
September	629
October	628
November	662
December	613
January '45	690
February	617
March	540

For the year of 1944, a total of 4,110 V-2 missiles were produced. For the three months of 1945, the total was 1,847 units before the plant closed on 31 March 1945.[35]

However, as the Russians advanced from the east and the Western Allies advanced from the west, many German factories were occupied and parts for the V-2 came into short supply. The Allied bombing offensive did its share to erode Germany's arms manufacturing capability, and, owing to the loss of industrial capacity, a plan was implemented to eliminate all subcontractors for V-2 components and to fabricate the missiles completely at Mittelwerk. To accommodate the increased fabrication of components, work was underway to build second floors in some of the tunnels even when the war ended.

In contrast to the subcontractor's efforts in production, the V-2 launch program was never seriously hampered by Allied bombing. The Germans always kept one step ahead by establishing new launch-sites more quickly

than old ones were knocked out.

The V-1s were manufactured at Mittelwerk and produced approximately 960 missiles per day. The Germans hoped each crew would launch one V-1 each twenty-six minutes; the best the crew could do was one missile every one and one-half hours. From multiple sites, an average of one hundred V-1s were launched every day from 13 June to the beginning of September 1944.[36] The highest rate launched from one site in a single night was eighteen missiles, though the Germans believed that over an extended period no more than fifteen missiles per site could be counted on. [37]

Postwar analysis leads to the conclusion that the Germans spent more on rockets and guided missiles during the war than on any other type of ordnance. As for their importance, War Production Minister Albert Speer, in an interview on 21 May 1945, noted that the V-2 especially was "protected with particular love by the Army Armament Office, and it was in contrast to all other items that the army got a special quota in order that nothing could happen to it."[38]

It is estimated that the German missile program cost in the neighborhood of three billion war-time American dollars, and that 25,000 V-1s and V-2s were successfully launched, for an average cost of 120,000 American dollars per launch.[39] Each of these missiles carried an average of about one ton of explosives. Assuming all 25,000

V-weapons struck at or near their targets, only some 25,000 tons of explosives would have been delivered. By way of comparison, the Allies dropped more than 36,000 tons of bombs on V-weapon launching-sites alone from December 1943 to D-Day (6 June 1944). Also, the German three billion dollar V-weapon effort was more costly than the United States two billion dollar Manhattan program that produced the atomic bomb.[40]

Opinion differs among Germans as to the worthiness of the V-1 and the V-2 programs. Hitler once said that missiles spared his men and his planes. He even suggested that fuel would be conserved as there was no need for the return trip to Germany. Speer, in his May 1945 interview, had modified his positive opinion of the rockets and claimed that:

> From the point of view that in their technical production the rockets were a very expensive affair for us, and their effect compared to the cost of their output was negligible. In consequence, we had no particular interest in developing the affair on a bigger scale. In this case, the person who kept urging it was Himmler. He gave Obergruppenfuehrer Kammler the task of firing off these rockets over England. In Army circles they were too expensive; and in Air Force circles the opinion was the same, since for the equivalent of one rocket one could almost build a fighter. It is quite clear that it would have been much better for us if we had not gone in for this nonsense.[41]

General Dornberger, however, recorded that in mid-1943

Speer had confided his "...full confidence...in the success of the scheme [the V-2]." Moreover, Dornberger felt that the fighter program had moved along unhindered by the V-weapon program, "right up to the closing days of the war," Dornberger insisted. "We lacked not fighters but gasoline. Our vital artery, fuel, had run dry." [42]

On the cost issue, Dornberger stated that "every A-4 (V-2) in mass production cost thousands of marks less than a torpedo and less than a thirtieth of the price of a twin-engine bomber," and questioned "...how often, after 1941, could a German bomber fly to England before being shot down?"[43] Recognizing that it was idle to speculate on its possible effects on the war, he concluded that only one thing can be said with absolute certainty: the use of the V-2 may be aptly summed up in the two words "too late." According to Dornberger, "lack of foresight in high places and failure to understand the scientific background were to blame."[44]

This conclusion was echoed by General Georg Thomas, Chief of the Economic and Production Office of the German Armed Forces High Command from 1934 to 1943:

> The low priority allotted to the development of rockets... has without doubt caused the loss of much precious time, which in 1944 was evident in a most disturbing way.[45]

Nevertheless, in an interview in July 1945, he

admitted that "no one conscious of his responsibilities believed that this weapon would ever decide the outcome of the war."[46]

General Dwight D. Eisenhower, Supreme Commander of the Allied Expeditionary Forces, wrote in his book Crusade in Europe:

> It seemed likely that if the Germans had succeeded in perfecting and using these new weapons [V-1 and V-2] six months earlier than they did, our invasion of Europe would have proved exceedingly difficult, perhaps impossible. I feel sure that if they had succeeded in using these weapons over a six-month period, and particularly if they had made the Portsmouth-Southhampton areas one of their principal targets, "Operation Overlord" might have been written off.[47]

Churchill disagreed:

> This is an overstatement. The average error of both these weapons was over ten miles. Even if the Germans had been able to maintain a rate of fire of a hundred and twenty a day and if none whatever had been shot down, the effect would have been the equivalent of only two or three one-ton bombs to a square mile per week.[48]

Even amongst the German High Command there were questions about the V-2 weapons' effectiveness. In a conversation with the Fuehrer, General Alfred Jodl, head of the German Army, stated:

> I have one more thing to mention, that is to say, a report from an agent in Antwerp who claims

that on 17 December 1944 a V-2 hit the Rex movie theater during a very crowded performance. There were 1,100 casualties, including 700 soldiers.[49]

Hitler responded:

> Well, that would finally be the first real hit. But it is so much like a fairy tale that I, skeptical as I am, don't believe a word of it. Who is this agent? Is he getting paid by the men who launch the V-2s?[50]

Speer, looking back at events from the perspective of two and a half decades, hardly changed his mind. In his book Inside the Third Reich he wrote:

> The whole notion [of producing 900 V-2s a month] was absurd. The fleets of enemy bombers in 1944 were dropping an average of 3,000 tons of bombs a day over a span of several months. And Hitler wanted to retaliate with thirty rockets that would have carried twenty-four tons of explosives to England daily. That was equivalent to the bomb load of only twelve Flying Fortresses. "I not only went along with this decision on Hitler's part but also supported it. This was probably one of my most serious mistakes."[51]

In retrospect, Speer realized that Germany should have put all her efforts into attempting to defeat the strategic bombing offensive. Had this been the major objective, and had Germany pressed forward with its promising jet aircraft and the Wasserfall surface-to-air missile program, the war in Europe might well have lasted until the advent of the

atomic bomb.

Speer muses:

> To this day I think that [using] the Wasserfall in conjunction with jet fighters would have beaten back the Western Allies' air offensive against our industry from the spring of 1944 on....[52]
>
> Instead, gigantic effort and expense went into developing and manufacturing long-range rockets which proved to be, when they were at last ready for use in the autumn of 1944, an almost total failure. Our most expensive project was also our most foolish one. Those rockets, which were our pride and for a time my favorite armaments project, proved to be nothing but a mistaken investment. On top of that, they were one of the reasons we lost the defensive war in the air.[53]

These judgments may be too harsh, but one is always tempted to search for the alternative "ifs." What if the Wasserfall had been accorded the priority the V-2 received? What if other surface-to-surface missiles, jet fighters, and air-to-air missiles had been used earlier in the war? Would the war have lasted longer?

Suppose the efforts spent on the heavy installations had been devoted to strengthening the Atlantic Wall and building additional submarine pens? Suppose Mittelwerk had produced only jet fighter planes? Or synthetic oil? Or tanks? Speer himself said that if the estimated thirty thousand V-1s and six thousand V-2s had not been manufactured, 24,000 fighters could have been built instead (one fighter equaling five V-1s or one-third of a V-2).

Dornberger's simple statement that the V-weapons were too late to be effective during the Second World War against a vastly superior enemy is, in the final analysis, the best that can be concluded.[54] They, along with the United States atomic bomb, British radar, and jet planes developed by all these powers, were the crowning technical achievements of the epoch.[55] Not only did they change fundamental concepts of warfare but they laid the foundations for stunning scientific and technological achievements in the decades to come.[56]

XIV. THE LUFTWAFFE: AIRCRAFT AND MISSILE PRODUCTION

The apostles of German air power argued in the inter-war period to make the airplane the decisive weapon of the next war. However, the conflict that arose was quite different from what anyone, including the airmen, expected. It forced Germany to embark on a new era that pioneered not only propeller aircraft, but technologies such as the ramjet, the pulse jet, and supersonic missiles that were years ahead of their time.

From the beginning, the Air Force sought to play a large and important role in both defensive and offensive strategy for Germany. Lieutenant General Walter Wever (who died in 1936) established the initial bombing strategy for the Luftwaffe.[1] Wever believed that it was far more economical to destroy the enemy's weapons at their sources, that is, their factories, than on the battlefield. He therefore demanded a heavy four-engine bomber that had sufficient range to reach Russia's industrial heartland and beyond, even as far as the Ural Mountains, some 1,500 miles east of the Reich's nearest airfield. The result was named the Ural Bomber, and by 1936, two promising prototypes were ready for testing: the Junkers 89 and the Dornier 19.[2] Wever, not satisfied with their speed, instructed the German aircraft industry to develop additional bombers with greater horsepower. This accelerated experimental research and development in the first half of 1936.

After Wever's death, Goering appointed Lieutenant General Albert Kesselring to succeed him. He was the first in a series of Chiefs of the General Staff whom Goering used to counterbalance General Field Marshall Erhard Milch. Milch was one of Goering's top aides in economic and armament affairs, but Goering wanted someone like Kesselring to play an oppositionist role to ensure that Milch would not gain too much importance within The Third Reich; this was a tactic that was typical of the high command structure of the Reich. The only thing on which Kesselring and Milch could agree was that the four-engine bomber was too costly in raw materials and consumption of fuel to produce. Goering duly acted upon their recommendations and, on 29 April 1937, ordered the heavy bomber scrapped in favor of more fighter planes and two-engine bombers such as the Heinkel 111 and Junkers 88.[3] This would eventually force German air strategy to take on a combination of two divergent elements: first, strategic bombing and, second, large-scale aerial activity in support of ground troops.

Air power became dependent not only on all the strategic, logistic, economic, social, and manufacturing variables, but since it was governed by military operations it also became dependent on the politics of The Third Reich. More importantly it relied also on the governing role of the military-industrial establishment and the Four-

Year Plan which controlled the economic direction of the war industry. A major criterion of the Plan involved the need for a substantial supply of fuel for military ordnance. Goering, as head of the Luftwaffe and Plenipotentiary of the Four-Year Plan understood the need to exploit all possible reserves of fuel within Germany and its occupied countries. He also supported research into aviation and synthetic fuels through the Hermann Goering Aviation Research Institute, since he was well aware of the limits of the German reserves in fuel.[4]

Germany pioneered jet aviation and its scientists were able to design the first usable jet engines and the first jet-propelled aircraft during the war. Jets were developed that could use synthetic fuel instead of the jet-A grade fuel which was becoming scarce throughout Germany and its occupied territories.

The Hermann Goering Aviation Research Institute at Braunschweig brought together experts in the field of rocket fuels, developing liquid and solid propellants to increase rocket power and to fuel jets.[5] Although the Braunschweig Group developed technology that influenced all the solid and liquid propellant combinations for motors developed in Germany, they were not directly connected with any particular project, and participated only as consultants in the work done by other agencies.[6] Modest funding was available to them through the lower eschaelons

of the Institut fuer Motorenforschung.

The Braunschweig Group started work in rocketry as early as 1935, which was prior to the Four-Year Plan, but their research funds were limited. Nevertheless, their research initiated much of the solid and liquid propellant technology still in use today in the United States space program. The main group consisted of only Dr. Wolfgang Noeggerath, Otto Lutz, and Dr. Hans Haussmann. Dr. Haussman was a consultant and not actually a member of the Braunschweig Group, but consulted from the very beginning in all questions of physics and chemistry, and is to be credited with most of the basic ideas the group produced.[7]

The rockets tested in 1935 consumed too much propellant and usually exploded before lift off. As for the first of these deficiencies, a thermodynamic investigation soon revealed that almost all suitable propellants available by that date would give about the same performance.[8] Consequently, Haussmann suggested correcting the unreliability of the reaction in a combustion-chamber. He suggested two solutions for this problem: First, the group experimented with a simple mono-component propellant, termed by the group Monergol (that is, a single combustible liquid fuel source)[9] to eliminate the hazards of a mixture ratio that would use two or more ignitable sources.

The Monergol project was to develop a self-contained source of energy for a missile with a turbo-prop rather than jet propulsion. In this case, the goal of obtaining a high specific impulse at relatively low temperature is predominant. Thermodynamic studies had already shown that the total reaction products should have a low molecular weight.[10] The Braunschweig Group selected Divers Liquid for their first experiment. This is a solution of ammonium nitrate in ammonia. As a monopropellant, the hydrogen-nitrogen mixture generated by dissociation of the excess ammonia provides a considerable decrease in the effective molecular weight of the products of reaction.[11]

There were still technical difficulties because the ammonium-nitrate solution caused corrosion and clogged orifices. Unstable reactions were common because the ammonia evaporated out of the solution, leaving the remaining ammonium nitrate caked together into lumps which then decomposed explosively. Therefore, they soon abandoned this solution in favor of another Monergol compound of nitrous-oxide.[12] The specific impulses calculated for these two monopropellants were comparable in performance with the only other monopropellant available at that time, the 83 percent hydrogen-peroxide used by Professor Hellmuth Walter.[13]

The first fuel test installation at Braunschweig was primitive. It consisted mainly of a rather thin-walled,

water-cooled combustion-chamber into which the propellant was injected at the top by a spray nozzle. Most of the chamber was filled with a catalyst for promoting the decomposition of the excess ammonia.[14] For a catalyst, at first nickel screens were used, then iron screens, and finally Raschig rings soaked with iron and nickel nitrate. In order to control the reaction, a hand-operated spindle valve was flanged to the top of the combustion-chamber. In the laboratory, Noeggerath accomplished ignition by the use of a glow plug and a hydrogen pilot flame.[15]

In the beginning, the only safety measure taken was to put a flask containing the monopropellant in a separate concrete pit. The combustion chamber, however, was located directly in front of the operator.

Noeggerath recalls in his journal:

> The operator was I. You might get the idea that, at that time, I was a very young and unexperienced mechanical engineer who had blind confidence in the superior knowledge, and insight, of the chemist to whose group I was affiliated. Haussmann, a born optimist, had assured me that backfiring was out of the question. My confidence was shaken a little the day we ran our first test, because, after we finally accomplished ignition, there was a backfiring. The final blow to my confidence, however, occurred not until two years later, when we moved to another building. Then we found under the bench on which we had done all our brazing and welding jobs a wooden crate containing three pounds of gun cotton.[16]
> Well, this first backfiring was not serious because, fortunately enough, it was stopped at the needle valve, and since I had opened this valve

> only a little, the connecting line to the combustion-chamber was filled with low pressure gas only. However, the explosion was still sufficient to rupture the flange, and, more important, it put me in the position to convince my chemists some safety measures ought to be taken.[17]

The safety measures that Noeggerath had installed consisted of a 3/16-inch strong steel plate which was hung between the combustion chamber and the operator. The valves were still manually operated though holes drilled in this shield. As tests proceeded and the flow rate was increased, the reactions got rough. Noeggerath remembers sitting before the trembling and shaking apparatus, and trembling and shaking himself "at about the same frequency, and counting the endless seconds until the test was terminated."[18]

Somewhat earlier, the Braunschweig Group started another interesting experiment. The Army had become interested in a rocket propellant consisting of solid carbon (black coal powder) combined with liquid nitrous-oxide as the oxidant. This system seemed to have potential advantages in filling the gap between solid and liquid propellants. It was simpler than a liquid bipropellant system (where two liquids ignite) but more complicated than a mono-component, or Monergol system. In the new experiment one liquid component was fed into a combustion chamber where it ignited with a solid component. The Group hoped that the thrust could be controlled easily by controlling the flow of this one liquid component.[19] The Braunschweig Group coined the name

Lithergol to define the two component reactive substance.[20] The name was derived from the Greek words lithos for stone and ergon for work, and from the Latin oleum for oil; it means, literally, a combination of a solid with an energy producing liquid.

Ignition was accomplished simultaneously at different points in the charge by means of igniters composed of black powder and of inserts made from active carbon; longitudinal holes were filled with celluloid rods in order to spread ignition over the entire surface simultaneously. The only major problem was to achieve equal burning along, and across, the total charge, in order that no major particles were left when the structure finally collapsed at burnout. By carefully spacing the holes and by giving them different diameters an equal burning was achieved. As a final result, reproducible thrust-time relationships were accomplished with only a short push-button delay of approximately 0.4 seconds.[21]

For Wolfgang Noeggerath this was only preliminary research, and he lost all interest in Monergol and Lithergol developments in January 1939 when Haussmann gave him the information that a cheaper process for producing hydrazine hydrate might be available in the near future. This revived their favorite idea of using Hypergols as a propellant.[22] Hypergols consisted of two energy producing liquid components that were to ignite together to obtain the desired reaction. At that time, by sheer reasoning, they were convinced that

the use of hypergolic propellants would solve almost all problems of a rocket motor, but the research was dangerous since the two liquids used would bring an immediate explosion unless carefully controlled.[23]

Without informing his superior, and against strict instructions from the Nazi management to concentrate on the Lithergol process, Noeggerath immediately prepared a simple demonstration. A sufficient amount of commercially available 35 percent hydrogen peroxide was enriched to 50 percent.[24]

One liter of hydrazine hydrate was procured at an exorbitant price, and a simple combustion-chamber was built from a piece of high-pressure tubing, having an inner diameter of approximately four inches and a length of six to eight inches. For an injector, two conical spray nozzles producing a very fine mist were placed in the combustion-chamber head so that the cones partially intersected. No catalyst was used at the time. Because they wanted to report the first result at a given date, the final arrangement was set up in a hurry, and the only recording instrument was a pressure-gauge mounted directly on the combustion-chamber. Finally, they were ready and opened the valves. Noeggerath recalls:

> I still cannot understand, why there was no explosion, because, as we know now, I had selected the almost optimum conditions for promoting a nice blow up: low energy propellant, no catalyst, separate dispersion of both components into a fine mist--and this all in a horizontal chamber

> permitting the accumulation of mist. But it did not explode, in fact, the reaction was so poor, that the test-pit was immediately filled with fog, and we could not read the gauge.[25]
>
> There was no time left, since my train was leaving in about an hour, and therefore, for the next test, I went into the test-pit and bent over the combustion-chamber in order to get my recording.... Well, anyhow, I got my record, and while the quantitative result was very poor, the fact that we had achieved a continuous reaction was sufficient for obtaining the official approval to proceed in this direction.[26]

The Braunschweig Group was then given permission to improve the technique considerably by designing an adequate injector and by adding a catalyst to the fuel. They were able to obtain complete reaction even if the hydrazine hydrate was diluted with methyl alcohol down to a 50 percent concentration. With this latter improvement the propellant began to be acceptable from the logistical point of view.

After three months of work, the Braunschweig Group presented as a demonstration a 450 pound motor in operation to a representative of the Air Ministry.[27] This proved to be a crucial demonstration, and from 1940 on the use of Hypergols was introduced in all major rocket developments in Germany. As far as the Braunschweig Group was concerned, they were in business.

It was later discovered that the development of hypergolic fuel in Germany paralleled that of the United States, only the Germans had a head start. Yet, sometimes the development in both countries was not only parallel, but

simultaneous. For example, the importance of furfuryl-alcohol as a component for hypergolic fuels was determined by the German engineer Egelhaaf on almost the same day an article describing it was first published in the United States.[28]

Neither the German Braunschweig Group nor the Americans believe the simultaneity in fuel research was aided by secret intelligence information, but instead think it was merely a coincidence. Actually, Noeggerath recorded in his files that the major concern of the group was to keep this information from being revealed to United States sources, because they felt the Americans were in a much better financial position to produce the important chemicals needed.[29]

Spin-offs of German Hypergols were soon adapted into the various research projects under the control of the Luftwaffe. Even von Braun's V-2 program began to utilize this new technology.[30] However, before the new fuel could be used in rocket engines, another breakthrough had to be made in producing metal that could withstand the extreme heat generated by these new high-temperature fuels. Although faced with a shortage of materials, the Braunschweig Group found compound materials could be used to withstand high temperatures; among these were compound ceramics and so-called "sweating" materials. They also found powder metal techniques that would allow for the manufacture of parts with sufficient strength and suitable porosity to be used in

exhaust nozzles and shell casings.[31] From steel, "sweating" materials were produced with tensile strengths exceeding 50 kg/mm^2. Zones of metal were sintered to the ceramic rings, thus forming intermediate layers with increased metal concentrations. Appropriate materials were, thus, developed that would resist high temperatures without any cooling, and which should be especially suitable for rocket engines and gas turbine blades.[32]

The Braunschweig Group also employed the services of Professor Hellmuth Walter who designed numerous rocket engines in his private factory known as the Walter Werke. His first engines were given the military acronym HWK for Hellmuth Walter Factory - Kiel. (Kiel being the location of his central facility.) The fuel produced by Professor Hellmuth Walter to operate his engines consisted of T-Stoff and C-Stoff mixed 3:1 (T-stoff had 80 percent hydrogen peroxide; C-stoff had 30 percent hydrazine hydrate). Z-Stoff ($CaMnO_4$) was also produced to react with T-Stoff.[33]

Fuels were an outgrowth of the independent research Professor Walter had begun in early 1933, as well as the information he obtained in collaboration with the Braunschweig group. His initial purpose for developing synthetic fuels was to develop a powerful gas turbine engine for application in submarines. After he successfully used hydrogen peroxide (H_2O_2) as an oxidant substitute, he turned to developing a rocket engine in which hydrogen peroxide was

decomposed by a fuel or catalytic agent (for example, sodium sodium manganate).[34] In this arrangement a hydrocarbon such as diesel oil was sprayed into the oxidant-catalyst mixture, allowing combustion. During the burning process, temperatures up to two thousand degrees Celsius were achieved.[35] Over a period of ten years, Walter discovered that hydrogen (H_2) and oxygen (O_2) were not a good energy source for old gas turbines, but could work well with rocket engines.[36] (See Appendix J for additional synthetic fuels developed.)

The hydrogen superoxide fuel source, specifically T-Stoff, did have its problems. Unlike gasoline it decomposed quickly and had to be regenerated every couple of weeks. His staff was able to make the T-Stoff more stable by the use of hydrazine hydroxide.

Walter's small rocket engines found use in a number of aeronatical applications, some of which were twenty years ahead of their time. Basically, the rocket engine is an extrapolation of the jet engine. In a jet engine, fuel is vaporized and mixed with oxygen, in this case, derived from air; the presence of molecular oxygen in the air makes the fuel air-mixture combustible. By controlling the incoming air pressure, the fuel delivery rate, the point of ignition, and the shape of the output nozzle, a jet engine harnesses the energy produced during combustion. During combustion the hot exhaust gases are allowed to escape from the rear of the

engine, while the resulting internal pressure forces the engine (and the aircraft) forward at a speed far greater than any obtainable from propeller driven engines.[37]

The technological developments did not stop with fuels. German scientists began also to explore areas of new jet propeller and jet craft. One of the most unusual designs was the Me 163 that was powered by synthetic fuel flowing through a HWK 109-509 engine. The designer of this epoch-making machine was Dr. Alexander Lippisch, who transferred his team of designers from the Tailless Airplane Department of the German Glider Research Institute (DFS) to the Messerschmitt works in search of better working conditions. Most of the engineers who had committed themselves to move to Augsburg with Lippisch had absolutely no idea that they were moving there to work on the development of a rocket-powered airplane.[38] They first learned about it from Lippisch on the memorable morning of 2 January 1939. "We had all followed the Old Man to Augsburg on 5 January 1939. We thought that Me 163 must be the biggest kept secret ever in German aviation history," recalls one engineer.[39] Most of the employees had been active with Lippisch in Darmstadt in the Tailless Airplane department at the Glider Research Institute.

The secret, known as the Me 163 monoplane, was a tailless fighter, nicknamed Kraftfrei or Komet, because it took off like a comet. It functioned like a manned rocket-

glider jet craft. Built by the Messerschmitt works, it was the first liquid-fueled rocket-driven aircraft in the world and was destined to become the model of the American Lockheed U-2 (spy plane) built in the 1960s.[40]

The Me 163-A V4 was the first flight-capable prototype of the four test designs that the German Air Ministry approved. The next model was the operational Me 163-B which had a larger fuselage with a greater fuel capacity and correspondingly longer range. It was also armed with over 1,400 pounds of thrust.[41] Its engine could provide more than twice the power as the first model. The Me 163-B was able to climb to fifteen thousand meters (49,212 ft) in 210 seconds and after its fuel was diminished it would glide back to earth.[42]

The Walter engines HWK 109-509, RI 201, 202, 203, 210, and RII-203 used in these applications were produced at the Walter Werke. The design and manufacturing of these engines kept nearly five thousand people employed. This facility was one of the most advanced in all countries doing rocket engine research in the 1940s.[43] The most spectacular use of Walter's engines was as the powerplant for the Me 163 rocket-powered fighter.

In addition to the unique design of the Me 163, engineers were already designing what they hoped would be the fastest jet airplane in the world. Developed by the Messerschmitt Company, and designated the Me 262, this

aircraft was powered by two axial-flow turbojet engines. Equipped with two Junkers Jumo 004 engines for its first test flight, the prototype set a record of 866 km/h at a constant altitude of 900 meters on 18 July 1942.[44] Later powered by two new Walter fluid-driven RII-203 engines it achieved a record speed of 895 km/h.[45] As early as 10 April 1942, however, it had reached a speed in a test dive of near Mach 1, coming very near to the sound barrier, a phenomenon not yet fully understood at that time.[46]

The Me 262 originally was armed with four 30-mm aircraft MK 108/30 cannons with 240 rounds of ammunition. Later, in the war, operational Me 262s were also equipped with twenty-four RAM rockets mounted on wooded racks beneath the wings, and some versions carried forty-eight rockets. These rockets could be used as either air-to-air or air-to-surface missiles during combat; the pilot ignited and launched the rockets with a simple cockpit-mounted switch which was wired to the wing racks.[47]

By 1942, the Luftwaffe had initiated development in the following high-technology areas: high-performance rocket fuels; rocket-powered fighters; and jet-powered fighters. However, before Speer took over the Ministry for Armaments and Munitions, there was only minimal funding for these projects. The military leaders and Hitler especially questioned their capability in deployment, so they felt there was no need for further development.[48] The Germans were

winning the war through their Blitzkrieg strategy.

Moreover, throughout the summer of 1941, Hermann Goering had ducked the ugliest problem confronting him that was to haunt him later in the war. It stared him in the face: Ernst Udet, whom he himself had appointed Director of Armaments two years earlier, had failed to assist Milch to increase aircraft production.[49]

In March and April (1941), as Udet's surviving agendas show, he regularly postponed the discussion of items like "supply situation" and "increased fighter output." Udet was no longer normal. He was flooding his system with alcohol and mind-numbing narcotics, and his brain blared with all the symptoms of persecution mania. At midday on 17 November 1941, Udet's personnel chief telephoned to say that Udet was dead as a result of suicide.[50] Hitler appointed Milch as the new Director of Armaments and Goering made him Chief of the Air Ministry. This proved to be a sound decision, because by June 1944 the aircraft industry would be manufacturing fifteen times as many planes.

However, two obstacles faced Milch head-on when he took over as the new Director of Armaments. The first was the army's failure at the front gates of Moscow, in the winter of 1941, which created serious difficulties for the possibility of increasing aircraft production.[51] Heavy equipment losses in Russia, combined with ongoing military operations in the east, gave Hitler no choice but to switch industrial

priorities away from air force production and concentrate on a continual increase of army armaments. The second obstacle was that Hitler had placed a ban on further research and development of new technologies, such as the Me 163 and the Me 262. Strong limitations were also placed on raw material allocations. For example, only one-half of expected copper was to be available for aircraft production.

General Georg Thomas estimated that the new priorities in production would mean that the aircraft industry could complete only 60 percent of the Goering Program and the Program would not involve any new experimental research. The Program, which was predicated on winning the Russian campaign, exclusively focused on the production of traditional fighter and bomber planes, such as the Me 110, the Junker 52, and the Junker 86.[52] Fortunately, owing to the efforts of Milch, little reduction occurred in production of the traditional fighter and bomber aircraft. Despite the fact that the aircraft industry possessed the same work force and aluminum allocation that it had in 1941, aircraft production began a dramatic acceleration that would continue into 1943 and 1944.

From an average monthly production of 981 aircraft in 1941, German production rose to 1,296 per month in 1942, a 32 percent increase. In December 1942, production reached 1,548 aircraft per month, a 58 percent increase over December 1941, including 554 fighters and 674 bombers. This dramatic

increase was largely owing to one man, Erhard Milch, who changed the direction of the air industry from the strategic bombing viewpoint of Goering and Ernst Udet to one of working with broad-based military science on land, air, and sea.[53]

To begin with, Milch established a close working relationship with the new armaments czar, Albert Speer, and became one of his Deputy Ministers. Only the Luftwaffe remained independent of Speer's direct control, and cooperation between Speer and Milch removed much of the friction of typical bureaucratic relationships. Nevertheless, the army's desperate condition in the East and high ammunition expenditures in the great land battles in North Africa did force Milch, in spite of Speer's assistance, to make do with what the Luftwaffe had received in previous years.

While the Germans possessed significant resources of aluminum, aircraft production faced serious competition from other users. In 1941, 5,116 tons of aluminum per month (16 percent of all allocations) went to ammunition production for the three services (for example, for fuses, incendiaries, and tracers). Milch noted to Goering that this equalled the aluminum necessary to produce one thousand Dornier 217s or four hundred Bavarian Flugzeug 109s (Bf 109s).[54] Altogether, aircraft construction received 74 percent of aluminum production. From the last quarter of 1941, allocations for aircraft productions began to run seriously

short and the situation remained constant throughout 1942.[55]

Milch waged a strong running battle to increase aluminum allocations for the aircraft industry. By 1943, recycling of scrap aluminum, and crashed aircraft had increased available aluminum by 57 percent. Substitute materials, such as steel alloys and wood, further stretched aluminum allocations.[56] Success was dramatic. In 1942, with 15,000 fewer tons of aluminum, German industry produced 3,780 more aircraft weighing a total of 28,629 more tons.[57]

On the labor side of aircraft production, Milch and industry leaders achieved similar results. Through 1941, the aircraft industry had received a disproportionate share of labor resources, undoubtedly because of Goering's position as leader of the Four-Year Plan. However, beginning in late 1941, Hitler ended the Luftwaffe's favored position; and over the course of 1942 despite a massive influx of foreign workers into Germany, the aircraft industry received few new workers.[58] Milch was able to have the aircraft industry rationalize its methods of production and not only make better use of allocations of raw materials, but its work force as well. The result of such pressure was a steady increase in productivity from 1941 through 1943 as German industry introduced methods of mass production.[59] But no matter how revolutionary the new methods were in German industrial practices, aircraft manufacturing never came close

to equalling what occurred in the United States; as one historian of the strategic bombing offensive has noted, American industry was turning out aircraft like cans of beans.[60]

Despite Milch's drive to increase production, there remained considerable skepticism in the general staff as to the size of the proposed program. As late as March 1942, Luftwaffe Chief-of-Staff Hans Jeschonnek objected to Milch's urging for a rapid increase in fighter production. He remarked, "I do not know what I should do with more than 300 fighters!"[61] By June, Jeschonnek had modified his opinion and written Milch that the general staff foresaw a need for a monthly production of at least 900 fighters by the winter of 1943.[62]

The impact of Milch's success was favorable in the short run. From a low of 39 percent for all operational combat aircraft in late January 1942 (44 percent for fighters and 31 percent for bombers), the operational rate had risen to 69 percent for combat aircraft by June 1942 (75 percent for fighters and 66 percent for bombers).[63]

If the Luftwaffe had recovered some strength, the patient was still in serious condition. By 21 June 1942 the Luftwaffe possessed only sixty more combat aircraft than one year earlier (4,942 in 1942 versus 4,882 in 1941). For the remainder of 1942, aircraft strength fell, as other commitments multiplied. By the end of the year, the Germans

German Air Force Official Production Programs and Actual Production for Total Aircraft Selected Months, 1941-1945

Program No.	July 1941	Jan 1942	July 1942	Jan 1943	July 1943	Jan 1944	July 1944	Jan 1945	July 1945
Total Aircraft									
15 Mar 41 19	1257	1353	1262						
1 Nov 41 21/1		1288	1465	1632	1732				
15 Mar 42 21/1		1110	1429	1602	1651	1705			
21 Sep 42 222/1			1302	1698	2295	2619	3250		
15 Apr 43 223/1					2575	3254	4937	6384	6616
15 Aug 43 223/1					2248	2946	3850	4826	5465
1 Oct 43 224/1						3238	5404	6995	7063
1 Dec 43 225/1						2962	4811	5035	6817
15 Jul 44 226/2							4133	6252	6620
15 Dec 44 227/1								4696	6174
16 Mar 45 228/2									1815
Actual	1021	906	1345	2004	2337	2015	4007	3179	

Source: USSBS Aircraft Division Industry Report p. 44B

German Fighter Aircraft Production by Type
1943 and January 1944 - December 1944

	1943	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
Twin-Engine Fighters														
Me 110	1509	154	44	137	178	158	110	148	141	188	103	99	58	1518
Me 210	119	5	12	22	12	14	7	2	0	0	0	0	0	74
Me 410	458	70	36	84	104	89	114	102	63	40	0	0	0	702
Me 262	0	0	0	0	16	7	28	59	20	91	117	101	125	564
He 219	26	11	0	14	15	17	13	16	17	25	18	19	23	188
Totals	2112	240	92	258	325	285	272	327	241	344	238	219	206	3046
Single-Engine Fighters														
Me 109	6418	932	715	804	1006	1065	1230	1348	1375	1605	1583	1463	1086	14212
FW 190	3208	383	301	572	690	811	944	1267	1391	1391	1091	1291	1248	11411
Me 163	0					1	3	12	13	35	61	22	90	237
Totals	9626	1315	1016	1377	1696	1907	2177	2627	2779	3031	2735	2776	2424	25860

Source: USSBS Aircraft Division Industry Report Exhibit IIIC.

had less than 4,400 combat aircraft.[64] Thus, not only were the Germans losing more aircraft in relative terms, but attrition in absolute terms now took place at a faster rate than in 1941. By the end of October 1942, in its operational ready rate, its force structure, and its attrition, the Luftwaffe was dangerously overextended on too many fronts.

In fact, the impact of the air war on German armaments was such that rising attrition cancelled out increasing production so that there was remarkably little change in the Luftwaffe's total frontline strength from 1940 through 1944, particularly in the combat categories of fighter and bomber aircraft.[65] The Luftwaffe attrition rate over the last three years of the war was extraordinarily high. Its impact on the German armed forces only began to be acknowledged by Reich leaders in the summer of 1943 when it was too late for the Germans to reverse trends that put them at an increasing disadvantage. There was some slight hope that a massive influx of resources might redress the balance between the fighter force and the enemy's growing air superiority.

A circular from Speer's ministry warned that the fighter defenses were the only means to protect the armament industry from Allied air attacks. Frontline pilots called desperately for replacements for those aircraft that American escorts were so rapidly shooting out of the air. General Adolf Galland, reporting that he had only 250 fighters the day before to meet the American onslaught, pleaded for "fighters,

fighters, nothing but fighters" from industrialists and managers.[66] But even at this desperate moment, the Reich leaders were still unwilling to support a stronger program of production or improved development.

The warning signs had been apparent in 1940 and 1941 in the failure to mobilize production. As the Germans fell behind in the race for production, their losses mounted and attrition levels reached new highs, but they coped for a time. They coped until the gap between their production and Allied production reached such an extent that the Luftwaffe was effectively destroyed by numbers, as well as quality of aircraft and untrained pilots.

Simultaneously word was getting out that successes had been made in spite of Hitler's rigid veto to stop the experimental research on new jet aircraft. What happened to the Me 262? In his book, The First and the Last, General Adolf Galland describes how after his first Me 262 flight on 22 May 1943, he was impressed and enthusiastic as never before for it proved itself to be the fastest aircraft in the world. By this time everyone in the Luftwaffe knew that unless some miracle occurred there was little hope of its survival in the face of enemy attacks.

Galland wrote a report with the help of colleagues and delivered it personally to Reich Field Marshall Hermann Goering.[67] Notwithstanding this great technical success, the problem of the ban hanging over nearly every innovation

in the German armed forces still existed. However, Goering, according to Galland: "was electrified by our plan [to begin production] and enthusiastic."[68] He promised to drive to headquarters the next day to inform Hitler about the details.

In response, Hitler formed a conference of experts in 1943 who had very little appreciation of this new technology. However, owing to the years of low priority placed on this technology, none of the participants could promise any firm delivery dates or provide a guarantee that a certain number of aircraft would be combat ready or have pilots trained. Therefore, the decision was made to manufacture a few test aircraft that could be flown and proven in combat before an urgency priority status for the Me 262 would be assigned to give the project the precedence it required. When all the missions were allotted to the Me 262 project at the end of 1943, Hitler further complicated matters by insisting that the airplane be changed from a fighter to a fighter bomber. This thwarted the immediate impact of the Me 262 as a fighter! [69]

In fact, an explosion in the German command occurred when Hitler discovered that the Luftwaffe was manufacturing the Me 262 as a fighter. In late December 1943, Hitler drastically intervened:

> Every month that passes makes it more and more probable that we will get at least one squadron of

> jet aircraft. The more important thing is that they [the enemy] get some bombs on top of them just as they try to invade. That will force them to take cover...and in this way they will waste hour after hour! But after half a day our reserves will already be on the way.[70]

Goering also vested his hopes in the new Me 262 jet. "I don't want to come up with the Me 262 half a year too late. A modest production series is now planned--one Me 262 in January 1944, eight in February, forty in March, and sixty a month after that."[71] It was doubtful whether the decision to produce the Me 262 could ever have had much impact on the war's final outcome. The engineers had only solved the problems of the production line by March 1944 with the first models appearing in that month. Output for April was sixteen Me 262s, rising to twenty-eight in June, and fifty-nine in July 1944.[72] Even under the best of circumstances, it is unlikely that a massive output of Me 262s could have occurred in 1944. By the time its production began, Allied escorts had already savaged the German fighter forces, and the Germans had irrevocably lost air superiority over the continent. Real mass production would not begin until November 1944. [See Appendix K for fighters produced and a review of those still in the planning stage.]

Similarly, other new technologies started to make themselves known. A renowned jet-test pilot, Wolfgang Spaete, at a top-level meeting with the Fuehrer in Rastenburg in the Spring of 1943, mentioned how he was astounded to

discover that not only Hitler, but all other military and special dignitaries present, knew nothing about a new and important jet rocket development of aviation called the Messerschmitt 163 (Me 163).[73]

Did Goering not inform this team of anything? Was it because of Hitler's ban on technology that efforts were being kept secret? The key leaders should have been at least briefed on the technical innovations which could have far-reaching effects on the war effort. Who actually was Hitler's advisor? In this case, Goering should have been the key person. "Was it really true, what everybody whispered, that Goering knew as much about technical issues as I know about baking a cake?" Spaete commented later.[74] The Me 163 was also set up on a production line in connection with both the Messerschmitt and the Helmut Walter Werke company who produced the engines. However, as in the case of the development of the Me 262, there were further military complications. The Reich Luftwaffe Ministry (RLM) undermined the Helmut Walter Werke achievements by unrealistically demanding that the new airplane engine must be modified to be fully controllable during the transition from idle time to maximum power. According to Dr. Demant of Helmut Walter Werke in Kiel (HWK), the unrealistic demands of the RLM cost the Lippisch group time in trying to comply with an obviously unnecessary requirement from the ministry.[75]

The Me 163 was designed so that on a typical mission it

could take off using its own rockets, jettisoning a temporary undercarriage after it left the ground. It continued to ascend until the fuel ran out, usually at about 20,000 to 25,000 feet. The pilot would then attack Allied bombers in a series of powerless, but extremely fast gliding passes. The high speed and small size made the Me 163 a difficult target for Allied gunners. Indeed, the gun turrets of the American B-17s could barely rotate fast enough to track the rocket fighter in a full-speed pass through the bomber formations.

At the end of a mission, the pilot would glide the Me 163 back to the airfield, where the fighter would land on its center belly skid. It was at this point that the fighter was the most vulnerable. An Allied fighter quickly learned that it had only to loiter near the airfield and attack the Me 163 as it made its unpowered landing.[76]

In addition to the problem of vulnerability, it became impossible to plan for great numbers of the Me 163s because the vast quantities of hydrogen superoxide that were needed could not be produced and all of the air force deliveries were behind schedule, owing to the deteriorating war situation. In short, the Me 163, as one of the weapons of retaliation, was downgraded in importance for the V-weapons upon which the leaders in government had only recently placed their new-founded hope.[77]

However, the fast Me 262 became the fighter of choice. General Field Marshall Milch made the following notes in his

personal diary which he had written after the Director of Armaments meeting on 20 April 1943:

> 262 must tackle right away! A couple of 262 as quickly as possible! Petersen reported, Spaete has test flown it. Has a lot of experience. Supports the Me-163 100 percent, but three hundred percent for the 262. Main focal points: 262 engine and airframe. At least one thousand aircraft, better today than tomorrow. 262 engine and airframe must be completed alongside 163. Faster! It can't be that difficult to accomplish![78]

Unfortunately, for the Germans, the initial air victories could not be sustained because the older equipment was not rapidly replaced by the new series of aircraft innovations. When war conditions led to limited materials and limited synthetic fuels, once again, it was too little too late. Even with the ability of the Me 262 to bring down the Flying Fortress, the superiority of the Allied air power was so overwhelming, the Me 262 did not make much of a dent in the devastating Allied bomber attacks on the German cities.

On 9 October 1944, General von Brauchitsch brought to Goering's headquarters a gloomy memorandum that General Kriepe had written entitled, "Air Warfare in 1945." The report depicted a Reich hopelessly encircled by superior air forces. Goering sent for Kriepe on the 12th of October and tossed the document on the table. "It's defeatist!" he screamed. "It smacks of slide rule and general stuff! I'm

sorely disappointed in you. Now you too are stabbing me in the back!.... Aren't you aware that the Fuehrer has forbidden the general staff ever to assess our overall situation?" Goering tore the paper in two, but whom could the Reichsmarshall now appoint as chief of air staff?[79] This is a scenario of an avuncular Goering who had ruthlessly carpeted generals like Manfred von Richthofen and Walter Reichenau for their arbitrary use of air power. Yet, Goering had earlier admitted to the Gauleiter in November 1943 that the Luftwaffe could never regain superiority in numbers.

The enemy's thousand-bomber raids were now commonplace. By 1944, according to Dr. Frederick Ordway III, Smithsonian specialist on German aerospace developments, the Germans had lost the equivalent of two entire air forces (based on 1939 standards).[80] In spite of this tremendous loss of men and equipment, aircraft production rates continued to grow between April 1944 and March 1945, eventually reaching a four-fold increase over 1941 levels of production. However, by January 1944, the Luftwaffe possessed only 1,561 fighters and 1,604 bombers. In fact, the rate of loss was such that the increasing German production was never able to sustain frontline squadrons at their full authorized strength. While there were, of course, fluctuations in the percentages of authorized strength on hand in frontline units, the trend from 1942 on was unmistakably downward. Only eight of Germany's one hundred seven air aces to score more than one

hundred victories, joined their decimated squadrons by mid-1942.[81]

The final blow fell during the "Big Week" (20 February 1944), when 10,000 tons of Allied bombs were dropped accurately on every important target of Goering's aircraft industry. For an instant it appeared that the Luftwaffe was defeated. But Goering gave Field Marshall Milch permission to set up an interministerial, troubleshooting Jaeger Staff (Jaegerstab).

Goering began to withdraw from crucial decisions and the Jaeger Staff was placed under the control of Karl Otto Saur, Goering's right-hand man. The Speer ministry rose to the challenge and released the vitally needed raw materials and machine tools. In consequence, aircraft production began to pick up again.

On 24 February 1944, Goering left for three weeks to his home at the Veldenstein Castle. The next day the new Jaeger Staff met for the first time at Speer's ministry. The group's activity were evidence of a further significant abdication of power by Goering to his rivals.[82] The group was comprised of representatives from various ministries and agencies all of whom would meet at one large conference table, with Karl Otto Saur presiding as chairman. Where Milch and Saur ran into bureaucratic red tape and recalcitrance, they hustled offending individuals to the hands of the SS.

The Jaeger Staff performed an extraordinary job in

restoring order and dispersing production to less vulnerable locations. Underground work and production space was immediately acquired for the production and protection of the new aircraft; and the group issued a forecast-report that the work area for underground facilities needed to be increased to 1,250,000 square meters by 1 June 1945.[83]

Milch never gave up! In spite of attacks by the Allies, by January 1945 two thousand additional fighters were delivered to the Luftwaffe.[84] Yet, throughout 1944, regardless of Milch's figures in production, the Luftwaffe was able to maintain a force of only approximately fifteen hundred fighters.

However, it was all futile; Hitler's goal of shielding the entire armament output from air raids was unattainable because the overall dimensions were too great. Furthermore, this program was nonsensical in regard to air strategy. Even as the underground work area was expanding, the enemy was paralyzing the transportation-network on the surface, so only the tiniest portion of production could have been moved.[85]

Construction of the underground facilities for large numbers of workers placed yet another burden on the war effort. In a wireless of 8 April 1945, an unknown Colonel Pretzeel had decided that Emmerich Corporation, in Weingut II (an underground factory) will receive:

> ... four thousand square meters of manufacturing area within seven days, an additional fifteen

> hundred square meters within another five days, and a total of seventy-five hundred square meters by 1 May [1945]. Any further interior installation has been stopped. But the outside construction is continuing according to plans. Tomorrow the first special transport of cement is to arrive from Blaubeuren.[86]

In other words, construction of the actual work area, the "interior," had been abandoned.

In March 1945, General Hans Kammler had received a final mission from Hitler to change the course of the war. In concordance with Reich Minister Speer and Hauptdienstleiter Saur, he made Director Degenkolb Plenipotentiary for Manufacturing the Me 262 at the Reich Ministry for Armaments and War Production.[87] Actually, Degenkolb had already been the acting Ministry Plenipotentiary for the manufacture of jet planes, for some time.[88]

The high priority of the Me 262 program is illustrated by an April 1945 message from an SS Obersturmbannfuehrer named Staeding, who called himself "Plenipotentiary of the Fuehrer for Jet Engine Aircraft." In his wireless message, he notified Professor Willi Messerschmitt and Director Degenkolb, that he was transferring himself and his agency from Halle to Dresden. His message ended:

> What can I do for you or for the Me 262 from here? The Protectorate can also be considered. Where else do you need help?"[89]

Apparently, he felt compelled to offer assistance to the jet fighter project even as he was fleeing from the advancing Allied front. When all is said and done, the German achievement in increasing fighter production, amidst the confusion at the end of the war, is remarkable. Still, the failure of the Luftwaffe was symbolic of the fate of The Third Reich. Germany's leaders held goals that were manifestly beyond the nation's capabilities. The buoyant nature of their success in the first years of the war should not disguise the dilettantism among those who conducted the Reich's grand strategy. Thus, intermixed with an exceedingly high level of competence on the tactical and operational side was a complete inability to see a relationship between means and ends on the level of grand strategy. With the foundering that occurred with the fall of France, one doubts whether Hitler ever had a grand strategy.[90]

The period between November 1942 and August 1943 is crucial in that it was the Luftwaffe's last opportunity to maintain air superiority over the heart of the Reich. However, the German leaders were unwilling to trade the initial rapid expansion of the Reich's borders for the time needed to build up industrial, technical, and manpower reserves at home. As a consequence, the Luftwaffe fought a continual battle of attrition at the Reich's periphery, and this was bleeding the German Air Force white.

At the very moment when the air battles in the

Mediterranean and in the East peaked, a terrible new danger appeared in the West: the bomber thrusts of the Eighth Air Force aimed at Germany's industrial heart. Bereft of its fuel, its units ravaged by the summer attrition, the Luftwaffe soon became a force that no longer exercised any influence on the conduct of either air or ground operations. The Luftwaffe had no choice but to come up and to fight. In the process, its destruction had already begun.[91]

XV. TOP SECRETS IN LUFTWAFFE ENGINEERING

Most of the technological and aerospace developments in wartime Germany have been credited to Albert Speer and Hermann Goering. The larger picture and sophisticated aspects of the V-1 and V-2 rocket programs remained outside the grasp and vision of Hitler and the Nazi officialdom until the fourth year of the war.

Parallel to the work funded by Hermann Goering's Four-Year Plan and the Luftwaffe, Albert Speer had his own group of technical advisors, scientists, and engineers. Their work involved a plethora of hybrid airplane and missile systems that made use of proven advances in the V-1 and V-2 programs. With the development of missile technology, an entirely new chapter opened on military aerospace armaments which are worthy of detailing in terms of their technical merits.

In December 1944, Dornberger had been given complete responsibility for the missile project named the Flak E Flugabwehr-kannonenentwicklung. The Germans desired a long-range missile that could attack the Allied air and naval fleets. Von Braun was appointed as technical director.[1] Since General Dornberger and Professor von Braun, had been relieved, for the most part, of responsibilities with the V-2, they could now turn their attention to increasing the range of missile technology. Ranges up to 408 kilometers were achieved in experimental firings.

Of the missile designs under development at that time, Dornberger suggested that all projects except Wasserfall and Taifun could not possibly be operational until 1946.[2] In a final desperate attempt to deal with the problem of anti-aircraft protection for the Third Reich, Dornberger focused his efforts on the simplest rocket missile ever designed at Peenemuende, Taifun (Typhoon). Only five hundred seventy-five millimeters long and twenty millimeters in diameter, the liquid-propellant rocket weighted nine kilograms. Its simple, pressure-fed motor burned the hypergolic propellants (developed by the Braunschweig Group) and the little rocket was boosted to a velocity four times the speed of sound. The warhead contained five hundred grams of high explosives with a simple contact fuse. Forty-five Taifuns were to be launched simultaneously at Allied bombers overhead from cheaply made racks. Despite its simplicity, the weapon could not have been operational until August 1945. Even so, ten thousand were manufactured at Peenemuende and in December 1944 plans were made to produce two million rockets per month, beginning in mid-1945.[3]

In the final analysis, time was simply running out. Money to support projects like the Taifun and Wasserfall came too late to save Germany from Allied air forces. In addition to the developments of the V-1, V-2, Wasserfall and Taifun at Peenemuende, there were several other categories of Wunderwaffen that were developed by some of the most gifted

aerospace engineers in Germany. Four engineers that contributed to these discoveries were Dr. Robert Lusser (V-1 technology), Dr. Wernher von Braun (V-2 technology), Dr. Helmut Wagner from Wien, and Dr. Alexander Kramer from Augsburg. All four men were employed by the United States Army after the Second World War because of their excellent knowledge of surface-to-air and air-to-air missile systems.

Dr. Wagner developed his own family of missiles. First it must be stated that Dr. Wagner was employed in 1939 as the head of experimental and developmental engineering of the Junkers Airplane Company. In May 1939, Dr. Wagner resigned from this position because of disagreements with the president of the company over the nature of the company's developmental program which placed low priority on guided missiles.[4]

Shortly, thereafter, Dr. Wagner submitted a design of a ricocheting bomb to the Air Ministry and the Ministry found it sufficiently interesting to give him a contract to study the weapon. Dr. Wagner sold this contract through a private arrangement to the Henschel Aircraft Company and was promptly hired by that company to perform the study with necessary assistance being furnished by Henschel. On 1 January 1940, he went to work in an empty room which was quickly furnished with a desk and chair.[5]

Dr. Wagner examined a low-priority glide bomb project at Gustav Schwaertz Propeller Werke and found that it had never

made a successful flight even though the airframe had been designed by the Luftfahrtforschungsanstalt Hermann Goering and the autopilot by the Askania Company. The Henschel Company acquired four engineers who had been working on the glide bomb together with the models and the drawings.

By June the design of the first missile, named HS-293 (for the Henschel-Schwaertz company), was completed and in August it was ready for ground tests. The glider was aligned to a white barn, as a point of aim, and released at an altitude of two thousand meters about eight kilometers from the target. The glider was guided by radio control signals.[6] The successful test was carried out from Peenemuende and the white barn was located on a peninsula near the base.

Owing to the pro-army viewpoints of Hitler and the German General Staff on the introduction of new aerial weapons, production of the HS-293A-1 began in the middle of 1941 and it was employed in combat in the middle of 1943. Production was stopped late in 1944 owing to the lack of planes to carry them and lack of operating rail systems.[7]

The two basic categories of air-launched missiles are the "air-to-surface" and the "air-to-air" types. The HS-293 was an air-to-air missile and, for example, the HS-117, known as the Schmetterling, was an air-to-surface missile.[8]

By late summer of 1943 reports began to pour into Allied

capitals regarding the deadly accuracy of the HS-293 missiles as launched from the Dornier 217 airplanes. In one report of 27 August, on a convoy, eighteen missiles were launched, of which two were direct hits, sinking the HMS Egret and damaging the HMS Athabaskan.[9]

Then followed a period when the HS-293 began to develop failures and few reached their targets. Special radio jamming equipment had been placed on destroyer escorts and this caused a number of failures as the attacks progressed over a period of a year. At the end of 1943, a summary indicated that the Germans had released a total of 165 HS-293 missiles and had obtained only eleven direct hits or a score of seven percent.[10] Dr. Wagner had to defend his work continually before the Air Ministry and did not seek financial support from the SS who would have secured control of his projects.

Television guidance was later installed in the HS-293D model after development of a light weight (seventy pounds) compact set by Dr. R. Weiss under Albert Speer's supervision. Two television systems were developed, the K-11 for the HS-293D (air-to-ship) and the K-12 for the HS-117 (ground-to-air). A total of one thousand of the K-11 sets were ordered by the Luftwaffe and around three hundred were delivered.[11] The device was intended to detect a one thousand-ton ship at a distance of ten kilometers. The television furnished the control operator with directives which he used to control the heading of the missile by radio.

An airplane might be hundreds of kilometers away from the target or above the clouds. The target image appeared on a screen in the same way as pictures appear on television sets. By night, infrared rays could be used for receiving and transmitting a picture. Operationally, the HS-293D was launched and allowed to fly on an autopilot course for six seconds and thereafter was under radio control.[12]

Dr. Wagner also developed the HS-294 series of missiles which were similar to, but larger than, the HS-293 model and were designed to permit underwater travel of the missile with an explosive charge. When the missile struck the water, its wings, tail surfaces, and all extraneous parts would shear off and the charged missile would continue on its underwater path.[13]

In addition to Dr. Wagner, Dr. Kramer had his own family of guided missiles and developed missiles known as the X-1 through X-4. Test of the X-4 were begun about the middle of 1943.[14] The X-4 was a small air-to-air version of the high angle glide bomb, derived from the X-3. It rotated at a speed of one to one and a half revolutions per second and had an aerodynamic design that had been thoroughly developed by both wind tunnel measurements and drop tests.[15]

In March 1945 around 150 drop tests were made, most of them at Peenemuende, and the results were so favorable that a schedule of production for five thousand per month was ordered to start that month.[16] The officers controlling

the drops at Peenemuende, as well as Dr. Kramer (who made six drops), agreed that 50 percent hits could be obtained on a target the size of a four-engine bomber with a target distance that ranged up to fifteen hundred meters.[17] Dr. Kramer was also working on an acoustic homing device, before the war ended, which would permit the pilot who dropped the missile to take evasive action immediately following the release of the X-4.[18]

Many of the missiles were operated as projector-launched missiles where angular information could be transmitted to what was called the Einlenk computer system. In an unique modus of operation, the reflector for the missile location was pointed towards the launcher up to the moment of launching. At that moment the Einlenk computer started to control the aerial for the missile location.[19]

In the shortest possible time the missile-location-reflector had to be directed into a position parallel to the radar. This was achieved by means of the Einlenk computer in such a manner that the movement of the missile-location reflector depended not only on the movement of the target but also on the maneuverability of the missile in order to achieve a precise payload.[20] Here for the first time in history a parallax computer, and a trajectory-computer were combined, as well as a device for turning the base of the joy-stick before the launch in order to maintain the right sense of missile-movements. The Wasserfall was one example of

a launch guided by computer and radar.[21]

Albert Speer also directed many unusual scientific developments throughout Germany and Austria in the centers of technology under his supervision. At Lofer, in the Tyrolean mountains, the Waffenamt, under Speer's direction, had an institute that at one time was assigned to develop mountain artillery. In addition, the Technische Akademie der Luftwaffe was running a station for secondary research on aerial equipment in the same region. In 1944, these buildings served as the technical nerve-centers for a far greater complex of research workers scattered about and hidden in the area. An ultrasonic canon was tested in this facility with the expressed purpose of stopping the Allied air fleets from attacking crucial industry.[22] Preliminary experiments fully confirmed the possibility of destroying a plane in flight by causing the wings or rudder to fracture after being struck by the violent, fiery gust. Nevertheless, developmental problems with timing and ignition remained.[23]

Under Speer's supervision Fernsehen G.m.b.H. of Berlin worked closely with the Institute for High Frequency Studies (RHF), in the development of televisions that would enable pilots to control both planing bombs and rocket bombs after they were launched. The installations used a wavelength of between seventy to one hundred centimeters. The images received appeared on a tiny television screen about three inches square.[24]

At Ainring, the latest model television promised to have an effective radius of action of twelve miles on land and sixty miles at sea. The laboratory for the military applications of high-frequency radio waves had also completed a remote-control system for bombs, rockets, and aircraft that resisted all known enemy systems of jamming. This was the Mosaik project developed by Professor Folske from an idea that had occurred to him in 1943.[25] In addition to its radio and television researchers at Oberammergau, the Oberbayerische Forschungsantalt (OBF) was working on infrared detecting devices based on the principle of the bolometer.[26]

The Braunschweig Group under Hermann Goering developed sophisticated technologies in the infrared and high-frequency region and made calculations for the energy emitted by certain targets, for instance by airplanes, ships, certain ground installations, in order to detect them under all conditions of lighting and climate.[27]

Speer preferred to direct his major air efforts to new types of aircraft design and countermeasures. Two types of Raketenflugzeuge ohne Pilote (pilotless fighter rockets) were designed. The Krach (Crack) was about sixteen feet long and armed with a battery of eight 55-mm R-4-M rocket projectiles. The Donner (Thunder) was armed with a rapid-fire MG-213/C.30 small cannon.[28] Both had the characteristic blunt, teardrop shape of the well-known Me 163 rocket-engine

fighter.

Other revolutionary technologies included the Kugelblitz (Ball Lightning), the first example of the jet-lift aircraft.[29] As in modern vertical landing craft and anti-gravitation vehicles, the Kugelblitz, the older brother of the Feuerball anti-radar device was the second authentic antecedent of the present-day hover craft and it was with them and other German devices of the same family (spinning bombs, lenticular bombs, ramming fighters, and flying spheres) that the prehistory of the hovercraft technology begins.[30] This vehicle was initially developed by Viktor Schauberger, SS engineer, in Austria in 1941 and later developed in Britain and the United States.[31]

In Germany, a program systematically to test special high speed ram-jet engines had been started, as early as 1937 by Hellmuth Walter in Kiel.[32] Owing to the lack of testing experience and of accurate flow and performance calculations, a triple objection prevailed against the ram-jet system which brought all experiments to a denied. When initial experiments failed, the skepticism of Luftwaffe officialdom deadlocked the funding to continue the research. One investor, Eugene Saenger, privately continued to fund this work.

Despite these handicaps, Saenger ventured in 1941 to meet the tactical requirements of the German Air Ministry with the idea of what he called a "modified Lorin engine."

The engine, by admitting very high combustion temperatures, could considerably increase the concentration of thrust.[33]

Saenger's planning of his model was governed by the desire to obtain positive results as quickly as possible. In short, the Germans could not afford time-consuming, novel test-stand facilities to prevent associated risks.[34] Moreover, at that time in Germany there existed no wind tunnel which allowed the reproduction of high altitude conditions. This was needed for appropriate combustion at lower air densities of the Saenger program.[35]

Some of the major problems Eugene Saenger resolved by his towing tests on the top of an Opel-Blitz truck; here the towing speed corresponded to the assumed air-speed at the diffused outlet. Other tests required the towing of the complete ram-duct. The speed attained with a mounted jet duct was, for that time, remarkably high and reached 90 km/h on the test-course. The test-duration was limited by the length of the roadway to only a few minutes.[36]

Saenger's first test began in early autumn 1941 with a violation of the sacred red tape of the Reich. As unsuspecting idealists, his team imagined that they would earn particular merits by doing research work as quickly and economically as possible. Thus, their enthusiasm led their team to use a simple drain pipe of approximately fifty centimeters diameter and several meters in length, belonging to their lab's construction department. After they proudly

transmitted their first good test-results to Berlin, to their stupefaction, instead of expected commendations, they earned only a cool reprimand, criticizing the fact that they dared to produce successful test-results before the tests themselves were officially authorized.[37] Nevertheless, somewhat later they continued their testing with official authorization using properly constructed combustion-ducts of 800 millimeter diameter, as well as complete ram-jets with a maximum diameter of 500 millimeter and with an interchangeable diffuser.[38]

In spite of very satisfying results, it was only in 1944 that an official work for the development of the ram-jet engine was issued. Negotiations for the cooperation of the Saenger experimental group with Dornier had already been started as early as October 1942.[39] Conferences with the same aim were held in Spring 1943 between the offices of the Air Ministry, Speer, and the firm of Junkers. In May 1943, the firm of Hellmuth Walter was commissioned to start the design of a combined rocket ram-jet power plant. A little later, around November 1943, the experiences of his experimental group were handed over to the firm of Focke-Wulf with the intention of winning their cooperation in the ram-jet domain.[40]

All these efforts failed the first time either because the firms were blocked by bureaucrats who wanted to pay off the money invested in the current classical developments, or

because Saenger insisted on creating his own designs. Among the possible backgrounds of these failures, there is one case which Dr. Saenger recounted for its tragic outcome and the lesson it provided on scientific-managerial rivalry. To be absolutely sure, the Air Ministry had in 1942 asked a prominent aerodynamical scientist for an expert's report on the new system of propulsion. This overburdened man obviously overlooked a technical mistake he made by dividing the measured gross thrusts by the double ram pressure v-2, instead of by v-2/2, so that the net free thrust, after deducting all the theoretical coefficients of resistance, turned out to be too small. When Saenger accidentally got hold of this report, a long time later, and had the opportunity to give (on 16 September 1944) a written correction, almost two years had been lost.[41]

Accidents like this were probably the reason why, at a decisive Congress on Jet Propulsion, in Berlin on 29 September 1943, the ram-jet tests were only mentioned during a discussion after the lectures. Even on 11 January 1944, at a meeting of the German Aeronautical Research Board, the flight tests and the Hunter Project with ram-jets were designated as "not actual facts."

The first positive cooperation began in December 1944, when Eugene Saenger received a research order with the number OB 6429/262 from the Oberbayerische Forschungsanstalt. The somewhat obtuse sounding code name of this order meant it was

simply a Heimatschuetzer (home protector).[42] In the war period, with increasing fuel shortages and desperation, the ram-jet was also to bring about a new hope. The report of a meeting at the office of the Chief of Technical Air Armament on 30 November 1944, which Saenger received in January of 1945, gave limited approval:

> The importance of the Lorin engine is to be pointed out....Because results have to be at hand as fast as possible, it will be necessary to start communication of experiments on a large scale. The development of subsonic propulsion devices will be stressed, the supersonic speed range actually will be encouraged only as far as the research stage is concerned.[43]

Work for this project had just been started, when the Supreme Command of the Luftwaffe issued a second work order in mid-December 1944 which gave Saenger an administrative background to the collaboration with the Aeronautical Research Establishment in Vienna. This collaboration had already existed, as a matter of fact, since April 1944. The Lippisch Delta-VI body, originally planned as a single-seat fighter, was intended to be built as a 3 L-device which was the German code name for an unmanned device, powered with solid fuel on the Lorin principle, the fuselage of which consisted mainly of explosives.[44]

Unfortunately for Saenger, in April 1945, in the very last days of the war, he finally got a commission from the firm of Heinkel in Jenbach, concerning the design of a

fighter of three tons flying weight with gasoline-operated central ram-jet engines and booster rockets for military take-off.[45]

It was too late. At the end of the war all these developments were no further than the project stage or had just undergone preliminary tests. Civil aviation in peace-time, however, tends to be less interested in high thrusts than in long action ranges and long flying times.

All in all, Saenger's work led to the development of: fuel-injection devices working with air flow instead of with pressure-tanks; automatically operating fuel regulation devices; regulating devices for the size of exhaust nozzles; mechanical regulating devices for the injector-nozzle-system; and multiple designs for installation of ram-jet ducts in existing fuselages. All of which pioneered the ram-jet technology that is currently in use. It is his name which was placed on the first German space plane--the Saenger Silver Bird--that will soar over the earth in the mid-1990s.[46]

Von Braun centered his own developments on more elaborate versions of the A-4, such as a winged version known as the A-9. For the same fuel load, the A-9 was theoretically able to double the range of the A-4 to reach a distance of 600 kilometers.[47]

Many of the new technologies never saw real action on the battlefield. And there were numerous other projects that were merely dreams and never became reality. The designers

of the A-9 had gone so far as to plan for placing a pilot in a pressurized cabin instead of the warhead. This model of the A-9 rocket von Braun said "was capable of carrying a pilot a distance of seven hundred kilometers in seventeen minutes. It might have taken off vertically, like an V-2, and then land glider-fashion on a medium-size strip."[48]

The more exotic A-11 was never developed beyond the stage of preliminary design-study. It consisted of a booster rocket for the A-10 and A-9 combination with a thrust of 1,600 metric tons. Thorough calculations showed that this three-stage rocket could reach the so-called orbit velocity of 7,800 meters per second at which the third stage, that is, the A-9, could perform a continuous powerless flight of infinite duration around the earth. Thus the combination of A-9, A-10, and A-11 would have unlimited range, but it could hardly be considered a weapon.

Von Braun also considered the A-12. It would have a thrust of not less than 12,800 tons. It would bring the A-10 to satellite velocity, but this time not with a lone pilot, but rather with a payload of some thirty tons. "A number of such ships, maintaining a regular shuttle service to the orbit, would permit the building of a space station there," envisioned von Braun.[49]

It is clear to see their thoughts were not entirely on developing weapons for war, but for space futures. Thus, as early as 1944, the Peenemuende team was considering the

ultimate in the design of large space boosters: a proto-Space Shuttle. Perhaps, even more incredibly, they also were considering forms of rocket propulsion that have yet to appear.

In short, Germany evolved new methods of production and new techniques of fighting constituting a veritable revolution in the field of modern war. The technicians and scientists could have given a new turn to the war had they been in a position to complete these inventions four to five months earlier. The British Prime Minister, who was well informed about German developments, declared at the beginning of October 1944 that if the Allies were unable to decide the war in their favor by March 1945, the Germans with their new weapons could turn the tide and once again drive the Allies out of France.[50]

XVI. THE END SIGNALS A NEW BEGINNING

On 6 June 1944, the Allied invasion of Normandy began. By the beginning of July, almost a million men were involved in the continually expanding bridgehead, which induced German countermeasures in France. Simultaneously, in June and July 1944, almost all branches of the armament industry under Speer had reached their highest levels of production since the beginning of the war.[1] However, because of the shrinkage of the area hitherto dominated by the German military, and the misery of fuel shortages, part of the strategic goals for mobilizing the German reserves lost its meaning.[2]

Ironically, the German management realized it would make no sense to increase production of airplanes and tanks if fuel was not forthcoming. There was also no purpose to push ahead with production of munitions, if the German command did not have sufficient explosives.[3] Still, the army continuously drafted younger men who had thus far been spared service at the front, as well as those who had been working for the arms industry.

On 18 June 1944, Speer presented Hitler with the "Edict about the concentration of the armament and war production," which Hitler signed on the 19th of June.[4] Despite the hopelessness regarding the final outcome of the war, Hans Kehrl was convinced that the German efforts in mobilization

with a priority for defense should not be diminished.[5] The Speer-Kehrl group would not deny new arms to those millions of soldiers who were fighting on the vast Eastern fronts, in Romania, Greece, Yugoslavia, and Italy, who were in dire need of these arms for their defense.[6]

Everything, of course, that could be done as far as armaments were concerned made sense if the Germans were successful in bringing an about-turn in the domination of airspace. Speer informed Kehrl periodically, about the stubborn fight Speer himself, Milch, Air Force General Adolf Galland and others fought, to push through an adequate fighter plane force which was desperately needed to protect the homeland. The constant use of small numbers of normal fighters and every once in a while of some new Me 262 jets for defense, was much too weak to bring about a positive result. More Me 262s were needed for German aerial defenses.

Hans Kehrl, in his activity in the Speer ministry, was fundamentally and instrumentally involved in the remarkable German achievements in production of armaments. As a final blow to Kehrl, the Luftwaffe and its technical teams, Hitler had made another erroneous decision, under the cover name of Aktion 88. The Flak (missile) program was to be emphasized at the expense of the production of fighter planes.[7] Hans Kehrl decided to notify Speer of his opposition to this plan in a written memorandum. He wanted to prevent it from being

ditched in one of Speer's offices and, therefore, sent seven other copies to top members of the management team, including Field Marshall Milch, Secretary of State Koerner, Kehrl's colleague Saur, and also to Wilhelm Keitel, through his liaison officers. Kehrl was fully aware that Aktion 88 was no longer a concept, but an order already signed by Hitler. In effect, Kehrl cloaked his presentation with an introduction to make it appear as if there was still time to bring up arguments for reconsideration. The memorandum carries the date of 18 August 1944 delineating Kehrl's sharp views against the throttling of the fighter production so as to favor the Flak program.[8] The memo to Speer stated:

> ... I also must point out, that according to my estimation, the decision to save fighter planes for a massive combat defense of our homeland would result in enormous dangers to the production of explosives and their products. If you would cut them out in the same volume as you currently cut out the production of fuel, the consequences would be even more tragic than the cut in the fuel production, because the use of all weapons in the air, in the water and on land would be endangered in the same way. To protect all these productions during this time through the use of the Flak, would be hopeless. It is the very protection of these important foundations of our fighting power which demands a quick decision in the above mentioned intention.[9]

In response, Speer called Kehrl during the night and asked him if he was out of his mind. The Aktion 88 would be already considered an edict of the Fuehrer, although Speer would have condemned it as nonsense in a few dry words. Speer

wanted to know who else had received the other copies and ordered Kehrl to immediately telephone all the other recipients and order the document back. Kehrl was also told not to let anyone know about the existence of the document. In reply, Kehrl refused emphatically to call Saur, because he suspected that Saur had not been totally innocent of Aktion 88. Speer commented then, that he would call Saur himself.[10]

The next day Speer told Kehrl that he could not inform him about the discussion in the headquarters of the Fuehrer and it was hopeless to countermand Aktion 88. It was Kehrl's last try to take influence on the decisions of leadership.[11]

Kehrl drew his own conclusion, that in the future and to the bitter end, to rely totally on himself, and to make all decisions and considerations according to his own judgment without consulting anybody. Obviously, reasonable decisions could no longer be expected from Hitler, and the Ministry of Speer was, in the chain-of-command, apparently being dissolved.[12]

Kehrl's criticism of Aktion 88 was not his first attempt to influence Hitler's policy. More than a half a year after the Casablanca conference (with its demand for an unconditional surrender) and about the time that the overture was made to the Soviets in Stockholm (finally vetoed by Hitler), as President of the Planning and Raw Materials

Agency in Berlin, Kehrl had brought up some thoughts regarding the necessity for a special German-Soviet peace accord.[13] He requested that Minister Speer plead this case before the Fuehrer as an alternative to a "crushing defeat." Kehrl also appealed to his boss's sense of political responsibility, in a conversation with Speer regarding the necessity of a separate peace initiative and pointed out to him, as he had earlier with his predecessor, Minister Todt, that he was not only a technical minister, but was also a Reich Minister.[14]

In spite of all the criticism and the recognition of the Nazi ruling methodology, in spite of the daily realization of the shortcomings of the system, the thought of giving up the idea of war was never a real possibility. In Kehrl's memoirs, one finds that the determination of Roosevelt's policies of an all-out war were credited with the desire to persevere that Kehrl and those around him exhibited.[15] Above all they sought a unified direction of the economy.

Kehrl's desire to continue was motivated not least of all by the hope that the arrangement of a separate peace treaty with the Soviet Union (through a complete withdrawal from all Soviet territory) would prevent an unconditional capitulation and defeat before the advancing Soviet armies. There is no doubt that by rapidly increasing the production of armaments, Germany took on a powerful tactical position to

open the door for a separate peace treaty with the Soviet Union. Yet Hitler, had his own anxiety-ridden speculations regarding the collapse of the coalition between "plutocracy" and "bolshevism," and hoped to be able to force the West to recognize the necessity of an alliance with him against the East.[16]

In Hitler's own words: "The nation [Volk] must continue to live."[17] The decision to subvert and sabotage Hitler's orders and directives, to oppose the last consequences of the all-or-nothing strategy and to plan for the time after the European invasion by the Allies, were for the crisis manager Kehrl, according to his own testimony, more than just the budding concerns of a technocrat. The Germans were now clearly facing the destruction of many factories, mines, roads, bridges, and transportation-facilities. Yet, what they accomplished in the area of decision-making activities in economic policy during the twelve Nazi years was able to stimulate new technologies not so much for conducting the war, but according to Kehrl, for the inspiration of bringing a new technical understanding of the tasks and special missions which war presented.

On 13 July 1944, an edict of Hitler did see the light of a proposal Kehrl had designed in January 1944, several weeks after he became head of the Reich Project Commission. Kehrl had noticed, before his entrance into the Speer Ministry, that in several areas of the economy, enormous stockpiles had

accumulated because orders had not been filled as requested. Hitler's new edict gave the armed forces and the para-military units great powers to take inventory of all sorts of materials that no one to date had wanted to release.[18]

Once the order was given, Speer gave jurisdiction to the local arms inspectors and Kehrl was given all necessary powers of attorney for the project. Speer and Kehrl were ultimately responsible for the general distribution of all goods held in reserve. Kehrl immediately employed a large number of people to gain access (by means of photocopied warrants) to reserve depots throughout all the armed services.[19]

Kehrl kept closely abreast of the situation and the results were fascinating. After making the first inventory of the Luftwaffe Ordnance, Kehrl found unexplainably large stockpiles. In fact, a manager was sent to Kehrl with a suggestion that the Air Force would be prepared to immediately deliver uniforms for a million men, and other equipment,[20] if Kehrl's team would stop its investigations at once. Kehrl and his team agreed and received specified allotments and quotas for the next half a year.

The Navy Ordnance had no less than six thousand complete fittings for sailors in store. This action did not only facilitate matters for the next two quarters by making use of the stock piles, but also was effective in reducing the need to rely on the manufacturing and distribution of Party

bodies, such as the Gauaemter for technology.

The inspection of Army Ordnance warehouses had resulted in the finding of enormous stockpiles of equipment and weapons which lacked only certain parts for their completion. The retreat from the Eastern front brought great losses and the army welcomed the older editions and serials of munitions and equipment.

In parallel research, the Office of Planning (under Kehrl) discovered that many other areas, such as repair and spare parts, were treated equally negligently. The fighter staff had already recognized that great numbers of planes could be delivered to the Air Force with a relatively small number of workers and materials, if the repairs had priority to the production of new equipment.[21] The same held true for army tanks, locomotives, and trucks of every kind. Therefore, production of spare parts was increased, which yielded, in combination with a forced program of maintenance, a greater number of weapons and supplies with less effort in work hours and materials, than had been needed for the complete production of new military equipment.[22]

All committees were therefore instructed that repair and completion had priority over production of new systems.[23] Owing to this change in the production of arms and general equipment, vital supplies in the early months of 1945 did not drop nearly as much as they could have, for necessity proved to be the mother of invention.

However, the end was now in sight! General Dornberger and the engineering team of the V-2 program were told they must move from Peenemuende because of the proximity of the Russians. Dornberger moved to Bad Sachsa and was followed in January 1945 by his staff.[24] On 31 March 1945, the whole remaining personnel of the Electromechanische Werke and as much equipment as could be moved, left Peenemuende and arrived at or near Bleicherode where Professor von Braun had set up his headquarters.[25]

When defeat was inevitable, the Germans began to transfer the most recent war inventions still in developmental stages to the southern part of Bavaria with the hope of technological transfer to the Americans should their military situation collapse. They had also hoped to mount a large-scale effort to support an American offensive against the Soviets. The advance of the Soviet armies caused another shift and in the midst of the second shift of location, the unconditional surrender of Germany closed the chapter.

Von Braun's brother, Magnus, was the only one of von Braun's group of engineers who could speak English. He was sent to make the first contact. It took a short while until the Americans realized whom they had in their possession. Once they did, they immediately recognized the value of the team as a whole and gave them entry and eventually carte blanche to continue their research in the United States.[26]

The reports of the British Intelligence Technical Staff

(T-3s) on electronic, atomic, aeronautic, and rocket applications of advanced science that were written immediately after the war and that traced German industrial activity during the first quarter of 1945 frequently contained such significant annotations as the following: "Documents removed or destroyed by the SS before its retreat toward the Bavarian Alps," or "Plans removed by SS men to the mountain areas in the south of the Reich." It is estimated that 300,000 patents were taken as war booty and some fourteen billion U.S. dollars worth of inventions and technical drawings were confiscated by the Americans and British as a result of under-the-table dealing in German scientific documents.[27]

Later in the United States, those around von Braun protected him from any type of bad publicity or outside influence which they deemed not in the best interest of themselves or the later NASA facilities at the Marshall Space Flight Center and its space program.[28] According to Admiral Delmar S. Fahrney of the U.S. Navy, who oversaw the transfer of German engineers, Dr. von Braun was allowed to keep his entire team in exactly the same command structure as Peenemuende, to ensure an effective continuation of the V-2 program, as well as to prevent German scientists from accepting Soviet offers of employment.[29]

Von Braun was perceived by his directors as a father figure whom they wanted to please. Subsequently, they

insisted upon absolute perfection from their own subordinates, as well as themselves. If a director made a mistake, for example, he believed that he did not look as good in the eyes of his father and could lose his exalted place around the organizational table. This striving for perfection, well known at Peenemuende, became an early feature of the American space program.[30]

Imagination and feelings were important to the von Braun team members. They continued their dreams of reaching the heavens. They listened to their hearts while others could not understand their concepts. Within the context, it was no surprise that the German team instinctively utilized novel methods of management and scientific inquiry deeply rooted in Germany's past. Only with a clear understanding of German history and culture, could one begin to understand the success of this group.

XVII. CONCLUSIONS

There are a number of technological programs described here which were influenced by the German political movement. Because of the outcome of the war, the validity of these technical efforts is difficult to judge. Moreover, the German industrial model was different from those of the British and the Americans in that technological development and output in production were closely linked: both phases were under the guidance of the same team. Therefore, at any stage of the war, the level of production of a weapons system tells one something about the success of the technological effort behind it.

It is interesting to note that in spite of Allied bombings, near the end of the war German levels of production in armaments continued to rise. In December 1944, more submarines were launched than in any other month of the war. Similarly, the production of aircraft rose to unprecedented figures. Moreover, the output of conventional weapons was augmented by the development and production of newer, high-technology weapons such as jet aircraft, rocket fighters, and ballistic missiles.[1] All this would seem to indicate that Germany was conducting a successful war effort. Nevertheless, Germany was defeated.

A major contributing factor to the German loss of the Second World War was the political environment in Germany.

This environment can be characterized by three major problems. First, the grand strategy of the war was controlled by only a few decision-makers such as Hitler and Goering. Second, the armament effort in industry was controlled by a dual chain-of-command comprised of military personnel on one hand and Nazi Party officials on the other; toward the end of the war, a third dominant chain of command arose in the form of the SS.[2] Third, with the exception of a few individuals such as Speer, high level officials ignored important details of the technological programs, and this led to fragmentation of the overall industrial effort. A detailed look at each of these areas shows that no one possessed both the authority and the technological sophistication to make the decisions that would win the war. This lack of decision-making, specifically in the field of advanced aerospace weapons, led to delays in advanced missile systems which alone might not have led to victory, but might have lead to earlier settlements or comprises between Germany and her adversaries.

One obvious reason for Germany's failure was Hitler himself. His major strategic decisions from 1941 to 1945 were so clearly wrong that any properly trained General Staff officer ought to have perceived the mistakes. No doubt, after years of belonging to the topmost level of the military apparatus, the officers taking part in war strategy had become so far removed from the reality of the war that they

were no longer willing or able to project the consequences of Hitler's irrationality onto the daily affairs of state.[3]

The top civilian officials also sided with Hitler because he allowed them simultaneously to achieve their own goals and extend their spheres of power. There were some exceptions like Reichsminister Hjalmar Schacht, who was removed in 1937 because of his unsympathetic attitude toward the building of a new and complex industrial infrastructure, the expansion of the armaments program, and, in particular, the introduction of Goering's Four-Year Plan.[4]

Even if Hitler had made all the correct strategic decisions, the German war effort was hindered by continual struggles for power between military and political agencies. And these internal problems during the war were a direct result of the evolution of National Socialism under Hitler.

In Hitler's economic thinking prior to 1933, he developed certain policies of the National Socialist regime: the fundamental readiness to use the state to develop credit; the readiness to subsume the economy under the primacy of politics; and the readiness to develop a military-economic security based on economic policy divergent from the contemporary world markets. This allowed the National Socialist ideology to become firmly entrenched and evolve into a totalitarian power.[5]

The state, according to the National Socialist view, had the obligation to provide a clear framework within which

opposition and rivalries could be overcome, but exactly the opposite took place. The military-industrial system created by Hitler and the National Socialist leadership was a dual chain-of-command. For every Reichsminister in the civilian sector there was a corresponding Reichsleiter in the Party or Field Marshall in the military sector. Sometimes even a triple chain-of-command was created suggesting a migrating political authority governing armament services and political institutions at different times during the Nazi regime. This was exactly what the National Socialists desired because it allowed them to assert authority in practically every area of military and civilian life without necessarily assuring the corresponding responsibility.

The shift to a war economy was impeded by the rivalry of personalities and offices. The Reich Ministers refused to give power of command to the military so that the military could share in the practical goals of the mobilization for total war. The military itself was divided between the armed forces services and the power command of the OKW, each one not wanting to relinquish its own power of control and its command position.[6]

Hitler maintained this rivalry by creating overlapping offices and by continually changing the position of his Ministers. Added to this was the tremendous concentration of power in the hands of the SS. It had the ability to infiltrate other agencies and hand-pick influential members

within all the Reich Ministries, even within Albert Speer's influential Ministry of Armaments and War Production.[7]

In this respect, it can be argued that Hitler and the National Socialists ideologues kept the military and economic forces on a dual track system. This was to change in 1942 when Albert Speer challenged their authority and power. Speer correctly perceived that the existing low production and faulty organization in programs of armament production could not support total war without a major concentration of power in the hands of a capable authority. Moreover, such an authority could not be divided by ideology, personality cult, or traditional military training.[8]

Throughout the war the NSDAP's economic structure had been opposed by technocrats, like Speer, who existed at the highest levels of the industrial system. They were members of the National Socialist movement, but they opposed its military-industrial strategy. They functioned within the Party system out of professional bent and also out of a deep-seated belief in a perceived destiny of Germany, but they were dedicated to the modernization of Germany through technology. Their economic outlook, was not limited to National Socialism in the strict sense. They used many different forms of economic and industrial experimentation from cartelism to industrial and financial implementation of the Four-Year Plan, as well as developing quasi-capitalism and techniques of production based on observed methods of

mass production in the United States.[9]

National Socialists clearly were divided. The original ideologues such as Gottfried Feder and Walter Darré were socialistically inclined.[10] Later party leaders favored a move towards private property, private initiative, middle-class organizations, and business structures owning private commercial property regardless of the needs of war. There were others on the fringe of the Party, like Albert Speer and Hans Kehrl, who preferred a massive build-up in the armaments and war economy and the elimination of competition, as well as the concentration of production into a few large competent industries as in a capitalistic system of monopoly. A third group which was composed of SS specialists like Gerhardt Degenkolb, desired the concentration of production in the hands of the SS state, managing a bureaucratic cartel-economy with totalitarian control. The National Socialist ideologues and the SS were both opposed to Speer's technical urbanization.[11]

The philosophic, political, and social approaches of the National Socialist leaders guided their actions and their agencies through personal loyalties and personal animosities. In addition to Hitler and the NSDAP, Germany suffered from men like SS Reichsfuehrer Himmler and Reich President Goering. Goering, as Plenipotentiary of the Four-Year Plan and Commander-in-Chief of the Air Force showed a continual lack of involvement in crucial areas of Air Force production

and design. His failure to judge accurately the necessities of war and his inability to collaborate with the head of the OKW, Wilhelm Keitel, or other ministries led to his setting of quotas in production that were never realized.[12] In 1941, a narrow Weltanschauung existed within German ideology and politics, emanating especially from those in support of Hitler. This was a direct result of the defeat of France which gave the NSDAP a false sense of confidence under which their economic policies continued to preserve German resources by exploiting newly occupied countries. The apparent success of these policies supported the misguided notion to acquire Lebensraum (living space) towards the East, as Germany looked to provide economic necessities for its own expansion.[13]

The New Order of 1941 was a short-lived episode within which The Third Reich envisioned a complete military victory in all Europe. Only after the winter of 1942 was the Hitler regime forced to overhaul quickly its military-industrial priorities, and the political and economic ideologues had to face up to a very long and wearying war and begin the building up of a more effective infrastructure.[14]

In the early stages of the war from 1938 to 1942, Germany had a number of short-range plans to produce armaments sufficient for a series of Blitzkrieg engagements. None of these plans, however, could support the capacity of production required by total war. At the high point of the

war, for the Germans, in late 1942, out of necessity, Speer and others challenged the National Socialist regime to modify its imperialistic ordering principle. The political goals of a Blitzkrieg were no longer applicable. The concept of Germany's New Order began to be opposed. The global perspective of a German prosperity sphere equalling a unified Europe was only a dream. However, the National Socialists never gave up on the idea that after the war Europe would be dominated by German industry.[15]

The blending together of the models of war and National Socialist political thinking at that time led to profoundly erroneous conclusions that compounded the tragedy of the Nazi episode in German history. As the Allies grew in strength and fighting spread to five fronts, the National Socialist regime was not prepared to deal with the complicated infrastructure required to prosecute the war and maintain control of all occupied territories under their jurisdiction. As the war became ever more demanding--became total war--the Nazi region failed to measure up and meet the demands. Its policies were founded on the presupposition of swift, easy military victories in Europe and the belief that the exercise of raw power could be efficacious in controlling the conquered peoples and exploiting their resources. The Nazis were wrong on all counts.

America's involvement came at the very moment when Germany's national economy was no longer able to meet the

increasing demands of the front. Germany had to fight almost single-handedly against three great world powers whose capacity for producing armaments exceeded hers at fifteen to one.[16]

In the face of the coming defeat, near the end of the war, no council ever formed that could oppose Hitler's decisions. The consequences of this must not be underestimated as far as the military interests in production of armaments were concerned. On the military front, only Speer, a non-military technocrat, was strong enough to implement direct overall leadership in the production of armaments. This happened only after Hitler had eliminated much of the armed forces leadership and neutralized the War Economics and Armament Office of the OKW, who controlled the ways and means of production for military ordnances.

Ironically, even with the advent of total war in 1942, and with Speer's newly instituted civilian control of all war production, there was still no agency which would provide an overall military-economic policy to address the demands of the continuing war. Plans for production in armaments continued to be undermined by conflicts of personality among Goering, Keitel, Himmler, and Speer. With the exception of Speer, the Nazi rulers were always dependent on the old elite to maintain the essential functions of government, because the Nazi system itself failed to allow for the evolution of competent new leaders.[17]

The untenable situation arose that Hitler had become the only authority to adjudicate all conflicting views in military issues. Hitler arbitrarily changed the programs of the armed forces and interfered by continuous special actions which were by no means always in the interests of the military. Thus, a long-term armaments-program was compromised by improvisation. In simple fact, Hitler issued some orders based on decisions that were wrong. The armed services subsequently objected to these decisions, but in vain. Owing to the conflicts within the military services, Speer found it impossible to estimate the military requirements, so he became obligated to execute the so-called Fuehrer Program.[18]

In the midst of chaos, Speer foresaw the emergence of a new European economic community using new methods of management governing goods and services. Total employment, a high standard of living, and security against foreign influence were defined as the goals for the post-war economic community in which Germany was to play a leading political and economic role. With this modified world view, representatives of industry, like Speer and Kehrl, had initiated the steps to achieve these goals.[19]

Whether he intended to or not, Speer also had much to do with the establishment of the technological community in the post-war world. Under Speer, the armament program exploited technology that had previously waited on the side-lines of

the war. In particular, vast numbers of patents and futuristic aerodynamic designs were identified and supported by Speer.

Rallying behind a German ideology that was more nationalist than socialist, the German technical community worked to rise above the red tape of the bureaucrats. However, the technological progression was continually stymied by political circumstances. From time to time, the technologists could win small battles. For instance, Speer lifted patent restrictions to allow civilian design-groups access to military inventions. He also relaxed governmental specifications to allow partial retooling whenever a weapon system was modified, instead of the complete retooling dictated by the previous standards. It seems, however, that neither institutions or political processes permitted scientific foundations to be laid and technology to take its proper course. What the exigencies of the systems in conflict did produce was the emergence of the technocrats and technicians as a new warrior class within the vigorous conditions of total war.[20]

Until Speer, the German command could hardly see the significance of new rocket and jet technologies, and owing to an almost incomprehensible misjudgment of the actual situation of the war, all research into new weapons that might have taken just over one year to complete was banned or limited in 1941! Later, when this ban on research was lifted

and work resumed, a delay of more than one year had resulted and in many fields the loss of time could no longer be remedied.

During the last two years of the war, Speer created a vast framework to develop and deploy a new breed of weapons. These Wunderwaffen consisted of weapons of high technology such as high-altitude guided missiles and jet aircraft whose performance was so advanced that the German High Command believed they would turn the tide of the war. These superweapons appeared to be destined to replace conventional weapons in almost every category.

Germany redirected nearly all its industrial capability to the production of these new weapons. However, even with full-scale production of the Wunderwaffen, Germany was still unable to deploy these weapons in sufficient numbers.

The circumstances that proved fatal to technical advisors were: (1) Hermann Goering provided no leadership as the nominal head of the Luftwaffe and the Oberkommando der Wehrmacht (OKW) failed to play a much needed role as coordinator of the Armed Services; (2) German political institutions developed no theory and practice of planning for a long-term war which could have more rapidly led to the development of new air weapons, e.g., no support was given for the V-1 and V-2 efforts from 1939 to 1943; (3) when recognition was made of the profitability of these new air weapons, a major shift of Hitler's support to the V-2 in 1944

was done at the expense of developing a sophisticated fighter and bomber fleet; (4) the German High Command had no full comprehension of the effect of Allied day-bombing, which drove German industrial production underground or into oblivion by mid-1944; and (5) air force leadership under Ernst Udet had no overall conception of using the most advanced jet fighter of the period, the Me 262, which was ready for operation two years before its deployment.[21] Although their weapons configurations were not sufficient, the organization and especially the technical excellence of the German engineering teams were to survive the war.

With the exception of Speer and certain military commanders, it was the Allies, and not the German elite, who recognized the full value of the new aerospace technology as early as 1943.[22] Owing in part to their own accomplishments, both the United States and the Soviet Union were able to separate the German Nazi ideology from its technical accomplishments. The Americans were able to maintain and use the same German technical structure almost twenty-five years after the first V-2s were launched.[23]

By way of historical reconstruction, the period of the Second World War can be seen as a pivotal area for a larger industrial-technical drama taking place, not from 1939 to 1945, but from 1929 to the end of the Cold War period in 1989. With the technological transfer to the West in 1945, [24] the nature of science during the Nazi period shifted, in

part, to America. First, the Germans tried to build advanced rockets in a wartime economy, then, the Germans and Americans built them together in a different economy in the United States where they were given scientific legitimacy and National Security clearance.[25]

In American hands this technology continued its role as a psychological deterrent employed as ballistic missiles against the Soviet Union and other contenders for world leadership. The Intercontinental Ballistic Missiles were a logical extension of the V-2 weapon which was foremost a psychological weapon of terror.

The beginnings of German wartime technology have also led to more benign aerospace science with the creation of orbital space stations, and ultimately, the industrialization of outer space. Thus, the command structure and basic technology derived from the German aerospace team has led to: the successful American realization of the first ballistic missile with an inertial guidance system; the development of a satellite launch-capability; the first Russian satellites in space; the launching of the first astronaut into space; and the Apollo program which put the first men on the Moon.[26]

A large accomplishment began with a small team of experts whose direction and major funding in the end came not from Germany but from the United States through cooperation between the government, military, and scientific communities.

The same team of experts who labored unsuccessfully under Germany's confused political institutions, received scientific and institutional support in an improved social environment in the United States, where they evolved scientific and technical goals that received world-wide acclaim in the field of aerospace science.

APPENDIX A:

The Kegelduese

The Kegelduese used pressure-fed gasoline with liquid oxygen poured into thin-walled cooper vessels inserted into a massive steel tank. Both containers were pressurized from a steel cylinder containing high-pressure nitrogen. The 2,000 psi pressure in the cylinder was reduced to 150 psi by a welder's pressure reducer. The gasoline and liquid oxygen were piped to the Kegelduese by 1/4 inch copper tubing. The Kegelduese itself, with the exhaust nozzle pointing upward, was submerged into a water-filled bucket for cooling, which in turn was placed on a grocer's scale to measure the thrust. Fuel and oxidizer consumption during operation of the Kegelduese were measured by gauging the container contents before and after the test.

APPENDIX B:

Personalities in Business and Technology of the Third Reich

Arnhold, Carl R. Founder and Director of Dinta Institute, which sponsored training programs for development of social engineers in industrial plants. Appointed head of vocational-training division in Labor Front in 1936. Established pilot training schools for industrial apprentices; strongly influenced apprenticeship policy of Goering's office for the Four Year Plan.

Blenk, Hermann. Director of the new Hermann Goering Aviation Research Institute that was established at Volkenrode-Braunschweig.

Bormann, Martin. Secretary to Rudolf Hess (1931); enemy of Ernst Roehm (1932). Managed funds for Hitler Donation; built Hitler's Berghof in Bavarian Alps. Appointed chief of party chancellery in 1941. Systematically extended his influence over the Gauleiter and exercised great power in last phase of the Nazi regime. Confidant of Hitler.

Buetefisch, Heinrich. Chief of Leuna plant (central Germany) of I.G. Farben. Visited Hitler in summer of 1932. Secured contract (signed in December, 1935, by Undersecretary in Ministry of Economics) for supply of synthetic gasoline to Third Reich and granting I.G. Farben a ten-year price guarantee on costplus-profits basis. Member of Keppler circle and honorary officer of the SS. Indicted in I.G. Farben trial at Nuernberg,

Darré, Walther. Agronomist and author of The Peasant as the Bearer of the Nordic Race (1928). Joined NSDAP in 1930 and organized peasant branch of the party. Head of agrarian division at party headquarters and of racial office of the SS (1931-38). Appointed Leader of the Peasants and then (1933) Minister of Agriculture. Father of entailed-estates law and "ordered markets." Supported Four Year Plan for agriculture and introduced German state organizations into occupied countries. Dismissed by Hitler in 1943.

Degenkolb, Gerhardt. Trained as engineer, Degenkolb rose to become head technocrat of the Deutsche Bahnhof as ace of massive reorganization and production of trains at Kassel. Later as SS *obergruppenleiter* Degenkolb was selected by Himmler and Speer to built special rail networks and launch facilities for the V-2 for strategic firings according to the needs of Dr. Wernher von Braun.

Dornberger, Walter. As a young engineer of rocketry and

colonel in the German army (1932), Dornberger with the assistance of August Nebel and Wernher von Braun laid the foundations for the Wehrmacht's support of early testings of field rocketry and, later, the V-2, as a military weapon. Later to become a general and honorary member of the SS, Dornberger established the advanced teamwork for some two thousand German engineers who were returned from the war front to work exclusively at Pneenemuende. As post-war specialist at Bendix Corporation, Buffalo, Dornberger was also a consultant to U.S. Naval Weapons and NASA.

Feder, Gottfried. Trained as engineer; later became charter member of NSDAP. Co-authored party's program and served as member of its central committee. Elected to parliament in 1924. Chairman of the party's economic council, advisor on economic affairs, and head of party's technical branch. Coined "thraldom of interest" slogan and proposed a work-creation program. Demoted by Hitler in Gregor Strasser dispute (1932). Later (1933-34) undersecretary in Ministry of Economics and Commissioner of Resettlements (1934). Dismissed by Schacht after Roehm purge and stripped of his offices in the party.

Flick, Friedrich. Formerly head of Mitteldeutsche Stahlwerke A.G and substantial shareholder in Vereinigte Stahlwerke A-G. Sold his shares of the Gelsenkirchener Bergwerksgesellschaft to the Reich in 1932 and contributed two million marks to political parties, including the NSDAP. Regained his sold shares and also exchanged (via Goering) "black" for "brown" coal properties. Member of the Himmler Circle and negotiator in obtaining confiscated properties. Greatly increased his holdings during Hitler regime. Indicted but acquitted by International Military Tribunal in Nuernberg. Subsequently rebuilt his industrial empire in Germany.

Frick, Wilhelm. Served with police headquarters in Munich (1922-23). Involved in November revolt in Munich, but released by the court. Member of parliament in 1924. Minister of Education in Thuringia in 1930, Reichsminister of Interior in 1933. Opposed "second revolution" and disliked by Himmler, but replaced by the latter in 1943 as Minister of the Interior. Sentenced by the--IWCT--International War Crimes Tribunal.

Funk, Walter. Resigned as editor of Berliner Borsenzeitung in 1931 and joined NSDAP. Served as liaison between party and business leaders and headed party's economic council in 1932 while soliciting funds for the party. Undersecretary in Ministry of Propaganda from 1933 to 1938; member of council of ministers dealing with foreign-exchange crisis (1936); Minister of Economics in 1938; president of the

Central Bank in 1939; temporary Plenipotentiary-General of War Economy. His functions were gradually absorbed by Albert Speer. Indicted by the IWCT.

Goebbels, Paul Joseph. Gauleiter of Berlin and Reichminister of Propaganda. Participated in the making of several decisions that had economic significance. Organized Chamber of Culture and pressed all cultural professions into compulsory, party-dominated organizations. Started spoliation policy against Jews and sought to undermine Speer's position of pragmatism and quasi-capitalism in 1942-1943.

Goering, Hermann. Appointed Reich Minister of Air Force in Hitler government (1933) and Prussian Minister-President and Minister of Interior. Consistently exhibited extraordinarily strong position for new technical innovations. Negotiated standstill agreement with Thyssen and Voegler in 1933; used Prussian police to remove Nazi commissioners in business organization. Deceived Schacht by accepting chairmanship of Commission on Raw Materials and Foreign Exchange (1936) and subsequently outmaneuvered him in long, intricate struggle for control of the economy. Put in charge of Four Year Plan in 1936; founded Hermann Goering Works A-G in 1937 that aimed at making Germany and the German airforce supreme through synthetic fuel research. Passed on all major economic decisions from 1937 to 1942.

Grauert, Ludwig. Manager of employer association for northwest area of the Ruhr and member of NSDAP. Obtained loan of 200,000 marks for Goering's newspaper in Essen (1931) and campaign funds for NSDAP in spring election of 1932. As undersecretary in Prussian Ministry of Interior, he supervised suppression of Prussian police and was responsible for secret law that transformed SA units into auxiliary policy and prepared legal basis for terror election of March, 1933. Subsequently, after political monopoly of NSDAP had been assured, took action against local Nazi extremists.

Himmler, Heinrich. Reich leader of Blackshirts in 1929, and head of all German police in 1936. Commissioner for resettlement of Germans in other lands in 1939; leader of SS armed forces and Minister of Interior in 1943; Commander-in-Chief of Home Army in 1944. His interest and actions had more indirect than direct economic influence: co-responsible for removal of SA leaders in 1934 and thus helped to defeat economic counterrevolution; used unified police forces and Gestapo to frustrate combined actions of Hjalmar Schacht and steel industrialists in 1937. As a technocrat of the SS State from 1941 onwards his

inner team collected annually about one million marks for the SS through business friends in the Himmler Circle. He transformed labor programs under Sackel into forced camps of day-and-night production (under Fritz Kammler) for the components of new aircraft and V-2.

Kehrl, Hans. Chef des Rohstoff und Planungsamtes fuer Ruestung und Kriegsproduktion. Former director of religious affairs in the Reich, Kehrl rose to become second-in-command under the Speer government and played a leading role in German-French relationships of economic development from 1942 to 1945. He also developed the business ID card for fabrics.

Keitel, Field-Marshal Wilhelm. Headed political division of Ministry of War in 1934, and later (1938) in charge of Military High Command (OKW), which replaced the Ministry. As deputy for the Fuehrer in military administration, he rejected all arguments against the leader's military strategy. Worked for full mobilization of the economy as chairman of working committee of Reich Defense Council, and, while head of the OKW, insisted on economic preparation for lightning war.

Keppler, Wilhelm. Manager of small chemical factory when selected as Hitler's liaison with business leaders. Organized Keppler circle and persuaded Hitler to address it in 1932. Instrumental in arranging meeting between Hitler and von Papen in January, 1933; urged business leaders to petition von Hindenberg for appointment of Hitler as Chancellor. Made economic adviser by Hitler, with instructions to restrain economic actions of party offices during first phase of the regime. By sustaining close contact with I.G. Farben and other concerns, helped to prepare the way for Four Year Plan. Also acted as agent for Hitler in Austrian Anschluss and liberation of Czechoslovakia and served as state secretary, with special duties, in Ministry of Foreign Affairs 1938-45.

Koerner, Staatssekretaer und Stellvertreter des "Beauftragten fuer den Vierjahresplan.

Krauch, Carl. Well-known chemist and head of Oppau Works of I.G. Farben. Successfully negotiated Air-Force contract for protection of synthetic oil. Joined Goering's economic staff in 1936 and became head of research-and-development division. Worked out details for production of synthetic rubber by I.G. Farben and completed preliminary draft of Four Year Plan. Joined Nazi Party in 1937. Put in charge of chemical sector of economy in 1938 and directed production of chemical industries while acting as chairman of the board of I.G. Farben.

Krupp von Bohlen und Holbach, Gustav. Minor diplomat and son-in- law of Friedrich Alfred Krupp (1906). Not in Hitler's favor prior to von Paper government but later signed petition seeking Hitler's appointment as Chancellor. Actively collaborated with Nazis during second phase of regime by making pilot plants and skilled workers available to Hermann Goering Works A-G and by providing many of the weapons used by German armies in WW II.

Ley, Robert. Early member of Nazi party and Gauleiter of Cologne until 1932. First, deputy head and then head of party political organization. After seizure of trade-union buildings, appointed leader of the Labor Front. Authored abortive law in 1934 that was intended to organize not only all employers and employees but all business organizations as well under the Labor Front. Prevented by Schacht and Goering from incorporating handicraft organizations into Labor Front and by Hess and Goering from making it independent of the party. He supported increasing demands of Four Year Plan on workers and used Labor Front as administrative agent in employment of forced labor.

Ohlendorf, Otto. Leading thinker within the SS and anti-Speer opponent on issues of modernization and quasi-capitalism during the Second World War. Along with Oswald Pohl formed the leadership in the SS chain-of-command which sought to keep all engineering projects under SS control.

Osenberg, Werner. Head of the Planungsamt des Reichsforschungsrates and sponsor of position papers within the SS to establish scientific and engineering cells near the end of the War (1944-1945) so that experts working on special projects in fuels and flight systems, including Party and non-Party military specialists (General Adolf Galland), could avoid red-tape of bureaucracy.

Pleiger, Paul. Started as businessman in western Germany; served as economic advisor to his Gauleiter. On staff of Wilhelm Keppler when it was incorporated into Goering's Commission on Raw Materials and Foreign Exchange (1936). Combined managerial abilities with ruthlessness; helped to originate the Hermann Goering, A-G, of which he later became general manager. Sought to promote the influence of the state in coal and steel industries and in 1942 was appointed plenipotentiary director of the coal industry in occupied countries.

Poensgen, Ernst. Member of managerial board of Vereinigte Stahlwerke A-G at its formation in 1926; in charge of most of the iron and steel cartels and of trade association for

Ruhr iron and steel industry. Opposed by Gauleiter for the Ruhr area as head of economic groups but confirmed in this position by Schacht (1934) in spite of Nazi protests. Influenced Schacht in latter's decision not to implement Goerdeler's proposal to lower cartel prices. Obtained the right to formulate Four Year Plan for steel, but unable to prevent founding of Hermann Goering Works A-G. Remained head of iron and steel group until 1942, when his organization was replaced by Reich Association created by Speer Ministry.

Schacht, Hjalmar. Entered politics as member of German Democratic party; appointed currency commissioner (November, 1923); twice president of Central Bank (1924-30), 1933-39). First negotiated and then repudiated the Young Plan. Strong supporter of Hitler and a principal speaker at Harzburg Conference. Acting Minister of Economics (August, 1934, to November, 1937); Minister without portfolio from 1937 to 1943.

Scheer-Hennings, Rudolf. Member of group of intellectuals sponsoring the cause of Nazified small business. As commissioner of steel- products industry in Ruhr, he proposed to set up a guild-like market organization. This proposal was not accepted, but Sheer was recalled by Kurt Schmitt (then Minister of Economics) as commissioner and given the figurative title of economics consultant. Later became one of the officers in selling agency of the steel cartels and joined Hermann Goering Works A-G in 1937.

Schmidt, Ernst. Father of the "heat-transfer" process, Schmidt was head of the motor institute within the Hermann Goering Aviation Institute at Braunschweig. As an adviser to Peenemuende and the Planungsamt, his work was central to the development of the turbines and servomechanisms used in both V-2s and in the jet craft of the aviation industry.

Schmitt, Kurt. Director-general of Allianz, Germany's largest insurance concern. Appointed Minister of Economics in July, 1933; made public his compromise with Hitler, which ended interference of intransigent Nazis in business. Called a halt to efforts to organize economic estates; issued two cartel laws and a law on the preparation of an "organic" form of economic organization. Later turned against cartels and regulation of imports and delayed payments of subsidized for synthetic oil. Forced to resign in June, 1934, he joined the Himmler circle.

Schmitz, Hermann. Treasurer of I.G. Farben and later (1934) director-general of same concern. Elected member of parliament in November, 1933, as Nazi

representative. Signed gasoline contract in December, 1933. Supported synthetic rubber contract in 1935 and subsequently favored close collaboration with Four Year Plan and its projects, including construction of new plants near Auschwitz.

Schroeder, Freiherr Kurt von. Banker of Cologne, member of Keppler circle, organizer of petition to von Hindenburg urging appointment of Hitler as Chancellor in November, 1932. Invited Hitler and von Papen to meet at his home and clear the way for Hitler government. Member of Himmler circle after 1936 and collector of funds amounting to one million marks a year for the SS.

Speer, Albert. German architect and Nazi politician. Rebuilt Reichschancellery at Berlin according to Hitler's plans and worked with Fritz Todt on Autobahnen in 1930's. Became Minister of Munitions and Armaments after Todt's death (1942). Played major part in building of Siegfried Line and construction (1943- 1944) of Channel defenses. Sentenced by the International War Crimes Tribunal at Nuernberg (1946) for responsibility in German use of slave labor during WW II.

Thomas, Georg. General-Staff officer and head of economic division of War Ministry. Wrote many important memoranda that prepared for subsequent policy deficisions (e.g., on economic dictatorship, June, 1934; foreign-exchange situation, February, 1935, and September, 1936) and contributed many ideas toward realization of goals and polices or original Four Year Plan. Subsequently turned against Hitler's lightning warfare and lost confidence in the regime after von Fritsch affair, but continued to serve until 1943, when his division was absorbed by the Speer Ministry.

Thyssen, Fritz. German industrialist and substantial shareholder in Vereinigte Stahlwerke A-G (United Steel Works). Joined Nazi party in 1931, arranged for Hitler's speech to industrialists in Duesseldorf (1932), signed petition urging von Hindenburg to appoint Hitler as Chancellor (November, 1932). Economic advisor to Ruhr Gauleiter (1933), Proposed leadership councils in management of industrial relations (1933); gave estimated one million marks in support of Nazis. Unwilling to vote in parliament for Hitler's plan to invade Poland, Thyssen left Germany. His holdings were then taken over by Prussian state and managed by Kurt von Schroeder in the interest of the government.

Todt, Fritz. Construction engineer. Joined the Nazis in 1923 and became model engineer for the Reich. Builder of Autobanen and West Wall, leader of NS-Technicians (after Gottfried Feder), inspector-general of German highways, and plenipotentiary director of construction industry (1938-42). Later inspector-general for water and power industry, and Minister for Arms and Munitions from 1940 to 1942. Killed in airplane accident February 8, 1942; succeeded by Albert Speer.

Voegler, Albert. First director-general of Vereinigte Stahlwerke A-G, member of parliament for German People's Party, and German delegate to Young Plan conferences. Resigned in protest against the latter and joined Keppler circle. Signed petition to von Hindenburg urging appointment of Hitler as Chancellor (November, 1932). Negotiated with Goering on economic reorganization (1933) and Four Year Plan (1937). Supported Speer's reorganization of steel industry (1942) and acted as economic chief of western Germany in last phase of World War II.

Von Braun, Wernher. Renown engineer who rose from tutelage under Walter Dornberger and Walter Riedel to become the recognized head of the A-9 project area assigned with the task of producing V-2s during the Second World War. His role as technical adviser to Speer and Fritz Kammler led to controversial decisions which many feel cost him the directorship of NASA following the success of the Apollo-Moon program (1969).

APPENDIX C:

Hermann Goering Aviation Research Institute at Braunschweig

The Hermann Goering Aviation Research Institute facilities including:

- The Institute for Aerodynamics
- The Institute for Materials Durability
- The Institute for Gas Dynamics
- The Institute for Kinematics
- The Institute for Engine Research
- General Administration.

The section provides the reader with a feel for the size, and complexity of the undertaking, but one must wade through an inordinate amount of technical detail to get there. It is obvious that the writers of these subsections were technical personnel. An outline of the subsections and titled paragraphs follows:

a. Institute for Aerodynamics
b. The Institute for Materials Durability
c. Institute for Gas Dynamics
   - Choice of Construction Type for the High Speed Wind Tunnel
   - High Speed Wind Tunnel with Pulsing Operation
   - High Speed Wind Tunnel in Constant Operation
   - Test Stand for Jet Engines
d. Institute for Kinematics
e. Institute for Engine Research

8. Previous Work of the Institute

This section provides an overview of the previous research work conducted at the institute. Each subparagraph addresses a particular discipline. The presentation is subdivided into general areas of interest and each subsection is followed by a listing of the studies, reports, or publications that the particular institute released as of the writing of the original text. An outline of the subsections and titled paragraphs follows:

a. Institute for Aerodynamics
   - Longitudinal Stability
   - Side Stability
   - Controls Studies (flaps, rudder, etc.)
   - Vibrational Studies
   - Test Equipment and Methods
   - Airframe Studies
   - Special War Requirements
   - Publications

b. The Institute for Materials Durability
   - No breakout of specialized areas
   - Publications
c. Institute for Gas Dynamics
   - Measurements Using Models
   - Theoretical Gas Dynamics
   - Experiments with Rocket Engines
   - Theory of Jet Engines
   - Publications
d. Institute for Kinematics
   - No breakout of specialized areas
   - Publications
e. Institute for Engine Research
   - Thermodynamic Fundamentals and Measuring Techniques
     + Theoretical Comparative Processes
     + Steady Pressure Gas Turbines
     + Iron Buildup in Large Volume Exhaust Gases
     + Comparative Studies of Streamlined Bodies
     + Temperature Measurements in High Speed Air Streams
     + Piezoquartz Apparatuses for the Measurement of Rapidly Changing Pressures
   - Heat Transfer and Cooling
   + Fundamentals
   + Thermal Characteristics of Materials
   + Heat Transfer in Cross Currents
   + Heat Transfer through Materials in Critical Conditions
   + Heat Transfer in Firearms
   + Insulation in High Altitude Aircraft
   + Jet Coolers
   + Cooling Measurements
   - Combustion Questions
   + Combustion and Knock
   + Combustion and Turbulence
   + Physical-chemical Processes in Combustion
   + Backfire Production and detonative Combustion
   - Current and Vibration Manifestation in Gases
   + Gas Exchange Processes
   + Gas Vibrations of Large Amplitude
   - Power Plant Development
   + Gas Turbines with Ceramic Blades
   + Jet Engines (Motors)
   + Jet Engines (Apparatus)
   + Short Term Performance Enhancements in Motors
   - Miscellaneous

Projects of the Hermann Goering Institute: Braunschweig

Schmidt's Project Agenda for the Motor Institute
Synopsis of specific research programs developed by Dr. Ernst Schmidt:

1. Thermodynamics and Combustion

Careful study of thermodynamical calculations involving combustion and high temperature reactions, evinced the necessity of finding new values for the dissociation constants of OH for new fuels.

The German team using new methods for the revaluation of the dissociation constants of OH by spectrographic methods.

1.1 The study of Preliminary reactions in combustion

The study of the preliminary reactions taking place in combustion and immediately before ignitions in motor control systems was investigated with a special engine which is motored; samples were taken periodically, and the products were frozen and analyzed.

2. New apparatus of micro-combustion and Heat Transfer was developed.

2.1 A new method of gas micro-analysis was been created and the chromatographic method for the analysis of peroxides was developed.

2.2 New methods for the preparation of peroxides have been developed for rocket alternatives.

3. Heat Transfer Work for Aerospace

3.1 A vast study of heat transfer through pipes at subsonic velocities.

3.2 Heat transfer to pipes at supersonic velocities that needed (WWII) to be investigated.

3.3. Heat transfer of liquids at critical points needed (WWII) to be investigated.

3.4 Heat transfer from turbine blades needed (WWII) to be investigated.

4. New Turbine Design during 1944-45

4.1 Interferometer tunneling up to 0.35 Mach for cascades

of blades under heat transfer conditions.

4.2 High speed interferometer tunneling for cascades of blades.

4.3 Dynamic similarity theory for testing model turbines under artificial flow conditions.

4.4 Electrical analogy of 3 dimensional potential field tank.

4.5 Water cooled rotor system with ceramic stator using new type of blades.

4.6 High speed torquemeter for compressors and turbines to run up to 40 000 RPM.

4.7 High speed precision tachometers up to 40 000 RPM.

5. Physical-Chemistry Breakthroughs by Schmidt Team

5.1 Vapor diffusion measurements by interferometric methods.

5.2 Investigation of critical points by new refractometric system.

5.3 Piezo-electric pressure indicators with high natural frequency (100 000) for study of detonation phenomena.

5.4 Schlieren photography of flame fronts and shock waves, etc., at a rate of 25 000 sec. generated in combustion chamber where an extremely fast compression was effected at piston speeds of over 150 F/s.

6. HIgh Altitude Test Plants

6.1 Air vehicles capable of 50 to 50,000 foot ceiling which could test any type of engine or combustion chamber.

For further information see:
Ernst Schmidt, "Waermeschutz durch Aluminiumfolie," Sonderbruck aus Zeitschrift des Vereines Deutsches Ingenieur. 1927.

APPENDIX D:

Members of the Scientific Commission
of the Hermann Goering Institute

Location: Braunschweig
Date: August 29, 1944

1. Athen, Reg. Baurat Dr., Heereswaffenamt
2. Bauer, Ob. Reg. Rat., Dr., OKM, Berlin
3. Betz, Prof. AVA, Goettingen
4. Berthmann, Dr.-Ing. Leverkusen
5. Boedewadt, Dr., Pibrans
6. Buchmann, Min. Rat., OKM
7. Buechen, Fl.-Stabsing. RLM
8. Bunde, Obltn. Dr., RLM
10. Eckarth, Reg. Rat. Dr., CPV, Kiel
14. Engel, SS HQ Stab, Pibraus
15. Fischer, Dr., Freiburg
16. Fresdorf, Dr., Strassburg
17. Greune, Dr. Frkft/M.-Hoechst
18. Grosse, Dipl.-Ing., Dueneberg
19. Hackemann, Dr. LFA
20. Hesse, Fl.-Ob. Sturmbannfuehrer, Berlin
21. Holt, Dr. E. von, Reinsdorfwerke
22. Kappel, Dr., Semtin
23. Kesslau, Dr. Bueneberg
24. Klein, Dir. Dr., Berlin
25. Knoller, Dr., Wien
26. Koemmnick, Dr., Berlin-Gatov
27. Kutterer, Dr.-Ing. Ob.Reg.Baurat, Berlin
28. Krische, Ob.Reg.Baurat, Berlin
29. Krautschick, Fl.-Haupt-Ing., Berlin
30. Kroeber, Oberstltn. OKH, Berlin
31. Landsmann, Assess., Luebeck, DWM
32. Leunig, Dr. Dueneberg, DHS
33. Lindberg, Dr., Kiel
34. Mossmann, Dr., Heereswaffenamt
35. Orthmann, Prof. Dr., Berlin
36. Plas, Oberst, Heereswaffenamt
37. Poepl, Dr., Berlin
38. Roegener, Dr., Strassburg
39. Rossmann, Prof.
40. Schade, Obltn. Dr., OKH, Berlin
41. Schardin, Prof. Berlin-Gatow
42. Scheel, Dr., Braunschweig
43. Schuessler, Dr. LFA
44. Schmidt., E., LFA, Braunschweig
45. Schweikert, Prof. Dr., Kummersdorf
46. Stankiewicz, Dr., Walsrode
47. Steinhart, Mar. Ob. Baurat, OKM
48. Teuber, Dr., Rheinmetall-Borsig

49. Tiling, Hptm., Berlin
50. Thiessen, Prof. Dr., Berlin
51. Wolff, Prof. Dr., Berlin
52. Walter, Dr., OKM, Berlin
53. Wiegel, OKM, Berlin
54. Zeyes, Fl.-St.-Ing., Berlin

Reichsforschungsrat Members - 1944

Scientific Leaders from the Special Working Communities and Institutes of the Reich's Research Council
(as of October 1, 1944)

1. Professor Dr. Bentz
   Bevollmaechtigter fuer Mineraloelforschung
   Berlin N 4, Invalidenstrasse 44

2. Professor Dr. Kurt Blome
   Bevollmaechtigter fuer Krebeforschung und Leiter des Zentralinstituts fuer Krebsforschung
   Reichinstitut an der Reichuniversitaet Posen
   Berlin SW 68, Lindenstrasse 42

3. Direktor Hans Crampe
   Bevollmaechtigter fuer Nahrungsmitteltechnik
   Baden-Baden, Schillerstrasse 4

4. Dr.-Ing. Richard-Eugen Doerr
   Bevollmaechtigter fuer Faserstoff-Forschung
   Hamburg 36, Phrix-Haus

5. Staatsrat Professor Dr. Esau
   Bevollmaechtigter fuer hochfrequenztechnische Forschung
   Berlin-Gatow, Kladower Damm

6. Professor Dr. W. Gerlach
   Bevollmaechtigter fuer kernphhysikalische Forschung
   Muenchen 22, Ludwigstrasse 17

7. Professor Dr. Gladenbeck
   Bevollmaechtigter fuer fernsteuerungstechnische Forschung
   Berlin NW 7, Dorotheeenstrasse 35

8. Professor Dr. Joetten
   Leiter des Reichsinstituts zur Erforschung und Verhuetung der Staublungen-Erkrankungen
   Muenster/Westf., Hygienisches Institut der Universitaet

9. Professor Dr. H.P. Kaufmann
Bevollmaechtigter fuer Fettforschung
Muenster/Westf., Lortzingstrasse 10

10. Professor Dr.-Ing. Ernst Schmidt
Bevollmaechtigter fuer Strahlvortrieb
Braunschweig, Postfach 390

11. Professor Dr. G. R. Schultze
Kommissarischer Leiter des Reichinstituts fuer
Erdoelforschung, Hannover,
Braunschweig, Fasanenstrasse 3

12. Dr. Schulz-Kampfhenkel
Beauftragter fuer Sonderaufgaben der erkindlichen
Forschung,
Neudorf am Groeditzberg Bezirk Liegnitz

13. Generalarzt Professor Dr. Schreiber
Bevollmaechtigter fuer Seuchenforschung,
Berlin NW 40, Scharnhorststr. 35

14. Min.-Dirigent Professor DR. E. Schumann
Bevollmaechtigter fuer Sprengstoffphysik
Berlin NW 7, Neue Wilhelmstrasse 15

15. Professor Dr. Richard Vieweg
Bevollmaechtigter fuer Kunststoffe
Darmstadt, Hochschulstrasse 2

16. Professoro Dr. Wagemann
Bevollmaechtigter fuer empirische Wirtschaftsforschung
Berlin-Charlottenburg 2, Fasanenstrasse 6

17. Professor Dr. Wuest
Leiter der Marinegeographischen Arbeitsgemeinschaft,
Berlin-Frohnau, Edelhofdamm 49

APPENDIX E:

Reich Investment Strategy for Armaments

The Military-Industrial Profile
In the 1930s of Germany

The absolute and relative development of military expenditures from 1932-44 in Millions of Reichsmark according to Otto Weitzel.

	(1)	(2)	(3)
1933	2772.0	16.5	7.0
1934	6143.0	29.7	12.2
1935	8017.0	36.0	14.1
1936	12325.0	46.0	19.8
1937	13360.0	45.7	18.7
1938	22000.0	55.8	25.3
1939	37340.0	62.8	37.5
1940	66445.0	79.1	60.4
1941	86500.0	81.2	72.1
1942	110400.0	83.1	88.3
1943	132800.0	87.5	98.4
1944	149800.0	89.2	115.2

(1) Military Expenditures
(2) Military Expenditures compared with % of Public Sector
(3) Military Expenditures compared with % of GNP

Note. In the end phases of the war the expenditures were higher than the entire amount of the national income. Eleven billion RM were being spent in 1939 and 149 billion, 800 million RM in 1945. The Military had a spending rate faster than they could accumulate funds.

APPENDIX F:

Major Third Reich Cartels in 1939

	Tonnage quota 1939
Steel Trust	
Vereinigte Stahlwerke AG	37,626,520
Concordia Bergbau AG	2,200,000
State-owned Mines	
Saargruben AG	15,686,000
Hibernia AG	13,958,300
Alta Haase (Vereinigte Elektrizitaetswerke)	700,000
Flick Combine	
Harpener Bergau AG	11,676,000
Essener Steinkohlenbergwerke	9,529,000
Siebenplaneten	1,215,000
Krupp	
Friedrich Krupp AG	5,327,000
Ver. Constantin der Grosse	3,876,400
Emscher Kippe	2,435,000
Other Steel Companies	
Eschweiler Bergwerks Ver.	8,866,600
Hoesch AG	8,710,000
Erwald-Koenig Ludwig (Thyssen)	7,215,500
Kloechner-Werke	5,753,200
Gutehoffnungshuette Oberhausen	5,348,800
Stinnes interests	
Mathias Stinnes Muelheimer Bergswerks	7,470,500
IG Farben	
Rheinische Stahlwerke/Ad. Hermann V.	7,875,400
Auguste Victoria	2,000,000
Other chemical interests	
Lothringen Bergbau (Wintershall)	5,212,900
Dahlbusch (Solvay-Lib. Owens)	1,589,200
Sachsen (Salzdetfurth)	1,160,000
Mansfeld AG (Salzdetfurth)	784,620

Wendel interests (French)	
Friedrich Heinrich/Norddeutschland	2,250,000
Heinrich Robert AG	2,000,000
Deutsche Erdoel	
Victoria Mathias Friedrich Ernestine	5,037,800
Rheinisch-Westfaelische Elektrizitaetswerke	1,892,775
Westfalen (Gessauer Gas)	1,700,000
Miscellaneous	
Niederrheinische AG (Michel)	1,100,000
Rheinpreussen Rheinland	4,795,000
Neumuehl Gewerkschaft	2,125,700
Carolus Magnus (Palenberg)	1,750,000
Carl Alexander (Aachen)	1,200,000
Sophia Jacobs (Aachen)	2,000,000
Heinrich Gewerkschaft	973,100
Langenbrahm Gewerkschaft	809,300
Carolus Magnus (Essen)	617,800

APPENDIX G:

THE OKW: THREE AREAS OF INFLUENCE

The Economics Branch was in charge of observing and evaluating foreign economics and the effect on the conduct of warfare; economic research in the fields of economic warfare and foreign military economies; gathering, checking and evaluating information on the military economics of different countries; sales of weapons to foreign countries; foreign exchange matters; evaluation of internal and foreign newspapers; and propaganda material on military economies and economic warfare.

The Armaments Branch was responsible for organizing the collaboration with the services and the governmental authorities in the field of armaments; organizing the structures and defining the missions of the armament agencies; drawing up the armaments programs; equalizing and adapting the requirements to the industrial capacity; verifying and planning military building schedules for the armament industry; keeping the command authorities informed on the economic situation in the field or armaments; submitting suggestions for the production schedules; surveying the armament status and the production situation; establishing and classifying production priorities; extending the labor requirements; handling problems of procuring and supplying commercial equipment, machine tools for industrial enterprises; planning production utilizing the industrial sector; and being the central agency for precision tools and optical instruments.

The Raw Materials Branch was in charge of employment of military economic units; shipping to the interior and utilizing raw materials from the occupied territories; general problems of controlling raw materials; matters pertaining to the rationing of metals, electric power and coal; importation of metals; establishment of the raw materials; quotas for the services and ascertaining their requirements; chemical products, such as rubber, gunpowder, explosives, chemical warfare agents, synthetic plastics, cellulose and synthetic mineral oils; and establishing quotas of expendable supplies for the military forces.

The Price Control Branch was responsible for contracts; commercial and economic affairs; representing OKW on the Reichs Control Board; verifying military-economic production figures; price controls; verifying the sales and cost prices of weapons and material, naval construction, clothes, and equipment.

Aside from the four main branches there were three additional sections subordinate to the Chief of Staff:

1) Main Control Sections had a mission to prepare reports on developments in the field of military economics; to provide protection for industrial enterprises and

supervise the factory air defenses and active defense system; to take care of problems pertaining to legal and economic policies; to verify patents and to exclude certain firms from war contracts.

2) Personal and Budget Sections were in charge of personnel and administrative functions covering the Office and its staff of a given government agency.

3) Chief sections were for the organization of the military-economic and armament agencies; communication problems in the field of military economics.

APPENDIX H:

Correspondence of New Planungsamt of the Military Armament Production of 1944

Der Reichsmarschall
des Großdeutschen Reiches

Berlin W 8, den
Leipziger Str. 3

Hauptquartier, den 24.August 1944

Unter Hinweis auf den Führerbefehl, zur Sicherstellung der für die Kriegführung unentbehrlichen Forschung 5000 Fachkräfte aus der Truppe zu entlassen (OKW WEA E (V b) Nr.9291/43 geh. vom 18.12.1943 betr. Stichwort "Forschung") und den Erlass des Führers über die Konzentration der Rüstungs- und Kriegsproduktion vom 19.6.1944, ordne ich, um neben der auch im Kriege unbedingt zu betreibenden Grundlagenforschung möglichst viele für die Kriegsentscheidung wesentlichen Forschungsergebnisse kurzfristig zu erhalten, eine noch stärkere Zusammenfassung der Forschung an. Die Arbeiten insbesondere der staatlichen Forschungsinstitute sind durch den Reichsforschungsrat so zu steuern, dass für die weitere Kriegführung der grösstmögliche Nutzen entsteht.

Zu diesem Zweck sind sämtliche staatlichen forschungstreibenden Institute namentlich in einer

W e h r f o r s c h u n g s - G e m e i n s c h a f

innerhalb des Reichsforschungsrates zusammenzuschliess-

Die Wehrforschungs-Gemeinschaft hat insbesondere folgende Aufgaben:

1.) Überwachung und Konzentration der Forschung auf vordringlichste durch Erfordernisse der künftigen Kriegführung diktierte Aufgaben.

2.) Anpassung der Forschungsvorhaben an laufende Entwicklungen entsprechend dem Führerbefehl vom 19.6.1944.

3.) Prüfung, inwieweit auf Grund der Ergebnisse der Grundlagen- und Zweckforschung Entwicklungsarbeiten Erfolg versprechen.

4.)

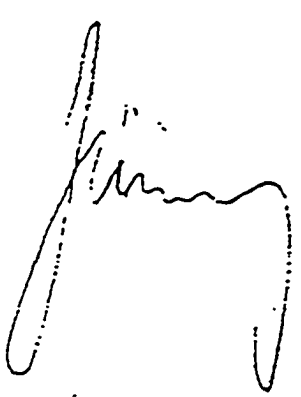
4.) Sicherstellung des für die Durchführung der unerlässlichen Forschungsvorhaben notwendigen Fachpersonals.

Zur Durchführung der Aufgaben zu 1.), 2.) und 3.) bedient sich der Präsident des Reichsforschungsrates eines wissenschaftlichen Führungsstabes, der sich aus den vorhandenen und in nächster Zeit noch zu berufenden Fachspartenleitern, Bevollmächtigten und Sonderbeauftragten des Reichsforschungsrates zusammensetzt. Der Führungsstab hat mir möglichst bald Vorschläge zur Konzentrierung der Forschung vorzulegen. Die daraus resultierende Steuerung der Forschungsvorhaben hat der Leiter der Wehrforschungs-Gemeinschaft im Einvernehmen mit den interessierten Stellen durchzusetzen.

Der Befehl zur Sicherung des notwendigen Fachpersonals erging durch OKW unter dem 3.8.1944 (OKW WRA Abt. E (V) Nr. 8240/44 geh.).

Mit der Aufstellung und Führung der Wehrforschungs-Gemeinschaft beauftrage ich in Personalunion den Leiter des Planungsamtes des Reichsforschungsrates, Professor Dr.Ing. W. O s e n b e r g .

Ausführungsbestimmungen hierzu erlässt der Leiter der Wehrforschungs-Gemeinschaft gemäss den ihm von mir gegebenen Richtlinien.



The Reichsmarshall
of the Great German Reiches
Berlin W 8
Headquarters, 24 August 1944

With regard to the Command of the Fuehrer for securing five thousand good trained employees out of the troops (OKW WEA E (V b) Nr. 9291/43 who are very necessary under the catchword "research" for 18 December 1943 regarding Air Research) regarding the order of the Fuehrer regarding the concentration of the production of Armament and War Material of 19 June 1944, I give the order--for the need of a still stronger concentration on research because basic research is important to get many essential research results in a very short time, those research results are essential for the prosecution of wider war leadership. The works, especially those of the state research institutes are to be directed in this way, through the Reichsforschungsrat, so as to give the highest possible benefit for the further warfare.

For this purpose all the state research institutes are to be concentrated in some community for the research on war within the Reich's research program. This community has especially the following tasks:

1) Surveying and concentration of research to the most important technology and most important necessities for the future of warfare.
2) Adaptation of the research to the current developments according to the Fuehrer's command of 19 June 1944.
3) Testing on the basis of the results of this basic purpose, research of those works of developments which seem to be successful. 4) Securing the necessary personnel which is inevitable for the making of those research developments.

For having those tests done cited in 1.), 2.) and 3.) the President of the Reichsforschungrat uses a scientific guiding staff which shall be composed of already existing directors of the branches of those who are allowed to do things, and special agents and orders. The guiding staff has to make proposals for the concentration of research. The guiding of the research which results from this has to be put through by the director of the research community in cooperation with the interested agencies.

The order for the assurance and getting the necessary of the trained personnel was given to the OKW on 3 August

1944 (OKW WEA Abt. E (V) Nr. 8240/44).

With the arrangement and leadership of the Armed Forces Research Community, I give the order to put in function and to guide this community to Prof. Dr. Ing. W. Osenberg, the director of the Planungsamt and the agency for planning of the Reichsforschungsrat.

All other orders of how one shall proceed shall be given by the Armed Forces Research Community according to the guidelines given by direction of me.

[Signed]
GOERING

DER LEITER
DER WEHRFORSCHUNGS-GEMEINSCHAFT
DES REICHSFORSCHUNGSRATES
Professor Dr.-Ing. W. Osenberg

Geheim!

Hinweise zum Organisationsplan der Wehrforschungs-Gemeinschaft des Reichsforschungsrates

1. Die Wehrforschungs-Gemeinschaft ist ein namentlicher Zusammenschluß von staatlichen, industriellen sowie Wehrmachtsdienststellen zugehörigen Forschungsstätten, deren Arbeiten un[illegible]Wehrmachtsdienststellen wichtig angesehen werden müssen. Während der Dauer des Krieges dürfen ihre Arbeiten nur der Erhaltung und Stärkung unserer Wehrkraft dienen. Durch diesen namentlichen Zusammenschluß sollen bestehende Organisationsformen sowie die Selbständigkeit und Selbstverantwortlichkeit der Institute nicht beeinträchtigt werden

2. Die Wehrforschungs-Gemeinschaft ist eine selbständige Gliederung des Reichsforschungsrates.

3. Die fachliche Leitung der Wehrforschungs-Gemeinschaft obliegt ausschließlich einem wissenschaftlichen Führungsstab des Präsidenten des Reichsforschungsrates, dem sämtliche Fachspartenleiter, Bevollmächtigten sowie Sonderbeauftragten angehören.

4. Der wissenschaftliche Führungsstab wird von dem Präsidenten des Reichsforschungsrates in regelmäßigen Zeitabständen zu Fachsitzungen einberufen, in denen Forschungsprogramme aufgestellt, Schwerpunkte innerhalb bestimmter Arbeitsgebiete gebildet, Dringlichkeitseinstufungen vorgenommen, insbesondere aber auch Beschlüsse über die Annullierung nicht kriegswichtiger, einen größeren Personenkreis bindender Forschungsvorhaben gefaßt werden.

5. Der Leiter der Wehrforschungs-Gemeinschaft, der ebenfalls dem Führungsstab mit angehört, hat außer den in dem Reichsmarschall-Erlaß vom 24. August 1944 festgelegten Aufgaben noch folgende Funktionen:

   a) die laufende Erfassung und Nachweisung freier oder frei werdender Forschungskapazitäten,

   b) zum Zwecke ihrer Verwertung die laufende Erfassung wertvoller Forschungsergebnisse,

c) Förderung der beabsichtigten oder bereits eingeleiteten Maßnahmen der Mitglieder des wissenschaftlichen Führungsstabes durch Personal-Rückholung und -Sicherung sowie durch Zuführung von Arbeitskräften aus seinem Ingenieurstab durch Ausnutzung aller Möglichkeiten des Planungsamtes des Reichsforschungsrates (Reichsmarschall-Erlaß vom 29. Juni 1943),

d) Forschungsstätten mit kriegswichtigen Aufträgen bei Verlagerungen behilflich zu sein.

6. Die in der WFG. zusammengefaßten Institute und staatlichen sowie industriellen Forschungsstätten werden je nach Fachrichtung in Betreuungsbereiche aufgegliedert, die jeweils einem Fachspartenleiter unterstellt sind; dieser hat nach dem Erlaß des Herrn Reichsmarschalls als Präsident des Reichsforschungsrates vom 24. August 1944 u. a. das Recht und die Pflicht,

a) die Forschungsvorhaben seines Bereiches fachlich und hinsichtlich des Personaleinsatzes zu überprüfen und zu überwachen,

b) durch Vergebung von Aufträgen nach Möglichkeit für die volle Auslastung sämtlicher Institute zu sorgen,

c) insbesondere aber auch die Arbeiten der Institute auf die Erfordernisse der Kriegsführung auszurichten.

Anfallende Ergebnisse, von deren Auswertung Erfolge für die Waffenentwicklung bezw. die Kriegsführung zu erwarten sind, müssen in geeigneter Form sofort dem Fachspartenleiter bekanntgegeben werden.

7. Es muß im Interesse einer einheitlichen Führung der deutschen Wehrforschung angestrebt werden, daß kein staatliches wissenschaftliches Institut außerhalb eines derartigen Betreuungsbereiches tätig ist.

8. Da bei Wehrmachtsdienststellen oder in der Industrie nur in den seltensten Fällen der gesamte Betrieb Forschung betreibt, können innerhalb dieser Unternehmungen sogen. Forschungsgruppen gebildet werden, die das gesamte, für Forschungsvorhaben angesetzte männliche und weibliche Personal umfassen. Diese Forschungsgruppen können auf Antrag unter Anerkennung der vorliegenden Richtlinien durch die Betriebsführung des Unternehmens ebenfalls in die Wehrforschungs-Gemeinschaft mit eingegliedert werden.

9. Durch Berufung der Fachspartenleiter und Bevollmächtigten des Reichsforschungsrates in die Entwicklungskommissionen des Reichsministers für Rüstung und Kriegsproduktion einerseits sowie durch Eingliederung von wissenschaftlichen Beiräten in die Forschung und Entwicklung betreibenden Stellen der Wehrmachtteile andererseits wird die im Interesse einer wirksamen Förderung unserer Wehrforschung liegende, unerläßlich enge Verbindung zwischen Forschung und Entwicklung hergestellt.

10. Der Bevollmächtigte des RFR. bestimmt in Abhängigkeit der ihm vom Präsidenten des Reichsforschungsrates gestellten Aufgaben den Kreis der Forschungsstätten, der zu ihrer Durchführung notwendig erscheint. Es ist ein Erfordernis einer klaren und einheitlichen Forschungsführung, daß der Fachspartenleiter über die Zusammenarbeit (Aufträge, Ergebnisse u. dgl.) zwischen dem Bevollmächtigten und dem Forschungsinstitut unterrichtet wird. Der Fachspartenleiter andererseits muß bemüht sein, innerhalb seines Betreuungsbereiches die Arbeiten des Bevollmächtigten mit allen zur Verfügung stehenden Mitteln fachlich zu fördern.

11. Die ebenfalls im wissenschaftlichen Führungsstab verankerten Sonderbeauftragten sind einerseits die organisatorisch eingesetzten Vertreter einer Gruppe von Forschungsinstituten, z. B. derjenigen eines Wehrmachtteiles, oder andererseits Beauftragte zur Wahrnehmung der Interessen der Entwicklungskommissionen, des Reichsministers für Rüstung und Kriegsproduktion, von militärischen Belangen oder dgl.

12. Als örtlich, ebenfalls nur organisatorisch tätige Vertreter des Reichsforschungsrates wurden Außenstellenleiter eingesetzt, die ihre Richtlinien durch eine Beauftragung vom Oktober 1944 erhalten haben; sie verwalten einen Bezirksbereich, dem nicht nur Hochschul- und Universitätsinstitute, sondern auch die im Bezirk tätigen, der Wehrforschungs-Gemeinschaft eingegliederten Forschungsgruppen der Wehrmachtteile sowie der Industrie angehören.

    Der Außenstellenleiter hat das Recht und die Pflicht, den Personal-Stand und -Einsatz (Männer und Frauen) sowie den Auftragsbestand (evtl. freie Kapazitäten) der Institute seines Bezirksbereiches zu überprüfen; er ist verpflichtet, dem Leiter der Wehrforschungs-Gemeinschaft sowie den Fachspartenleitern und Bevollmächtigten Auskunft über den von ihm erfaßten Personal- und Auftragsstand zu geben.
    Die zur Durchführung seiner Arbeiten erforderlichen Organisationsmittel (Meldeformulare, Karteikarten u. dgl.) werden zum Zwecke einer Vereinheitlichung dem Außenstellenleiter, auf Wunsch auch dem Fachspartenleiter und Bevollmächtigten von dem Büro des Leiters der Wehrforschungs-Gemeinschaft zur Verfügung gestellt.

13. Zur Unterbindung von vielfach unberechtigten und sich häufig wiederholenden Erfassungen u. dgl. werden die Leiter der Forschungsstätten der Wehrforschungs-Gemeinschaft ersucht, auf Anforderung Auskünfte über ihre Forschungs-Vorhaben und -Ergebnisse, den Personaleinsatz sowie evtl. freie Kapazitäten nur zu erteilen

    a) ausführlich an den direkten Auftraggeber,

    b) ausführlich an den zuständigen Fachspartenleiter, Bevollmächtigten oder Sonderbeauftragten, falls dieser nicht gleichzeitig der Auftraggeber ist,

    c) über Auftrags-Art und -Umfang (stichwortartig), Personal (Männer und Frauen) freie Forschungskapazitäten u. dgl. an den Leiter der Wehrforschungs-Gemeinschaft sowie die in seinem Auftrag tätigen Außenstellenleiter (siehe 12.)

Über Unklarheiten oder Schwierigkeiten in der Handhabung dieser unerläßlichen Abgrenzung der Auskunftserteilung über kriegswichtige Forschungsvorhaben ist der Leiter der Wehrforschungs-Gemeinschaft unverzüglich zu verständigen.

14. Oberster Grundsatz der neuen Organisationsform der Wehrforschungs-Gemeinschaft muß für alle Beauftragten und Beteiligten eine im Interesse der Erhaltung unserer Wehrkraft liegende Förderung derjenigen Forschungsvorhaben sein, deren kriegsentscheidende Bedeutung von den Fachspartenleitern und Bevollmächtigten des Reichsforschungsrates anerkannt wurde.

gez.: Dr. Osenberg

15. Oktober 1944

THE LEADER OF THE ARMED FORCES RESEARCH
COMMUNITY OF THE REICH RESEARCH COUNCIL
Professor Dr.-Ing. W. Osenberg
(Internal Memorandum Summer 1944)

Notes to the organization plan of the Wehrforschungs Gemeinschaft of the Reichforschungsrat according to Professor Dr. Osenberg.

1. The Wehrforschungs Gemeinschaft is a combination of unified structures of state and industrial as well as agencies of the Wehrmacht and of those places of research belonging to the Wehrmacht service places whose works and results have been seen important for the war effort. During the war their works must only serve the maintaining and strengthening of our war power. Through this connection by name, the existing organization forms, as well as the individual units, self-reliance and self-responsibility for this Institute [WGR] which should not be hindered.

2. The Wehrforschungs Gemeinschaft is a autonomous branch of the Reichforschungsrat.

3. The competent guidance of the Armed Forces Research Community is given only to a scientific leadership staff of the President of the Reichsforschungs to whom belong all directors of these branches and agencies.

4. The scientific guidance staff will be called in for sessions by the President of the Reichsforschungs in a regular time period in which there shall be established research programs and points of most interest within certain domains of work and classifications of urgency should be made, but especially confusions about the emulation of things which are not important for war, which bind and connect bigger circles of persons who have research programs.

5. To the Director of the Armed Forces Research Community, as well, to the guiding staff belongs some other functions which are given in the Reichsmarshall Proclamation of 24 August 1944 on the summons of the Wehrmachts needs.

a) We shall look at, show and write down freely the flexible capacities for the research authorities;

b) for the purpose of the use of exploitation one has to classify the worthy results of the research;

c) the findings of mass measurements of the members of the scientific guidance staff through he getting back of personnel, as well as the assurance of results, as well as the putting in of workers from his staff of engineers by the exploiting of all possibilities of the planning office of the Reichsforschungsrat (Reichsmarshall Proclamation of 29 June 1943);

d) To be of help to all locations of research which have programs which are important for war when they have to be relocated.

6. Those institutes that are connected in the WFG and all research institutes of the state as well as of the industry have to be split off into the regions of competence which are guided by a Fachsparenleiter who has this duty as established by the Reich marshall as President of the Reich Research Council from the 24 August 1944 pertaining to the following rights and duties:

a) to survey and test the research in this area in regard to the personnel which has to be put in;

b) when orders have to be given--he should look at all the institutes which have the same worth--to cooperate;

c) if nobody has nothing to do, all should cooperate in the project.

The work of the institutes have to be directed to the needs of the warfare to see the results which come and whose exploitation could give hope to having success in the development of arms or success in the field of warfare. Such results have to be reported immediately.

7. In the interest of uniform guidance of the German Armed Forces Services, it has to be stated that no scientific institute of state outside his interest of survey is acting alone.

8. Given situations in the Armed Forces Services or in Industry only in the rarest cases where the whole company is in the research. In these companies can be formed the so-called Research groups--who have all the male and female personnel which is planned for this research program. Those research groups can be integrated in the Armed Services Research Organization where they agree with the existing guide lines.

9. The general sense is that all these institutes do not have to make their research findings on their own --but by group and central surveillance--one research result shown by the groups within the body of research should be reported immediately to the director, and all things not essential for war should be set apart. Only those programs of research beneficial for warfare should be favored. The directors will set a connection between research and the development by forming a link between the guidance specialists of the commissions of development of the Reichsminster of the Armaments and Munitions on the one side, and, on the other, they will employ a link through the integration of scientific
councils with the other parts of the Armed Forces who make research.

10. The orders of the Reichsforschungsrat are in dependency of the tasks which he is given by the President of the Reichsforschungsrat [Osenberg]. And it is important that there is a flow of information for the directors who want to be informed immediately, and there will be funding by all means upon entering this sphere of reality.

11. There are the special forces who are on the one hand the representative of the leadership staff of special of research institutions, that is, one part of the Armed Forces Group, or on the other hand, people in charge of the serious undertaking for the keeping of interest of the development commissions for the Reichsminister of Armament and War Production, of military prosecution, etc.

12. Locally, there have been installed external leaders outside of the inner organization representative of the right alignments who are representatives of the Reichforschungsrates and have their guidelines through the order of October 1944. They have the administration of the local government offices, and not only to which belong not only organizations of universities and technical schools, but also the research groups of the parts of the Wehrmacht which are integrated with the Wehrforschungs Gemeinschaft, as well as parts of the industry.

The external leaders have the duty to survey the personnel level and sufficient replacements (men and women), as well as existing programs (needing free capitalization) of the institute of his district sphere. For his survey that he is obligated to report to the leader of the Armed Forces Research Community, as well as the special qualified leaders and the authorities of the future regarding what personal and council materials to submit.

13. If there are uncertainties and difficulties in the management of the leadership of the Wehrforschungs Gemeinschaft, the highest point of this new form of organization for the Wehrforschungs Gemeinschaft has to be standard for all who are involved

a) performance on the direct Employer;

b) performance of the specialists, authorities, and ministers with special responsibilities;

c) concerning commission-art and volume, personal (men and women) for research capitalization and founding of those research programs whose significance is for the result of the war and has to be agreed upon by the section specialists. and the ...leiter.

14. The highest guidelines of the new organizational structure of the Armed Forces Research Organization must be for all commissions and participants who have an interest in the procuring of our armed power for situated demands for particular research designs, and for war determined significance becoming recognized by the specialist leaders and the authorized agents of the Reich Research Council.

[Signed]
Dr. Osenberg
(Summer-1944)

Eingang Fernschreiben

prf osenbrg han
nsdap pkzl bln 4.9.1944 23.55 uhr

fuehrerhauptquartier, den 3.9.1944 05.15 uhr

reichsleiter m. b o r m a n n an alle g a u l e i t e r

r u n d s c h r e i b e n nr. .../44

betrifft:
sicherstellung der fuer forschungsaufgaben freigestellten kraefte

mit der lenkung der kriegswichtigen forschungsarbeiten an den deutschen hochschulen beauftragte reichsmarschall goering vor jahresfrist den leiter des planungsamtes beim reichsforschungsrat, professor dr. o s e n b e r g .

dieser hat in der zwischenzeit die notwendigen massnahmen zur durchfuehrung der kriegsentscheidenden auftraege getroffen. mit unterstuetzung des okw. wurden die zur forschung bei den staatlichen wissenschaftlichen instituten unumgaenglich notwendigen kraefte bereitgestellt. diese zurueckgeholten und die bisher schon im bereich der forschung taetigen kraefte sind durch einen befehl des okw. vom 3.8.1944 nr. 3240/44 geh von der einberufung zur wehrmacht befreit. sie sollen auch bei der abgabe von arbeitskraeften zu kriegswichtigen sondereinsaetzen ausserhalb des arbeitsorts nicht herangezogen werden, sondern wie schluesselkraefte von allen sondereinsaetzen befreit bleiben.
professor osenberg hat die verantwortung fuer die laufende ueberpruefung saemtlicher an den staatlichen wissenschaftlichen anstalten bearbeiteten forschungsvorhaben unter dem gesichtspunkt der erfordernisse der totalen kriegsfuehrung uebernommen. in zweifelsfaellen bitte ich vorher meine entscheidung einzuholen.

gez. m. b o r m a n n

verteiler:
alle gauleiter

durchgegeben: unterholzner
angenommen: mchn fuer 2 und 3 z.k. : mayer 05.35 uhr
mchn fuer mchn obb. abg: mayer 05.35 uhr
angenommen: pkzl bln z.weiterl. an die gaue 05.35 uhr
stoeckmann

angenommen: professor osenberg/vcell+++

Re. Professor Werner Osenberg
NSDAP

From M. Bormann to all Gauleiter
Fuehrer Headquarters 3.9.1944

Re. Assurance of all those personnel which is given free for the research.

Professor Dr. Osenberg has been given the direction of the research works which are important for war at the German technical institutes, and has guidance given to him by Reichsmarshall Goering.

Osenberg meanwhile has the necessary measurements for the fulfilling of all those important commands that are important for war. With the help of the OKW--all personnel who are important for the research and scientific institutions of state have been provided. Those powers which have been called back and put in production in former times are suspended as of 3.8.1944 Nr. 8240/44 accordingly for the drafting of plans for the Wehrmacht.

Research is important so it must serve for the war. There are other people who are suspended from providing information for the Wehrmacht. Prof. Osenberg has provided surveys and has responsibility for the survey of all those programs which are conducted at the scientific institutes of state from the point of view of the necessities of total leadership for war, and if in doubt [regarding the new structure], I beg you to ask for my decision before proceeding.

[Signed]

Martin Bormann

Versuchs-Anstalt
Grossendorf/Westpreußen

Grossendorf, den 6.9.1943.

E/M.

Geheim

Br.B.Nr. M Qf. 20/43 g + anl.

Herrn
Professor Dr.Ing. E.Schmidt,
Braunschweig
Postfach 390.

Betr. Arbeitstagung über Strahlvortrieb
am 15.9.43.

Mit Schreiben vom 23.8.43 haben Sie das SS-Führungshauptamt, Chef des SS- Waffenamtes aufgefordert, an der Tagung am 15.9. teilzunehmen und einen Referenten zu benennen.

Der Chef der Amtsgruppe A, SS-Brigadeführer und Generalmajor der Waffen-SS, Dr. Schwab hat dem Unterzeichneten, SS-Obersturmführer Engel befohlen, das für die Waffen-SS vorgesehene Referat zu halten. In der Anlage wird eine kurze Inhaltsangabe dieses Referates übersandt.

Da der Unterzeichnete auf eine Dienstreise gehen muss, von der er erst am 15. früh nach Berlin zurückkehrt, und da das SS - Führungshauptamt zurzeit infolge Fliegereinwirkung ausserhalb von Berlin verlagert ist, wird gebeten, an nachstehende Adresse Mitteilung zu geben, wo die Tagung am 15.9. in Berlin stattfindet.

SS - Obersturmführer Rolf Engel,

Berlin - Schmargendorf
Krantzerstr. 5.
bei Zumpe.

Heil Hitler !

ZZ-Obersturmführer

Anlage!

Einschreiben

SS Oberstrumfuehrer Engel
Versuchs-Anstalt
Grossendorf/Westpreussen
6.9.1943

To Prof. Dr. Ing. E. Schmidt
Braunschweig
Postfact 390

Re. Arbeitstragung/Conference about jet propulsion 14 Sept. 43.

With letter of 23 August 1943--you have asked the SSf.hauptamt, the chief of the SS Waffenamt to participate at the conference of 15 September and to name a referee. The chief of group A--SS group leader...and gen. major Dr. Schwab has ordered to the undersigned SS Obersturmfuehere Engel to hold a speech which was provided for the Waffen SS. In the annex there will be a short summary of the contents of the reference.

As the undersigned has to go on official voyage from which he returns only on the 15th to Berlin and because the SS fuehrenhauptamt is located out of Berlin because of damage of Allied aircraft, it is asked to give report to following address where the Conference on the 15th of September shall take place.

SS Obersturmfuehrer R. Engel
Berlin-Schmargendorf
Krantzerstr. 5 bei Zumpe

Heil Hitler

[Signed] R. Engel

AERODYNAMISCHE VERSUCHSANSTALT GÖTTINGEN E.V.
IN DER KAISER-WILHELM-GESELLSCHAFT ZUR FÖRDERUNG DER WISSENSCHAFTEN

Professor Dr.Alb.Betz

Aerodynamische Versuchsanstalt Göttingen e.V., Göttingen, Bunsenstraße 10 Fernruf 3453 Postfach 263 Girokonto: Reichsbankfiliale Göttingen Commerzbank A-G Göttingen Postscheckkonto Hannover 4952

Herrn
Prof.Dr.-Ing.E.Schmidt
Luftfahrtforschungsanstalt
Hermann Göring

B r a u n s c h w e i g

Dr. L.-A. Nr. 521/43 g

Einschreiben!

G e h e i m !

Ihr Zeichen Tgb.Rf.14/43g | Ihre Nachricht vom 8.9.43. | AVA-Zeichen DW/B.447/43g | Göttingen, den Bunsenstraße 10 15.9.1943.

Betr.: Arbeitsgemeinschaft.

Lieber Herr Kollege!

An der Arbeitsgemeinschaft für Strahlvortriebe, speziell auch an den Raketenproblemen, bin ich stark interessiert und werde deshalb gerne mitarbeiten. An der Tagung am 29.d.Mts. werde ich aber leider voraussichtlich nicht teilnehmen können, da ich bald darauf eine andere Tagung habe, die ich leiten soll.

An der Raketensache bin ich vor allem deshalb interessiert, weil ich im Rahmen der Gemeinschaftsarbeit "Aerodynamik und Waffenforschung" der Akademie als dritte Aufgabe "angetriebene Geschosse" aufgenommen habe. Ich weiß nicht, ob auf Ihrer Tagung die ballistischen Probleme mit behandelt werden. Für den Fall, daß dies zutrifft, bemerke ich, daß ich auf diesem Gebiet mit Wa Prüf 11 (Fl.-Stabsing. Z e y s s und Hauptmann Prof.Dr. O r t m a n n) Berlin-Schmargendorf, Kranzerstr.3, in Verbindung stehe.

Mit besten Grüßen und

Heil Hitler!

Ihr

Alb. Betz

Anlage: 1 Empfangsschein.

-372-

Kr.

Prof. Dr. Betz
Aerodynamische Versuchsanstalt Goettingen E.V.
In Der Kaiser-Wilhelm-Gesellschaft zur Foerderung des Wissenschaften
To Dr. Schmidt, 15 September 1943
Re. Cooperation for Working Together
[Propulsion for V-1, and Aerospace Designs]

Dear Colleague,

I am very much interested in this Arbeitsgemeinschaft for jet propulsion especially in rocket problems, and I am very much interested to cooperate with you, but unfortunately I cannot participate with you at the conference of the 29th of this month because some time later I have another conference which I should direct.

I am first of all interested in the matter of rockets because I have as a third task--the undertaking of jet propelled projectiles in the frame of collective work for "aerodynamics and weapon" research. I don't know whether on your conference there shall be discussed the ballistic problems. If this is the case then I make a remark that I am in connection regarding this area with the Waffenpruef. 11 (Fliegel Staff Zeyss and Lieu. Prof. Dr. Hauptmann), Berlin-Schmargendorf, Kranzerstr. 3.

With best wishes.

Yours, Prof. Dr. Alb. Betz

Der Reichsmarschall
des Großdeutschen Reiches

Präsident
des Reichsforschungsrates

Der Leiter
des Geschäftsführenden Beirates

Berlin-Steglitz, den 2. Sept. 1944
Grunewaldstraße 35
Fernsprecher 72 60 71

Motoren-Inst.	L	Z
Eing.: -5. 9. 44		
[illegible] 928		
z. d.		

Tgb.-Nr. ~~Rf. 5191/44~~ Sr/Se. Rd.Nr. 29

Auf Grund des Erlasses des Führers über die Konzentration der Rüstung und Kriegsproduktion vom 19.Juni 1944 hat der Reichsminister für Rüstung und Kriegsproduktion in mehreren Anordnungen eine Regelung für die laufenden Entwicklungen auf dem rüstungstechnischen Sektor gegeben. Hiernach sollen in Zukunft nur noch diejenigen Entwicklungen gefördert werden, die durch neue umstürzende Eigenschaften in der Lage sind, uns gegenüber den Entwicklungen der Feindmächte bedeutenden Vorteil zu bringen.

Angesichts der gegenwärtigen Lage und in Anlehnung an die Massnahmen des Reichsministers für Rüstung und Kriegsproduktion und des Reichsbevollmächtigten für den totalen Kriegseinsatz, Reichsminister Dr. Goebbels, halte ich es für erforderlich, daß die laufenden Forschungsvorhaben innerhalb des Reichsforschungsrates einer erneuten Prüfung auf ihre Dringlichkeit unterworfen werden. Auf dem Gesamtgebiet der medizinischen Forschung hat bereits der Reichskommissar für das Sanitäts- und Gesundheitswesen, Prof.Dr. Brandt, eine Überprüfung der vorliegenden Forschungsvorhaben in diesem Sinne vorgenommen und diejenigen Hauptarbeitsgebiete bestimmt, auf denen auch in der Zukunft weiterhin Forschungsaufgaben gestellt und bearbeitet werden dürfen. Ich bitte die Herren Fachspartenleiter und Bevollmächtigten, auf ihren Sektoren ähnlich zu verfahren und mir bis zum 15.September über das Veranlasste zu berichten. Das Ziel dieser Aktion ist weniger die Freimachung von Arbeitskräften als vielmehr die Schaffung der Möglichkeit, mit den im Forschungssektor überhaupt vorhandenen wissenschaftlichen und technischen Kräften die vordringlichen Forschungsvorhaben mit gr

An die
Herren Fachspartenleiter und
Bevollmächtigten des Reichs-
forschungsrats.

möglicher Intensität anzupacken und baldmöglichst zum Abschluss zu bringen. Die Konzentration der Arbeitsvorhaben erfolgt in Eigenverantwortung der Fachspartenleiter und Bevollmächtigten, das Endergebnis wird jedoch mit dem Reichsministerium für Rüstung und Kriegsproduktion abgestimmt werden, um die Aufrechterhaltung der bisherigen Dringlichkeitsstufen und Zurverfügungstellung der notwendigen Kontingente sicherzustellen.

Heil Hitler!

Ministerialdirektor.

Der Reichsmarshall des Grossdeutschen Reiches
Praesident des Reichsforschungsrates
Berlin-Steglitz, 2 Sept. 1944
Rf. 6191/44 Sr/Se. Rd. Nr.29

Re. Fachspartenleiter des RFR

On the basis of the order of the Fuehrer about the concentration of the Armament and War Production of 19 June 1944, the Reichsminister for Armament and War Production has given a mode of operation in several commands and a regulation how to deal with the current developments on the armament technical sector. According to this in the future only those projects will be funded which are able, because of new and brand new properties to give us an important benefit vis-a-vis the allied forces.

Because of the nowadays situation and according to the means of the Reichsminister for Armament and War Production. and the Reich power of attorney for Total War Engagement, Reichsminister Dr. Goebbels, I judge it as necessary that the running research projects within the Reichsforschungsrat shall be tested and shall prove their importance. In the area of the medical research there has already been made a check of the existing research developments by the Reichskommissar for Health and Sanitation, Professor Dr. Brandt, in this sense, has determined those main working areas in which also in the future there can be research tasks given research duties and can be worked out. I respectfully ask the Technical Departmental Leaders and Power and Authorized Agents to make the same in their sectors and report to me that which they have done in this case until 15 September. The aim of this action is less that of working powers than the creation of the possibility with the existing powers on the sector of development to lay hands on the most important research projects with the highest possible intensity and to bring them as soon as possible to an end. The concentration of the work programs follows in autonomous response from the Technical Departmental Leaders and Authorized Agents, and the end result will be discussed with the Reichsminister for Armament and War Production to assure the maintaining of the existing importance levels and of the providing of the necessary continuance of the quotas.

Heil Hitler

Menzel
Ministerial Director

Geheime Reichssache

Der Leiter der Kriegswirtschaftsstelle
im Reichsforschungsrat

Berlin-Steglitz, den 9.9.1943
Grunewaldstraße 35
Fernsprecher: 72 60 71

A.-Z.: RF 2060/43 g. Rs

An die

Herren Rektoren
der Hochschulen

Dr.Gra/Kp

1. Anlage zu M RF 16/43 g. K.

In diesen Tagen erfolgen umfangreiche Einberufungen aufgrund eines Befehls des Chefs OKW. Danach werden aus allen Verwaltungen (z.B. Finanzämter, Post, Bankgewerbe usw.) 50 % der bisher Uk-gestellten Wehrfähigen eingezogen. Dieser Erlass bezieht sich auch auf die Verwaltungen der Ministerien und der diesen unterstellten Dienststellen. Vielfach ist der Befehl indessen irrtümlich auch auf solche Hochschulinstitute und Forschungsbetriebe zur Anwendung gekommen, die als Rüstungsbetriebe anerkannt sind oder bei Anlegung der schärfsten Beurteilung unbedingt kriegswichtige Aufgaben zu erfüllen haben bzw. für den Lehrbetrieb unbedingt erforderlich sind.

Nach den hier durchgeführten Verhandlungen besteht Aussicht auf eine Regelung, die sowohl den Bedürfnissen der Wehrmacht wie der Forschung und Lehre Rechnung trägt. Für die Durchführung der vorbereitenden Massnahmen benötigt die Kriegswirtschaftsstelle im Reichsforschungsrat folgende Angaben, die umgehend als Geheime Reichssache einzusenden sind:

1.) Ist die Hochschule als solche zum W-Betrieb erklärt und durch wen? Angabe der Nr. (z.B. 259/062).

2.) Welche Institute oder Hochschuleinrichtungen werdem beim zuständigen Rüstungskommando (Anschrift angeben) wegen Übernahme von Aufgaben für die Rüstung als W-Betrieb geführt? Angabe der Nr.

3.) Für welche Betriebe wäre die Einstufung als W-Betrieb der Rüstungswirtschaft ausserden erforderlich? Sie hat zu erfolgen auf Antrag des Auftraggebers (Heer, Marine, Luftwaffe, Reichsamt, Reichsforschungsrat) beim Rüstungsamt in Berlin . Auftraggeber angeben.

4.) a) Welche Wehrfähigen aus den unter 2) und 3) genannten Instituten sind jetzt einberufen bzw. ist die Uk-Stellung aufgehoben?

b) Wer davon ist bei Anlegung des schärfsten Maßstabes entbehrlich? Angabe der Namen, Daten und des Fachs zu a) und b).

5.) Welche weiteren unentbehrlichen Kräfte aus Forschung und Lehre sind einberufen? Angabe der Namen, Daten und des Fachs.

Heil Hitler!

Gra

GEHEIME REICHSSACHE
Der Leiter der Kriegswirtschaftstelle
im Reichsforschungsrat
Berlin-Steglitz
Grunewaldstrosse 35
9.9. 1943

Re. To the Rectors of the Universities

Dr. Gra/Kp

In these days there are many drafts to the Armed Forces made on the basis of the order of the Chiefs of the OKW. These operate according to all administration branches (for example, per Revenue Office, the Post, the Banks). 50 percent of these people who are qualified for war and who can go to war until now have been put under the classified Uk-gestell-Verwaltungen [special military exemption status]. This order refers also to the administration of the ministries and all offices which are in that status. Often the order has been applied erroneously applied to [personnel] in the technical institutes and universities and research companies which are recognized as "Rustungs suppliers" or sources which have been selected, at any rate, to fulfill tasks which are important for the war or which are important and necessary for the teaching management.

After the discussions which have been made there can be a regulation which is good as well for the needs of the Wehrmacht, as well as for the needs of research and teaching. For the putting through and making of the preparatory measurements, the Kriegsforschungstelle in the Reichsforschungrat needs the following data which are to be sent immediately as Geheime Reichssache:

1. Is this place of high teaching [Hochschule research] as such declared as Wehrbetrieb? If so give the No. (z.B. 259/062).

2. Which institutes or branch of the hochschule is recognized by the Rustungskommando needed or the take over of tasks for the armament as betrief? If so give the No.....

3. For what factories, etc., would such a classifying of the Rustungsbetrieb be necessary? It has to be made by application of the Auftraggeber in the following (Army, Marine, Luftwaffe, Reich office, Reich Research Council) connected with the Armament Office in Berlin. Please give the Auftraggabe.

4. a) Who are those who are capable to go to war from those institutes listed under 2 and 3, who are already listed, in the UK --screened category?.

b) Who, by using the very specialized measurements [for research] has to be called up? Give name, dates, and branch.

5. Which far reaching and absolutely necessary powers for research and management are to be called up? Give the name, dates, and branch.

Heil Hitler

GRAUN

Dienstleistung seinen Wohnort oder gewöhnlichen Aufenthaltsort gehabt hat.

Bei Beamten ist die frühere Dienststelle zur Zahlung des vorerwähnten Ausgleichbetrages verpflichtet.

IV. Uk-Stellung

Entsprechend dem Freistellungsbefehl des OKW vom 10. 12. 1943 gilt als vorlageberechtigte Stelle für die Uk-Anträge der Präsident des Reichsforschungsrates, in dessen Auftrag der Leiter des Planungsamtes die Anträge einzureichen hat.

Die Sicherstellung der unter dem Stichwort „Forschung" aus dem Wehrdienst entlassenen Fachkräfte erfolgt somit nicht etwa durch die einzelnen Bedarfsstellen, sondern auf Antrag des Leiters des Planungsamtes für das Planungsamt des Reichsforschungsrates und zwar ohne Einschaltung der örtlich zuständigen Arbeitsämter und Rüstungskommandos, da deren Stellungnahme für die Entscheidung über den Uk-Antrag ohne Bedeutung ist. Demgemäß sind die den Bedarfsstellen zugewiesenen Fachkräfte bei Meldungen an die Rüstungskommandos und andere Dienststellen, wie z. B. auf Rückfrage nach Anzahl der im Betrieb vorhandenen Wehrpflichtigen, nicht mit aufzuführen, da sie an das Planungsamt des Reichsforschungsrates dienstverpflichtet wurden. Insbesondere ist es unstatthaft, die durch das Planungsamt freigestellten Fachkräfte bei einer etwa geforderten Meldung zu irgendeiner Einberufungsaktion mit namhaft zu machen. Über Freigabe zur Einziehung entscheidet allein das OKW. im Einvernehmen mit dem Leiter des Planungsamtes. Bei etwa in dieser Hinsicht auftretenden Schwierigkeiten ist dem Planungsamt unverzüglich – notfalls telegraphisch, fernmündlich oder fernschriftlich — Mitteilung zu machen.

Dr. Osenberg

F/0176

Geheim!

PLANUNGSAMT
DES REICHSFORSCHUNGSRATES

LEITER: PROFESSOR DR.-ING. WERNER OSENBERG

Richtlinien für den Einsatz der unter dem Stichwort: „Forschung" vom Wehrdienst freigestellten Fachkräfte

Northeim/Hann. Postschließfach 148 | Fernruf: Kallenburg 283/285 Northeim 782 | Fernschreiber: 025 58 | Telegr.-Anschrift: Osenberg, Northeim

Zur Weiterführung der für die Kriegsentscheidung notwendigen Forschung und Entwicklung hat der Führer die Rückholung von 5000 Wissenschaftlern und technischen Fachkräften aus dem Wehrdienst befohlen (Verfügung: OKW WEA E(Vb) Nr. 9291/43 geh. vom 18.12.43, Stichwort: „Forschung").

Mit der Erfassung der in Betracht kommenden Forscher, der Durchführung aller Rückholungsmaßnahmen sowie der Zuweisung der fraglichen Kräfte an die einzelnen Bedarfsstellen wurde der Leiter des Planungsamtes des Reichsforschungsrates beauftragt, dem auch die Steuerung und Überwachung des Arbeitseinsatzes obliegt.

Im einzelnen ist folgendes zu beachten:

I. Einsatz an der Bedarfsstelle.

Die Zuweisung der aus dem Wehrdienst entlassenen Fachkräfte durch den Leiter des Planungsamtes an die einzelnen Bedarfsstellen erfolgt grundsätzlich befristet, und zwar höchstens bis zur Beendigung des Forschungsauftrages, für den der Betreffende angefordert wurde, wobei ausdrücklich darauf hingewiesen wird, daß eine anderweitige Beschäftigung, z.B. in der Fertigung oder an weniger dringlichen Aufträgen, nicht zulässig ist. Dies gilt sowohl für die von den einzelnen Bedarfsstellen namentlich angeforderten und etwa schon vor ihrer Einberufung dort tätig gewesenen als auch für diejenigen Kräfte, die aus dem sogenannten Verfügungsstab des Leiters des Planungsamtes zugewiesen werden.

Eine vorzeitige Abberufung erfolgt grundsätzlich nur dann, wenn dies zur Schwerpunktbildung bei der Bearbeitung eines noch dringlicheren Forschungsauftrages unumgänglich erscheint.

Beim Auslaufen eines Forschungsauftrages ist dem Leiter des Planungsamtes rechtzeitig Mitteilung zu machen, damit die dafür zugewiesene Fachkraft umgesetzt werden kann. Im Bedarfsfalle ist gleichzeitig eine Neuanforderung dieser Fachkraft für einen anderen Auftrag vorzunehmen, dessen Auftragsnummer, Dringlichkeits-Einstufung, Stichwort, Richtpreis, Umfang und voraussichtliche Dauer — unter Beachtung der Geheimhaltungsvorschriften — angegeben werden müssen.

Die Möglichkeit der Zuweisung weiterer Mitarbeiter richtet sich nach der Dringlichkeit und dem Umfang der Aufträge.

Die Benennung dieser Fachkräfte hat unter Verwendung des vorgeschriebenen Transparentfragebogens zu erfolgen.

Über den weiteren Verlauf der Rückholung nach Meldung an das OKW, können durch das Planungsamt keine näheren Angaben gemacht werden. Es wird daher gebeten, von diesbezüglichen Rückfragen möglichst Abstand zu nehmen, da etwaige, die Freistellung betreffende Rückäußerungen der Wehrmacht, den einzelnen Bedarfsstellen jeweils zur Kenntnis gebracht werden.

Bei kurzfristiger Zuweisung ist im Bedarfsfalle rechtzeitig — etwa 4 Wochen vor Fristablauf — unter Beifügung eines Berichtes über den Stand der Arbeiten ein Verlängerungsantrag für die betreffende Arbeitskraft zu stellen, der vom Leiter des Planungsamtes nach eingehender Überprüfung entschieden wird.

Über den Einsatz und die Tätigkeit der den Bedarfsstellen aus dem Verfügungsstab zugewiesenen Fachkräfte ist dem Planungsamt jeweils vierteljährlich Bericht zu erstatten. Hierzu können selbstverständlich die Berichte verwandt werden, wie sie etwa für die Auftraggeber angefertigt werden, z. B. für die in Betracht kommende Wehrmachtsdienststelle, Kriegswirtschaftsstelle des Reichsforschungsrates oder dergl., wobei anzugeben ist, in welchem

Umfange die zugewiesene Fachkraft an der Durchführung des Auftrages beteiligt war.

II. Dienstantritt.

Die von den einzelnen Bedarfsstellen namentlich angeforderten Fachkräfte haben sich unmittelbar nach ihrer Entlassung aus dem Wehrdienst bei der Einsatzstelle persönlich zu melden und sind, ebenso wie die aus dem Verfügungsstab zugewiesenen Kräfte, sofort in den Arbeitsprozeß einzugliedern.

Über eine etwa verspätete Meldung ist dem Planungsamt unter Angabe der Gründe Mitteilung zu machen.

Unmittelbar nach dem Eintreffen der namentlich angeforderten Kräfte beim Leiter der Bedarfsstelle meldet dieser an das Planungsamt:

Tag der Ankunft,
Tag der Entlassung aus dem Wehrdienst
Einsatzbeginn
Privatanschrift der zugewiesenen Fachkräfte.

Auf eine Vorstellung der aus dem Verfügungsstab zugewiesenen Mitarbeiter bei den Bedarfsstellen muß mit Rücksicht auf die kriegsbedingten Reiseschwierigkeiten verzichtet werden.

Die formelle Zuweisung der Fachkräfte aus dem Verfügungsstab erfolgt durch den sogen. „ABORDNUNGSBESCHEID". Dieser wird dem Leiter der Bedarfsstelle als Original durch die Post zugestellt. Durchschriften des Abordnungsbescheides erhalten die betreffende Fachkraft selbst und sonstige am Einsatz interessierte Dienststellen (z. B. Fachspartenleiter und dergl.).

Der Leiter der Bedarfsstelle meldet auf dem abzutrennenden Teil des Abordnungsbescheides die Ankunftszeit und Arbeitsaufnahme der ihm zugewiesenen Fachkraft mit Angabe der Nr. sowie des Kennwortes und der voraussichtlichen Dauer des Forschungsauftrages.

Die vollständige Ausfüllung des vorerwähnten Melde-Vordruckes ist unbedingt notwendig. Nichtbeachtung dieser Vorschrift hat u. U. den Abzug der Arbeitskraft zur Folge.

Mit besonderem Nachdruck wird darauf hingewiesen, daß eine nach Ankunft der einzelnen Fachkräfte häufig erbetene Urlaubsgewährung, soweit sie nicht gesetzlich begründet ist, unter den derzeitigen Verhältnissen keineswegs tragbar erscheint, da sie dem Sinn der Freistellung zur beschleunigten Aktivierung der Forschung widersprechen würde. Eine Beurlaubung ist grundsätzlich erstmalig im Rahmen des betriebsüblichen Erholungsurlaubs zulässig, und zwar frühestens nach einer Dienstleistung von 3 Monaten.

In diesem Zusammenhang wird darauf hingewiesen, daß eine Arbeitszeit von wöchentlich mindestens 53 tatsächlich geleisteten Stunden, also ausschließlich Pausen, für die Tätigkeit an den Forschungsaufträgen aufzuwenden und auf Anforderung nachzuweisen ist.

Die Bedarfsstelle trägt die Kosten der Reise vom Planungsamt zum Einsatzort und zurück.

III. Dienstverhältnis.

Um die dem Leiter des Planungsamtes obliegende Verpflichtung der Steuerung und Überwachung des Einsatzes der unter dem Stichwort „Forschung" aus dem Wehrdienst entlassenen Fachkräfte zu ermöglichen, werden diese im Einvernehmen mit dem Generalbevollmächtigten für den Arbeitseinsatz durch das Arbeitsamt Northeim/Hann. an das Planungsamt des Reichsforschungsrates dienstverpflichtet und von hier aus den einzelnen Bedarfsstellen zugewiesen.

Die Dienstverpflichtung an das Planungsamt erfolgt zum Zwecke einer wirkungsvolleren Überwachung der Sicherstellung und trägt lediglich formellen Charakter, sie hat, soweit es die von den Bedarfsträgern namentlich angeforderten Kräfte betrifft, auf den Einsatz bei der Bedarfsstelle keinen Einfluß. Bei den nicht namentlich

aufgeforderten und aus dem Verfügungsstab befristet zugewiesenen Fachkräften behält sich das Planungsamt selbstverständlich das Recht der Umsetzung nach Fristablauf vor.

Der Leiter der Bedarfsstelle gilt für die Dauer der Beschäftigung als Arbeitgeber im Sinne des Gesetzes, d. h. er hat die ihm zugewiesenen Fachkräfte in sozial- und arbeitsrechtlicher Hinsicht zu betreuen, Gehälter zu zahlen und für die rechtzeitige Abführung sämtlicher nach dem Gesetz anfallenden Steuern und Sozialversicherungsbeiträge zu sorgen. Ferner sind von ihm die Arbeitspapiere, wie Arbeitsbuch, Angestelltenversicherungskarte, Lohnsteuerkarte und gegebenenfalls DAF-Buch sicher aufzubewahren und bei Beendigung der Arbeit mit einem Zeugnis zurückzugeben. Der Beginn sowie das Ende der Beschäftigung sind vom Leiter der Bedarfsstelle im Arbeitsbuch durch Unterschrift zu bescheinigen. Soweit ein Arbeitsbuch nicht vorhanden ist (z. B. bei Beamten) oder geöffnet werden muß, ist dies bei dem für den Einsatzort zuständigen Arbeitsamt zu beantragen.

In dem Falle, daß bei der namentlichen Anforderung einer Bedarfsstelle die betr. Fachkraft bereits vor ihrer Einberufung dort tätig war, tritt das frühere Dienstverhältnis wieder in Kraft, obwohl auch hier formell die Dienstverpflichtung an das Planungsamt notwendig ist. War die frühere Tätigkeit nicht arbeitsbuchpflichtig, z. B. bei Beamten, so ist auch jetzt die Ausstellung eines Arbeitsbuches nicht erforderlich.

Im übrigen entsteht für die Dauer der Zuweisung zwischen dem Leiter der Bedarfsstelle und der betr. Fachkraft ein Privatdienstverhältnis, das jedoch weder vom Arbeitgeber noch vom Arbeitnehmer gekündigt werden kann, da die Dauer des Beschäftigungsverhältnisses vom Leiter des Planungsamtes bestimmt wird (vergl. Ziff. I: Einsatz an der Bedarfsstelle). Falls aus irgendwelchen Gründen die vorzeitige Beendigung des Dienstverhältnisses gewünscht wird, ist dem Planungsamt entsprechend Mitteilung zu

machen. Eine selbständige Umsetzung durch den Leiter der Bedarfsstelle in andere Betriebe darf nicht vorgenommen werden.

Die Höhe der Gehaltszahlung richtet sich nach der für die Bedarfsstelle geltenden Tarifordnung oder sonstigen Regelung. Als Grundlage für die Berechnung der Bezüge wird — ohne damit eine bindende Anordnung zu treffen — die Tarifordnung A für Angestellte im öffentlichen Dienst empfohlen, wonach für Hochschul-Absolventen die Gruppe III und für Fachschul-Absolventen die Gruppe IV zugrunde gelegt werden kann. Beim Vorliegen der entsprechenden Tätigkeitsmerkmale ist eine höhere Einstufung nicht ausgeschlossen, wobei jedoch äußerste Zurückhaltung und Anlegung eines strengen Maßstabes an die Leistung der Einzelnen geboten erscheint. Die Dauer des Wehrdienstes ist bei der Festlegung der Berufsjahre anzurechnen.

An Verheiratete, die von ihrer Familie getrennt leben müssen, ist eine, den gesetzlichen Vorschriften entsprechende Trennungsentschädigung zu zahlen.

Aufgrund der Gehaltseinstufung nach TO A können keine Rechte aus den sonstigen Bestimmungen dieser Tarifordnung hergeleitet werden, da die Arbeitskräfte nicht zu den Angestellten des öffentlichen Dienstes gehören, soweit sie dies nicht bereits vor ihrer Einberufung als Gefolgschaftsmitglieder der Bedarfsstelle waren.

Im übrigen greifen die einschlägigen Bestimmungen für Dienstverpflichtete Platz, wonach ohne Rücksicht auf früher erhaltene Bezüge die tariflichen Bestimmungen an der neuen Arbeitsstelle bezw. die dort üblichen Gehaltssätze maßgebend sind. Ein etwaiger Unterschiedsbetrag zwischen dem früheren und dem neuen Gehalt kann vom Arbeitsamt im Wege der Dienstpflichtunterstützung gezahlt werden. Diesbezügliche Anträge sind an das Arbeitsamt zu richten, in dessen Bezirk der Dienstverpflichtete vor der

GEHEIM
PLANUNGSAMT DES REICHFORSCHUNGSRATES
(Dec. 1943)

Summary of "Richtlinien fuer den Einsatz der unter dem Stichwort: "Forschung" vom Wehrdienst freigestellten Fachkraefte"

For the carrying on of the necessary research to win the war the Fuehrer has ordered the calling back of 5000 scientists and technical workers from the Military Duty by order of the OKW (OKW WEA E (Vb) N4. 9291/43 issued on 18.12.43, under the password "Research").

I. Einsatz an der Redarfstelle

There is a type of process how these scientists and technical workers will be called back, for example, forms filled in on how long they can work, and if they work there they must not work elsewhere. If one research program is going to be terminated the director has to be informed in time so that this manpower which is involved in this technical program can be placed elsewhere and in the proper technical category. And, in this case, they have to fill in the proper forms for the "Neuanforderung dieser Fachkraft fuer einen anderen Auftraeg vorzunehmen, dessen Auftragsnummer, Dringlichkeits-Einstufung, Stichwort, Richtpreis, Umfang und voraussichtliche Dauer"...streamlining of the research activities under the Planungsamt with the proper technical category. The further process of the recycling these people into other areas is to be made after file of this initial report to the OKW.

There can be no data can be given by the Planning Office, and all members of the Military Duty are asked not to make inquires about this because answers of the Wehrmacht in regard to the Freistellung ... will be reported to those officers and places where they have to work individually.

II. Dienstantritt:

And those people will have to register personally when they have been dismissed from their military duty and to register at their new place where they are to work and are to be integrated immediately into the working process. If a report should be delayed, it should then be reported the reasons for the delay to the Planungsamtes, and immediately after the arrival of those powers which have been asked for by name ...the director of the Bedarfstelle (the place where they are to work) who, in turn, reports the

followings for the Planungsamt:

Day of arrival,
Day of dismissal for the military duty,
The beginning of action, and

Private address for powers which they have to fill in.

Within this larger overview, vacation is only possible within the scope of the project.

III. Dienstverhaeltnis (under Dr. Osenberg's Directorship).

The people are going to be obligated to service should understand that this Verplichtung is to be made with the Planning Office and because of this there should be made a more effective surveyance and assurance [of the talent], and this bears only a nominal form of character and has no influence on the substantial part of their work in the Bedarfsstelle (request stop). This bureau in Northeim/Hann. oversees all offices for the service in the military, service bureaus, and the departments for special service, including the salary, the working conditions, etc. ,according to the groups. There is something about the UK stellung (undefined higher technical group).

IV. Uk-Stellung.

According to the criterion of the OKW for the 18 December 1943, the President of the Reichsforschungsrat is allowed to preside over the authorized empowerment of the Uk-Antraege (proposition) giving assurance to those competent powers that have been dismissed from their military duty under the Stichwort "Research". This arrangement may not operate by the several Bedarsstellen, sondern auf Antrag (but by ordaining) from the leaders of the Reichsforschungrates and is not to be disturbed by worker agencies being involved (from the middle range of labor). Concerning the situation of dismissal --only the OKW is in a deciding position. If there are actions for drafting (Ueber Freigabe) people to the Wermacht the OKW decides in agreement with the chief of the Planning Office.

If there are difficulties the Planning Office has to be informed immediately by all mean--telegraph, telex, telephone.

[Signed] Dr. Osenberg

[Note. The Planning Office of the Reichforschungsrat was the final source of arbitration for the military to adjudicate discussions and problems with the military service.]

APPENDIX I:

Correspondence Between Technical Advisers at Peenemuende

Geheim.

Niederschrift über die Besprechung

am 3.7.42 in Peenemünde

Peenemünde, den 11.7.42.

Entwicklung einer Apparatur zur atmosphärischen Höhenvermessung für A 4.

[illegible]4 Ausfertigungen:	Anwesend:	
1.= Forschungsstelle f. Physik d. Stratosphäre, Friedrichshafen/[illegible]	Herr Prof. Regener	Forschungsstelle f. Physik d. Stratosphäre, Friedr.
2.= HAP/SS/L	Dr. Ehmert	
3.= HAP/SS/T/L	Dr. Schopper	
4.= HAP/SS/[illegible]	Oberstlt. Stegmaier (zeitweise)	SS/L
5.= HAP/SS/TS (Ing. Ludewig)	Dr. v. Braun	HAP/SS/T/L
6.= HAP/SS/T/BSM	Dr. Steinhoff	HAP/SS/T/BSM
7.= HAP/SS/T/BSM (Dr. Weiß)	Dr. Weiß	
8.= HAP/SS/T/BSM (Dr. Steuding)	Dipl. Ing. Reisig	
9.= HAP/SS/T/Proj	Dipl. Ing. Gröttrup	
10.= HAP/[illegible]	Dipl. Ing. Strobel	
[illegible] = Transparent		

Erledigungsvermerk: Betrifft | Erledigt

[illegible] A 4 bietet die Möglichkeit, atmosphärische Höhenvermessungen nach neuartigen Methoden auszuführen. Die baldmöglichste Durchführung derartiger Untersuchungen liegt nicht nur im Interesse der Forschungsstelle für Physik der Stratosphäre Friedrichshafen, sondern im Hinblick auf die Gewinnung einwandfreier Berechnungsunterlagen für Flugbahnenberechnungen, Erwärmungsfragen, Schusstafeln usw. auch im Interesse der Heeresanstalt Peenemünde.

Es wird daher beschlossen:

Die Forschungsstelle für Physik der Stratosphäre erhält von der HAP einen Entwicklungsauftrag zur Entwicklung einer Apparatur zur Höhenvermessung für A 4. Der Auftrag wird unter Dringlichkeitsstufe SS im Rahmen des A 4-Programms (Schwerpunktprogramm) erteilt. Die Forschungsstelle entwickelt im Rahmen dieses Auftrages eine Apparatur, die aus folgenden einzelnen Elementen besteht:

1.) Quarzbarograph
2.) Drahttermograph
3.) U.V-Spektograph
4.) Luftentnahmevorrichtung

Die unter 1.) und 2.) genannten Geräte sind bereits im Rahmen eines früheren von Professor [illegible] erteilten Auftrages entwickelt worden und werden für den vorliegenden Zweck geeignet umgestaltet.

Fortsetzung der Niederschrift über die Besprechung am 8. [illegible] 42

Bl. Nr. C1276/42 g Dr.

während die Meßapparatur mit sehr geringer Sinkgeschwindigkeit (ca 3 m/sec) auf den [illegible] der niedergeht und schwimmt. Die Standortverfolgung sowie das Einpeilen der Einschlagstelle für die Apparatur erfolgt durch Empfang des Treppensenders durch die vorhandene [illegible]-Bodenanlage.

Da es auf einige Kilo Mehrgewicht bei der Apparatur nicht ankommt, steht es Herrn Prof. Regener frei, über den vorstehenden Rahmen hinaus noch weitere Geräte in die Apparatur einzubauen. Vor Zusammenbau der ersten Apparatur erbittet HAP jedoch Zusendung einer Zeichnung.

Zur Durchführung der vorgenannten Arbeiten benötigt Herr Prof. Regener noch einen Spezialisten für die Entwicklung des Spektographen und einen Feinmechaniker bzw. Uhrmacher. Für die Entwicklung des Spektographen wurde bereits Dr. Paetzold (z.Zt. Gefr. bei einem Ersatztruppenteil) [illegible] gemacht. Als Mechaniker wird der HAP-Angehörige Rossner vorgeschlagen. Die U.K.-Stellung bzw. Kommandierung des Dr. Paetzold ist von der HAP bereits eingeleitet worden, sie wird mit besonderem Nachdruck weiterbetrieben. Der Mechaniker Rossner wird zum 10.8.42 zunächst unter Verbleib im Lohnverhältnis der HAP für die Dauer von 4 Wochen zur Probe zur Forschungsstelle Friedrichshafen in Marsch gesetzt. Nach Ablauf dieser Probezeit soll seine Übernahme durch die Forschungsstelle erfolgen. Bezüglich Lohn und Trennungsgeld besteht eine Einigung zwischen Forschungsstelle und Rossner bevor.

gez. [illegible]

F.d.R.d.U.

[signature]

GEHEIM 11.2.42
Niederschrift ueber die Besprechung
Peenemuende Research
TO HAP Personnel
Prof. Regener
Dr. Ehmert
Dr. Sonopper
Obsertlt. Stegmaier
Dr. v. Braun
Dr. Steinhoff
Dr. Weiss
Dip. Ing. Reisig
Dip. Ing. Groettrup
Dip. Ing. Strobel

The A-4 [V-2] offers the possibility of carrying our high-altitude measurements with new methods. The early possibility of carrying out such research work is not only in the interest of the Research Foundation for Physics of the Stratosphere, but also that of the Army Research Center at Peenemuende with a view to establishing reliable calculation bases for the establishment of trajectory predictions, solving questions of frictional heating, and preparing firing tables, etc.

In consequence it has been decided that the Foundation will receive from HAP Peenemuende a development contract, "Development of equipment for altitude measurement in the A-4". The contract is being awarded under Priority SS in the framework of the A-2 program (center of gravity programs):

The Foundation will develop under this contract equipment including the following items:

1. Quartz barography
2. Recording thermometer
3. Ultra-violet spectrograph
4. Air-sampler

The apparatus in 1 and 2 has already been developed under a contract granted to Professor Kuelzer and is to be suitably modified for the proposed project.

...while the instrument package comes down at a very low rate of descent to the surface of the water and floats. The position of the package will be found by receiving the signals from the automatic radio beacon it contains by goniometeric ground stations.

...The transfer of Dr. Paetzold has already been set in motion and is being pursued with insistence. The mechanic Rossner will be sent to the research center at Friedrichshaften on August 10, 1942, for a trial period of four weeks, remaining on the HAP prayrool. After this trial period, the research center will be at liberty to recruit

him. An agreement is pending on salary and severance payment between Rossner and the HAP.

[Signed] W. von Braun

Sonderausschuß A IV
beim Reichsminister für Bewaffnung und Munition

DER LEITER

i.V. Direktor Kunze

Briefanschrift:
Direktor G. DEGENKOLB
Berlin-Charlottenburg 2,
Bismarckstraße 112
Fernsprecher: 31 81 21
Telegramme: Lokwaggon Berlin
Fernschreiber: 01 1435

Berlin-Charlottenburg 2, den 11..8. 43
Nr. 129/43 g - Dir.K/S.

Geheim

Herrn
Prof. Dr. v. Braun oViA
AA Abnahme
Heimat Art. Park 11
Karlshagen/Pommern

Betr.: Klein Schanzlin u. Becker.

Mit Schreiben vom 26. 7. hatten Sie mich gebeten, die Einsetzung des Herrn Dipl.-Ing. S a l l w e y als Kommissar bei der Fa. KSB in Frankenthal für die Turbofertigung einzusetzen. Ich habe dieses Schreiben zunächst dem zuständigen Wehrkreisbeauftragten XII b, Gauamtsleiter Kelchner, zugestellt. Von Herrn Kelchner ist mir inzwischen die in Abschrift beigefügte Stellungnahme zugegangen, aus der ersichtlich ist, dass der von Ihnen vorgeschlagene Herr Sallwey für eine solche Aufgabe nicht als geeignet anzusehen ist. Hingegen wird sich der WKB XII b in verstärktem Masse der Turbagfertigung bei KSB annehmen. Soweit in der Fertigung der Turbo-Aggregate bei KSB Ihrerseits bestimmte Forderungen erhoben werden, empfehle ich zu deren Sicherstellung den Wehrkreisbeauftragten XII b unmittelbar zu unterrichten.

Heil Hitler !

(Kunze)

D: WKB XII b,
Gauamtsleiter Kelchner

HAP/EW
Eing. 13 AUG. 1943
Bb. Nr. E 3081/43 g
Bearbeiter

Sonderausschuss A IV
beim Reichsminister fuer Bewaffung und Minition
DER LEITER
i.V. Direktor Kunze (Office of Degenkolb)

Herrn Prof. Dr. v. Braun oViA
AA Endabnahme
Heimat Art. Park 11
Karlshagen/Pommern

When you wrote on the 26th of July you asked me for the report of Herr Dipl. Ing. Sallwey, as commissar for the fabrication facility KSB, for the turbo parts that would be inserted. I have handed over this priority request to the appropriate Arms Circle Commission XII b. Herr Kelchner has meanwhile given to me the transcript to put forth the proposition of Herr Sallwey and that for such a proposal of the enclosed undertaking it is not workable. On the other hand the WKB can become the strenghtening mass for the skillful assembly of Turbo finishings undertaken with the KSB. As far as the readiness of the Turbo-Aggregates [V-2 parts] is concerned with, the KSB has decided to raise demands for security measures from the Arms Circle Commission XII b [for the proper preparation of underground facilities for the V-2s) so as to instruct immediately.

Heil Hitler,

Kunze

APPENDIX J:

TABLE SHOWING THE FINANCING OF SYNTHETIC FUELS EXPANSION UNDERTAKEN ON BEHALF OF THE FOUR YEAR PLAN, MARCH 1937

I. Synthetic fuel plants under construction (Scholven Rheinpreussen, Ruhrchemie, Kloeckner-Werke)		
- hydrogenation and Fischer--Tropsch plants	=	100RM
- coking facilities		11RM
- power plants		16RM
- power plants		36RM
II. Synthetic fuel plants called for by 18-Month Plan (Gelsenberg, Scholven, Stinnes, Essener Steinkohle, Krupp, Hoesch, Rheinpreussen, Ruhrchemie, de Wendel)		
- judrpgematopm amd Fosjer-Tropsch plants	=	270
- coking facilities		30
- power plants		53
- mining installations (surface)		115
III. Increased coke productions	=	120
IV. Mines (underground)	=	400
V. Power Plants	=	110
		630
Total	=	1,261,000,000RM

Source: Hans Spethmann, The Mining Industry of the Ruhr and World War II (unpublished ms.)

The Codes for Fuels
That Self-Ignite for use in Flight Applications

Most common code names for oxidants	Fuel components
T-Stoff	H202
TS-Stoff	H202 Stabilized
TSS-Stoff	H202 Most highly stabilized
Salbei	HN03
Salbeik	HN03 plus catalyst
MS 10	Mix 0.9HN03 + 0.1H2S04
X- Stoff	Tetranitromethane
U- Stoff	N204
Gola IR	Aniline
Gola X	Xylidine
Optol	Crude pyrocatechol
Pantol 5S	Furfuryl alchol
B- Stoff, LJR	Hydrazine hydrate
Visol	Vizyl ether except Visol 7
Aquarol	Tetrahydrofurane
Arbin	Aromatic gasoline
Finol	Xylol
Opten	Mix Optel and aniline
Optel	Mix Optel and alcohol
Opturan	Mix Optel-tetra-hydrofurane
Optyl	Mix Optel and ether

APPENDIX K:

PRODUCTION OF FIGHTERS AND BOMBERS

German Air Force Official Production Programs and Actual Production for Fighter Aircraft Selected Months, 1941-1945

Program No.	July 1941	Jan 1942	July 1942	Jan 1943	July 1943	Jan 1944	July 1944	Jan 1945	July 1945
1-Engine Fighters									
15 Mar 41 19	267	373	400						
1 Nov 41 21/1		280	340	375	450				
15 Mar 42 21/1			340	405	465	445			
21 Sep 42 222/1			374	516	865	1409			
15 Apr 43 223/1					894	1356	1863	2212	2623
16 Aug 43 223/1					1113	1646	2822	3440	2853
1 Oct 43 224/1						1679	3327	4150	3228
1 Dec 43 225/1						1421	2933	2770	2200
15 Jul 44 226/2							2591	4750	4220
15 Dec 44 227/1								3625	4015
16 Mar 45 228/2									880
Actual	267	210	430	381	1050	1315	2627	2509	
2-Engine Fighters									
15 Mar 41 19	88	113	120						
1 Nov 41 21/1		117	128	140	130				
15 Mar 42 21/1		112	135	137	140	140			
21 Sep 42 222/1			59	141	177	243	335		
15 Apr 43 223/1					162	245	439	916	990
15 Aug 43 223/1					232	275	562	1158	1660
1 Oct 43 224/1						283	577	1172	1750
1 Dec 42 225/1						283	531	838	1354
15 Jul 44 226/2							341	850	1135
15 Sep 44 226/2							330	750	1070
15 Dec 44 227/1								397	1160
16 Mar 45 228/2									800
Actual	53	64	57	131	213	240	327	234	

Source: USSBS Aircraft Division Industry Report p. 44

German Air Force Official Production Programs and Actual Production for Bomber Aircraft Selected Months, 1941-1945

Program No.	July 1941	Jan 1942	July 1942	Jan 1943	July 1943	Jan 1944	July 1944	Jan 1945	July 1945
Bomber Aircraft									
15 Mar 41 19	411	483	428						
1 Nov 41 21/1		460	556	386	670				
15 Mar 42 21/1		456	550	683	620	652			
21 Sep 42 222/1			556	642	743	806	868		
15 Apr 43 223/1					653	746	783	756	648
15 Aug 43 223/1					668	696	743	832	772
1 Oct 43 224/1						705	737	853	913
1 Dec 43 225/1						704	601	646	848
15 Jul 44 226/2							771	621	952
15 Dec 44 227/1								406	504
16 Mar 45 228/2									125
Actual	446	444	555	674	743	522	767	261	

Source: USSBS Aircraft Division Industry Report p. 44A

MESSERSCHMITT-BOELKOW AIRCRAFT DESIGNS

Tech. Daten Typ.	M17	M18 (b)	M19	M20(b)	M21(a)
Verwendungs-zweck	„Sport- und Übungsflugzeug	Verkehrs-flugzeug	Wettbewerbs u Sportflugzeug	Verkehrs-flugzeug	Schul-, Kunst und Spotflugzeug
Sitzzahl (Besatzung + Passagiere)	1 + 1	1 + 4	1	2 + 8 - 10	1 + 1
Bauart	Freitragender Schulterdecker in Holzbauweise	Freitragender Schulterdecker in Leicht-metallbau-weise	Freitragender Tiefdecker in Holzbauweise	Schulterdecker in Leicht-metallbau-weise	Doppeldecker Stahlrohr-konstrukion mit Stoff-bespannung
Triebwerk Leistung PS kg Schub	Bristol Cherub 26 PS	Siemens Sh12 108 PS	Bristol Cherub 29 PS	BMW VI 5,5Z 500 PS	Siemens Sh11 84 PS
Spannweite m	11,60	15,50	9,60	25,50	10,00
Länge m	5,85	8,05	5,40	15,90	7,32
Höhe m	1,50	2,25	1,50	4,80	2,80
Fläche m^2	10,40	24,80	7,90	65,00	20,80
Rüstgewicht kg	186	600	140	2800	460
Fluggewicht kg	370	1200	340	4600	740
Höchstgeschwin-digkeit km/h	140	145	145	205	145
Reisgeschwin-digkeit km/h	125	130	120	165	130
Steigzeit auf 1000m min	12,5			5,5	9,5
Dienstgipfel-höhe m	4000	2700	850	4000	3300
Reichweite km	500	700		1000	500
Jahr des Erstfluges	1925	1926	1927	1928	1928
Produktionszahl Stuck	mind. 5	rd.30 a bis d	2	15	2
Besondere Leistungen/ Bemerkungen	1925 Sieger im Oberfranken-flug 1926 Überquerung der Zentral-alpen durch v. Contra und v. Langsdorff	Wirtschaft-lichstes Verkehrsflug-zueg seiner Zeit	Erstes Motor-flugzeug mit mehr Zuladung als Eigengewicht Sieger im Sachsenflug 1927	Auch als Frachtflugzeug z.T. bis 1943 der Lufthansa im Einsatz	Als Nach-folgmuster für Udet U-12 FLAMINGO vorgesehen

Tech. Daten: M22	M23(b)	M24	M25	M27	M28
Verwendungszweck: Nachtjäger u. Nachterkunder	Schul- und Sportflugzeug	Verkehrs-flugzeug	Kleinverkehrs flugzeug	Sportflugzeug	Schnellpost-flugzeug
Sitzzahl (Besatzung + Passagiere): 3	1 + 1	2 + 8	1 + 2	1 + 1	2
Bauart: Doppeldecker Stahl-rohrkonstruktion mit Stoffbespannung Flugel in Holzbauweise	Freitragender Tiefdecker in Holzbauweise	Freitragender Schulterdecker in Leicht-metallbau-weise	Freitragender Schulterdecker in Leicht-metallbau-weise	Freitragender Tiefdecker in Gemischtbau-weise	Ganzmetall Tiefdecker
Triebwerk PS Leistung kg Schub: 2 x Siemens Jupiter 2 x 500 PS	Siemens Sh 13 (oder versch. Motoren) 68 PS	BMW Homet (oder versch. Motoren)500PS	Siemens Sh 14 92 PS	Argus As8 100 PS	BMW Homet 500 PS
Spannweite: 17,00 m	11,80	20,60	12,40	12,00	15,50
Länge: 13,60 m	6,50	12,80	7,15	7,90	10,00
Höhe: 4,80 m	2,30	4,20	2,40	2,40	3,00
Fläche: 2 63,20 m	14,40	43,00	14,30	14,50	25,60
Rüstgewicht: 2900 kg	330	1480	480	430	1160
Fluggewicht: 3800 kg	595	3000	900	730	2750
Höchstgeschwin-digkeit: 220 km/h	160	220	168	200	260
Reisgeschwin-digkeit: 185 km/h	135	195	150	170	220
Steigzeit auf 1000m min: 2,4	5,5	4	9,5	4,5	3
Dienstgipfel-höhe : 6200 m	4700	5500	2700	5200	5200
Reichweite km:	800	800	850	700	2450
Jahr des Erstfluges 1930	1928	1929	1930	1931	1931
Produktionszahl: 1 Stuck	uber 80 a bis c	4	1	12	1
Besondere Leistungen/ Bemerkungen:	1928/29 T. T. Croness Sieger im Ost-preussenflub 1929 and 1930 F. Morzik Sieger im Europa-Rundflug	Eine Maschine auch als Schwimmer-Flugzeug geflogen			

Tech. Daten Typ.	M29	M31 (b)	M35	M36	Taifun
Verwendungs-zweck	Wettbewerbs- und Sportflugzeug	Sportflugzeug	Sport- und Kunstflugzeug	Verkehrs- und Fracht-flugzeug	Reiseflugzeug und Ver-bindungflz.
Sitzzahl (Besatzung + Passagiere)	1 + 1	1 + 1	1 + 1	2 + 6	1 + 3
Bauart	Tiefdecker in Gemischtbau-weise und mit geschlossenen Cockpits	Tiefdecker in Gemischt-bauweise	Tiefdecker in Gemischt-bauweise	Schulterdecker in Gemischt-bauweise	Ganzemetall-Tiefdecker in Messerschmitt Schalenbau-weise
Triebwerk Leistung PS kg Schub	Argus As 8 R (o. Siemens Sh 14a) 130 PS	Hirth HM 60 60 PS oder BMW Xa, 40 PS	Siemens Sh14a 130 PS	Armstrong-Siddeley Serval 4 350 PS	Argus As 10C 240 PS
Spannweite m	11,00	12,00	11,57	15,40	10,62
Länge m	7,75	7,85	7,48	9,80	8,33
Höhe m	2,00	2,20	2,75	2,80	2,02
Fläche m^2	14,50	17,24	17,00	30,50	16,45
Rüstgewicht kg	390	350	500	1320	850
Fluggewicht kg	700	650	800	2250	1380
Höchstgeschwin-digkeit km/h	262	175	230	235	305
Reisgeschwin-digkeit km/h	225	150	205	215	265
Steigzeit auf 1000m min	3	5,8	3,3	4	3,15
Dienstgipfel-höhe m	6000	3800	5300	4500	5000
Reichweite km	700	700	1000	700	1000
Jahr des Erstfluges	1932	1932	1933	1934	1934
Produktionszahl Stück	6	2	15	1	uber 1000
Besondere Leistungen/ Bemerkungen	Erste Messer-schmitt-Kon-struktion mit Vorflugein Landeklappen und Einbein-fahrwerk		1935 und 1936 Willi Stör Sieger der Deutschen Kunstflug-meister-schaften	Für Rumänien entwickeit und dort gebaut	

Tech.Dat: Me109(b-1)	Me109 (E-3)	Me109 (G-6)	Me110 (G)	Me 161	Me 162
Verwendungszweck: Leichtes Jagdflugzeug	Leichtes Jagdflugzeug	Leichtes Jagdflugzeug	Zweimot, Zerstörer, Nachjäger, Aufklärer	Fermaufklärer	Kampfflugzeug
Sitzzahl (Besatzung + Passagiere): 1	1	1	2	2-3	3
Bauart: Ganzmetall-Tiefdecker in Messerschmittscher Schalenbauweise	Ganzmetall-Tiefdecker in Messerschmittscher Schalenbauweise	Ganzmetall-Tiefdecker in Messerschmittscher Schalenbauweise	Ganzmetall-Tiefdecker in Schalenbauweise	Ganzmetall-Tiefdecker in Schalenbauweise	Ganzmetall-Tiefdecker in Schalenbauweise
Triebwerk PS Leistung kg Schub: Junkers Jumo 210D 580 PS	Daimler-Benz DB 601 A 1100/1030 PS	Daimler-Benz DB 605 A 1475 PS	2 x Daimler-Benz DB 605 2 x 1475 PS	2 XJumo 210 E oder 2 X Daimler-Benz DB 600	2 x Daimler-Benz DB 600 2 x 1000 PS
Spannweite: 9,90 m	9,90	9,92	16,27	16,69	16,20
Länge: 8,70 m	8,76	8,94	12,07	12,85	12,30
Höhe: 2,45 m	2,50	2,50	4,13		4,12
Fläche: 2 16,35 m	16,35	16,02	38,40	38,50	38,50
Rüstgewicht: 1580 kg	2060	2680	5850		4360
Fluggewicht: 1960 kg	2610	3200	7410	4890	6280
Höchstgeschwindigkeit: 460 km/h	560 in 5.2 km	630 in 7 km	561	440 in 4 km	480
Reisgeschwindigkeit: km/h		590 in 6 km	525		
Steigzeit auf 1000m min:		10,5 auf 6,4 km	4,5 auf 4 km		
Dienstgipfelhöhe : m	11000	12000	11000	8100	
Reichweite: 450 km	560	650	900		
Jahr des Erstfluges 1935	1939	1942	1936	1938	1937
Produktionszahl: Stuck	Gesamtproduktionszahl aller Me 109 von 1935-1955; rund 35000		uber 6000	2	3
Bewaffnung: 2-3 MG 17 B-1 erste Serienvariante	Bewaffnung: 2 MG 17, 2 MG-FF	Bewaffnung: 1 MG 151, 2 MG 131 Me 109 G: meistgebaute Serienvariante	Bewaffnung: 4 MG 17 2 MG 151 1 MG 18Z bewegl. + Rüstsätze für weitere MG/MK und Bomben	Entwickett aus Me 110	Bewaffnung: 2 MG 15, 500 kg Bombenzuladung

Tech. Daten Typ.	Me 163	Me 163 (B-1)	Me 208	Me 209 (V1)	Me209 (V5)
Verwendungs-zweck	Verbindungsflz Nahaufklärer	Abfangjäger mit Raketernantrieb	Verbindungs- und-Reise-flugzeug	Geschwindig-keit Rekord-flugzeug	Jagdflugzeug
Sitzzahl (Besatzung + Passagiere)	3	1	1 + 3	1	1
Bauart	Abgestrebter Hochdecker in Ganzmetall-bauweise	Mitteldecker mit Delta-flügein, abwerf-bares Fahrwerk Landekufen	Ganzemetall-Tiefdecker in Schalenbau-weise	Ganzemetall-Tiefdecker in Schalenbau-weise	Ganzemetall-Tiefdecker in Schalenbau-weise
Triebwerk Leistung PS kg Schub	Argus As 10 C 240 PS	Walter-Rakete 109-509 A 1X 1700kg Schub	Argus As 10P	Daimler-Benz DB 601 V 2500 PS	Daimler-Benz DB 6031 GV 1750/1450 PS
Spannweite m	13,58	9,30	11,50	7,80	10,95
Länge m	9,75	5,92	8,62	7,24	9,60
Höhe m		2,75	2,80	3,50	3,75
Fläche m^2	22,80	17,30	17,40	10,55	17,15
Rüstgewicht kg	995	1385	950		3370
Fluggewicht kg	1310	3995	1590	2515	4120
Höchstgeschwin-digkeit km/h	170-200	950	305	755	734 in 8,5km
Reisgeschwin-digkeit km/h		800	275		665 in 6 km
Steigzeit auf 1000m min		3,35 auf 12km	4		4,2 auf 4 km
Dienstgipfel-höhe m		14500	4800		12100
Reichweite km	450	80	1300		
Jahr des Erstfluges	1938	1942 ohne 1943 m. Triebwerk	1944	1938	1943
Produktionszahl Stuck	1	ca. 380	2	4	2
Besondere Leistungen/ Bemerkungen	Gebaut bei Weserflug. Konkurrenz-entwicklung zum Fieseler 'Storch' Daten rekonstruiert	Einziges in Serie gebautes Raketen-Jagdflugzeug: Konstruktion Dr. A. Lippisch Bew.:2 MK 108	Nach dem Kreig in Frankreich als Nord 1100 'Noralpha' und 1101 'Ramier' nachgebaut	Am 26.4.1939 Geschwindig-keits-Weltrekord mit 755,1km/h durch Fritz Wendel (Bestand bis 1969)	Bewaffnung: 1 MK 108 2 MG 131 2 MG 151

Tech.Dat: Me210(A-1)	Me261 (V1)	Me262 (A-1)	Me 263	Me 264	Me 309
Verwendungszweck: Zerstörer, Bomber Aufklärer	Kurierflugzeug Fernaufklärer	Jagdflugzeug mit Strahlantrieb	Abfangjäger mit Raketenantrieb	Langstrecken-bomber Fernaufklärer	Jagdflugzeug
Sitzzahl (Besatzung + Passagiere): 2	5	1	1	8	1
Bauart: Ganzmetall-Mitteldecker in Schalenbauweise	Ganzmetall-Mitteldecker in Schalen-bauweise	Ganzmetall-Tiefdecker in Schalen-bauweise	Mitteldecker, Rumpf in Ganzmetall-Schalenbau-weise	Schulterdecker in Ganzmetall-Schalen-bauweise	Ganzmetall-Tiefdecker in Schalen-bauweise
Triebwerk PS Leistung kg Schub: 2 x Daimler-Benz DB 601 F 2X1350/1190PS	2 x Daimler-Benz Doppelmot DB 606 A 2 X2700/2360PS	2 x Junkers Jumo 004B; 2x900kg Standschub	Walter-Rak. 109-509C 2000 kg Schub +400Startrakete	4 XBMW 801 TC 4 X 2000 PS	Daimler-Benz DB 603 G 1750/1450 PS
Spannweite: 16,34 m	26,90	12,56	9,50	43,00	11,04
Länge: 11,20 m	16,65	10,60	7,88	20,90	9,46
Höhe: 3,70 m	3,90	3,60	3,17	4,30	3,40
Fläche: 2 36,20 m	85,00	21,70	17,80	27,70	16,55
Rüstgewicht: 7070 kg	12100	4100	2065	20000	3530
Fluggewicht: 9460 kg	25150	5100	5100	56000	4250
Höchstgeschwin-digkeit: km/h 573 in 5.9 km	580 in 6 km	870	1000	570	730 in 8,5km
Reisgeschwin-digkeit: km/h 550 in 6 km	450		700	380	665 in 6 km
Steigzeit auf 1000m min: 12,4 auf 6 km	3	11 auf 8 km	3 auf 14,5 km		4,7 auf 4 km
Dienstgipfel-höhe : 8900m	12500	12000	14500	5200	12000
Reichweite: 1850 km	8900	1000	(15 min)	14000	1100
Jahr des Erstfluges 1939	1940	1941 mit Ottomotor 1942 mit Strahltriebw.	1944	1942	1942
Produktionszahl: Stuck 483	3	1433	1	1-2 unfertig	4
Bewaffnung: 2 MG 17, 2 MG 131, 2 MG 151 und 1000 kg Bomben-zuladung		Erste in Serie gebautes Turbinen-Strahlflugzeug	Bewaffnung: 2 MK 108		Vorgesehene Bewaffnung: 1 MK 108, 2 MG 151 4 MG 131

Tech. Daten Typ.	Me 321 Gigant	Me323(D)Gigant	Me 323 (B)	Me 410 (A-1)	Pe1101
Verwendungs-zweck	Grossraum-Lastensegler	Grossraum-Transporter	Schnellbomber mit Strah-lantrieb	Zerstörer, Schnellbomber Aufklärer	Jagdflugzeug mit Strahlantrieb
Sitzzahl (Besatzung + Passagiere)	2	5	1	2	1
Bauart	Abgestrebter Schulterdecker aus Stahlrohr mit Stoffbesp. abwerfbares Fahrwerk	Abgestrebter Schulterdecker aus Stahlrohr mit Sperrholz und Stoffbesp. abwerfbares Fahrwerk	Freitragender Mitteldecker in Gemischt-bauweise	Ganzemetall-Tiefdecker in Schalenbau-weise	Ganzemetall-Mitteldecker Holzschal. mit 40° Pfeilung
Triebwerk Leistung PS kg Schub	ohne	6 x Gnome & Rhone 14N 6X 1180/940PS	2 x Schmidt Argus-PS 2 x 300 kg Schub	2 x Daimler-Benz DB 603 A 2X1750/1450PS	Heinkel-Hirth He S011 1100kg Schrub
Spannweite m	11,00	55,24	7,00	16,39	8,25
Länge m	28,15	28,15	7,05	12,56	9,18
Höhe m	7,00	10,50	2,65	3,70	4,05
Fläche m^2	300,50	300,50	8,50	36,20	15,85
Rüstgewicht kg	12600	27000	1510	8700	2700
Fluggewicht kg	35000	45000	3240	11240	4064
Höchstgeschwin-digkeit km/h	230	260	700	568 in 6 km	985 in 7 km
Reisgeschwin-digkeit km/h	*	250			
Steigzeit auf 1000m min	*	17 auf 2 km		7,5 auf 4km	1 auf 1,2 km
Dienstgipfel-höhe m	*	4500	4000	10000	
Reichweite km	*	700	630	1200	
Jahr des Erstfluges	1941	1941	1942	1942	(1945 vorge-sehen)
Produktionszahl Stuck	200	150	ca. 3	ca. 1200	1(V1 80% fertig)
Besondere Leistungen/ Bemerkungen	* Entsprechend Schlepp-maschine Ju 90 od. He 111Z	Bewaffnung: 15 Waffen-stände mit je 1 MG 34 oder MG 15	Mit 500-kg Bombe Leistungen reduziert	Geanderte Me 210 Bewaffnung wie Me 210 A	Vorgesehene Bewaffnung: 4 x MK 108 1951 als Bell X-5 in den USA geflogen

Information from Messerschmitt Corp. Bulletin and Information Packet

SUPER FIGHTER PLANES

At the end of the war, several other designs of fighter planes were being developed within the Messerschmitt works at Augsburg. The interceptor Me P 1101, with a span of 8.3 meters and a wing surface of 15.8 square meters, powered by a Jumo turbo-jet engine, was undergoing tests when the war came to an end. It was surrendered to the United States, where it formed the basis of designs of American aircraft. It was powered by a Heinkel-Hirth engine, He S-011, and reached a speed of 890 km/h with a thrust of 1,300 kgp. Its armament consisted of four automatic cannon MK 108/30 mm. It could take off vertically from a take-off frame.

The rocket-driven fighter P 1104 was also in a state of development at the end of the war. It, too, was intended to take off vertically powered by a Walter engine, HWK 109-509, with a thrust of 1,700 kgp, it was supposed to reach a speed of 985 kgp at an altitude of 7,000 meters. The armament of this small aircraft with a wing surface of 6.5 square meters consisted of one automatic cannon MK 108/30 mm.

The subsequent P 1111, a single engine (He S-012) Messerschmitt model, was an all-wing type aircraft designed by Dr. Lippisch. This was one of the first practical attempts at developing a Delta aircraft. It had been based

on the Me 163 but was expected to considerably exceed its performance.

Finally, the development of another fighter was begun, the P 1116, which was to have had 40 degrees swept-back wings and a nose wheel undercarriage. The pilot was placed aft in front of the empennage. The plan was to give the aircraft a span of 6.65 meters and a length of 9.1 meters. In a similar way as with the P 1101, the turbo-jet engine was mounted beneath the fuselage. The air was to be sucked in through the nose, which was the contemporary method for many service aircraft everywhere. By the end of the war, due to the prestige of Dr. Lippisch and Willi Messerschmitt, all of the major aerospace firms of the Speer-SS "Councils" had shifted their attitudes to the support of this revolutionary technology. However, for Germany it was too much too late.

END NOTES

Introduction pages 11-19

[1] Karl-Heinz Ludwig, Technik und Ingenieure im Dritten Reich, Duesseldorf: Droste, 1974, pp. 125-245. This study looks at the growth and demands of the VDI for a new economic structure featuring a seperate Ministry of Technology designed to provide for new initiatives and directions in the way of technological thinking. This would later find a place in the Nazi program appointments made by Fritz Todt in 1939. By 1937, more than 84,000 engineers were members of the Nationalsozialistischer Bund Deutscher Technik, which comprised one-third of the total membership of the engineering professional groups. With Todt's election to the chairmanship of the VDI in 1939, the oldest and most prestigious engineering society was coordinated in the technostructure of the Third Reich. German engineers could not be harnessed for war production through the agency of the Four-Year Plan.

[2] Reichsfinanzministerium R 2, folder 19956, Bundesarchiv, Koblenz, and R 43 II, 1170. Goering's assignment to Todt was to introduce a priority system in input and output markets. First place was to be given to military demands, second to civilian orders or public agencies, and third to deserving civilian projects. Along with this were granted permits to build and rights to buy materials for the construction of military and technical quarters for those who were to be involved in the essential industries of the Four-Year Plan. Also Trials of War Criminals before the Nuremberg Military Tribunal under Control Council Law No. 10 (Washington, D.C., 1951-52), 8: 1279. Also Wolfgang Birkenfeld, Der synthetische Treibstoff 1933-1945: Ein Beitrag zur nationalsozialistchen Wirtschafts- und Ruestungspolitik. Goettingen: Berger Verlag, 1964, pp. 28-34.

[3] Walter Eucken. "On the Theory of the Centrally Administered Economy: An Analysis of the German Experiment," Economica, May 1948, pp. 79-100 and August 1948, pp. 173-193. Arthur Schweitzer, "Der organisierte Kapitalismus,' Hamburger Jahrbuch fuer Wirtschafts- und Gesellschaftspolitik, 1962, pp. 32-47.

[4] Conversation with Ret. General Adolf Galland at Northrup Aircraft Corporation, Los Angeles, June 1985, on the history of "The Luftwaffe and the Pioneers of German aviation," a projected film study (by Chateau Productions, Australia) on novel German jetcraft that were not entertained by Goering as possible for mass production due

to economic concentrations in other areas.

[5] Ludwig Boelkow (ed.), Ein Jahrhundert Flugzeuge: Geschichte und Technik des Fliegens, Duesseldorf: Droest, 1990, pp. 126-171.
Bernard Bellon, Mercedes in Peace and War: German Automobile Workers, 1903-1945, New York: Simon and Schuster, 1990, p. 14.
Personal papers on Willi Messerschmitt team and late war Boelkow participation 1943-45 in files of Ludwig Boelkow, Garching, Germany. Hans-Joachim Braun, "Fertigungsprozesse im deutschen Flugzeugbau 1926-1945, Technikgeschichte 57, 1990. pp. 111-135.

[6] With permission of Prof. Ulrich Grigull and Prof. Franz Mayinger the personal library of the late Ernst Schmidt (1892-1975), renowned scientist, was examined for his work which was highly instrumental for the development of turbine and rocket components of ME 262 and V-1 and V-2 systems. He is highly recognized for his role in the "fathering" of heat-transfer was principle architect for motor-engineering division of the Hermann Goering's LFV at Braunschweig, as well as, a consultant to the Reichsforsch-ungsrates during World War II. He was also a principle architect for the Hermann Goering Air Research Institute at Braunschweig. Following World War II he was an advisor to the American and British air force. Some of his more important writings that were crucial for the German air force are:
1) Ueber die Richtungsverteilung der Waermestrahlung von Oberflaechen. in Forschung Ing. wesen Vol. 6 (1935), pp. 175-183;
2) Waermetransport durch Fluessigkeiten in der Naehe ihres kritischen Zustandes. in Jahrbuch 1939 Deutsche Luftfahrtforschung Vol. 2, [[. 53-58;
3) Waermeabgabe ueber den Umfang eines angeblasenen geheizten Zylinders. in Forschung Ing. wesen Vol. 12 (1941), pp. 65-73; and
4) Waermeuebertragung durch natuerliche Konvektion in starken Fliehkraftfeldern bei der Kuehlung von Gasturbinen. in Abhandl. Braunschwig. Woss. Ges. Vol. 1 (1949), pp. 108-115.

[7] Conversations with Dieter Huzel, 24 June 1987, Los Angles, California. Huzel was responsible for correlating all paperwork of von Braun which was sequestered until turned over to American authorities in June 1945.

[8] Freedom of Information documents acquired for this thesis for the post-war American period of German-American cooperation from the U.S. Naval archives revolve around the sequestered role played by the major 137 German scientists

and technicians transferred with their personal writings from Peenemuende complex, the first space port, to locations in New Mexico and Florida where the launch facilities for upper atmospheric testing were built. These are the White-Sands and Cape Canaveral complex contracted with the leadership of the U.S. Army Air Force, U.S. Navy, and pre-NASA leadership. See Homer E. Newell and J.W. Siry, eds., Upper Atmosphere Research Report no. 2, NRL, Report no. 3120, December 1946, and no. 3, NRL, Report no. 3120, April 1947.

The interrelationships in technical leadership that are examined here are detailed in the private papers of Rear Admiral Delmar S. Fahrney, "father of the American missile" who established working conditions for the Peenemuende scientists to test their rockets in White Sands, New Mexico, Point Hueneme, California, and from the decks of American warships in 1945-50 in the first Pacific testing of the capability of the V-2.. It is significant that the German team was so prized by Del Fahrney and Col. Holger Toftoy for its perceived synergy in accumulative knowledge that it was kept intact and answered essentially to the Pentagon through the personal command structure of Wernher von Braun up through the successful period of the Apollo program in 1969. D.S. Fahrney, The History of Pilotless Aircraft and Guided Missiles. U.S. Bureau. Aer., 1958, unpublished, p. 1132.

[9] General Georg Thomas' economic program for military-industrial preparation of the German armed forces entitled, Die Organisation der Kriegswirtschaft. Bundesarchiv-Militaerarchiv RW 19/513, pp. 1-35.

[10] Kess Gispen, New Profession, Old Order: Engineers and German Society, 1815-1914. New York: Cambridge University Press, 1989, pp. 335-357. Gispen's thesis is that, as German engineering developed in the 19th century, it was subjected to forces that pulled it in a variety of directions, preventing the formation of a cohesive professional group. It was often difficult to say who exactly was an engineer, given the open-ended definition of this occupational group. The question of the engineers' willingness to embrace Nazism needs more empirical verification, given the fact, for example, that engineers were not overly represented in the Nazi party in 1933. A more thorough study is by Charles McClelland, The German Experience of Professionalization: Modern Learned Professions and Their Organizations from the Early Nineteenth Century to the Hitler Era, New York: Cambridge University Press, 1991, which explores how Germany's distinctive timing of industrialization had implications for the rise of the engineers as a powerful group between

labor and the established classes within German political and economic development in the 1920s and 1930s.

[11] The contrast with Speer's civilian, decentralized approach to preparing for total war was not very different, in fundamentals, from that of Thomas, except in one point: in Thomas' design, the military establishment was to control the economy, whereas in Speer's civilians controlled all war production. Unlike Thomas, Speer was an active participant in the inner-political circle of Hitler. See Thomas, Die militaerische und wirtschaftliche Lage und die sich hieraus ergebenden neuen Forderungen bezueglich der Ruestung, 1942. Bundesarchiv RW 19, 1922.

[12] The order to make preparations for the deployment of POWs and to create corresponding offices to handle the matter dates from 13 December 1937, RW 19 WI/F 5/1228, fol. 418. See also the Decree of the Reich Interior Ministry, 22 April 1939, R58/459, fol. 16.

[13] Galland conversation, op. cit. According to Timothy Mason, Sozialpolitik im Dritten Reich, Wiesbaden: Westdeutscher Verlag, 1977, pp. 170-315, Hitler had to pursue a dynamic foreign policy in order to maintain domestic stability, but, simultaneously, he was unable to create the conditions for a successful foreign policy involving war precisely because that would disrupt the degree of stability already reached and precariously maintained, by asking the working class to make sacrifices.

[14] Karl-Dietrich Bracher, The German Dictatorship: The Origins, Structure, and Effects of National Socialism. New York: Praeger, 1970. As Bracher sees it, National Socialism was an amalgam of deeply rooted German traditions, the tradition of the bureaucratic authoritarian state standing above both society and the individual, and using the voelkisch tradition of social Darwinianism to strike out against genuine innovation in the sciences that were a threat to the people.

[15] Karl-Heinz Ludwig, op. cit. What one finds most disturbing here is the dictatorial inclinations and the illiberalism of the underlying view of science that exemplified engineering activity in the early thirties.

[16] Conversation with the late John Gimbel, Standford University, May 1991 on the exploitation of German patents by the Americans following the Second World War. Gimbel advances the interesting argument that in some respects the exploitation of German engineers and scientists was key to the restoration of their vitality. See John Gimbel, Science, Technology, and Reparations: Exploitation and

Plunder in Postwar Germany. Stanford: Stanford University Press, 1990.

I. MILITARY CONTROL OF ROCKET DEVELOPMENT pages 20-25

[1] Rudolf Nebel, History of the Silver Bird. Cal Tech Galcit-72 paper presented at the Sixth History Symposium of the International Academy of Astronautics, Vienna, Austria, October 1972. Nebel was one of the early associates of von Braun who helped acquire the technical support for the testing of the German rockets before the German Army acquired the testing facilities of the German Rocket Society in 1933.

[2] Hermann Oberth, Die Rakete zu den Planetenraeumen. Munich and Berlin: Verlag von R. Oldenbourg, 1923, NASA TT F-9227, pp. 94-96; and H. Noordung, Das Problem der Befahrung des Weltraums. Berlin: Springer Verlag, 1929; on German wartime plannig , see Theodore von Karman, Where We Stand. a report prepared for the AAF Scientific Advisory Group, August 1945, published May 1946 by Headquarters, Air Material Command 13; also, "The Station in Space," Journal of the American Rocket Society. #63, September 1945, p.8.

[3] Willi Ley, Rockets, Missiles, and Men in Space. New York: Viking, 1968. p. 47ff.

[4] Frederick I. Ordway III (editor), Blueprint For Space, Washington D.C.: Smithsonian Institution, 1992, pp. 97-103.

[5] Conversation with Rolf Engel via Lt. Col. Arnold Bermingham in September 1987 in Munich, Germany, on his role in the development of the German weapons during World War II and the German-Soviet developments following the forced relocation of part of the Peenemuende team to the Soviet Union in 1945.

[6] Interview with W. Haeussermann, former Director of Guidance and Control Laboratory, MSFC, Huntsville, Al., 25 May, 1988.

[7] E. Drucker, "Project Manager in the Apollo Program: An Interdisciplinary Study," Syracuse/NASA, Syracuse University, Syracuse, New York, 1972, NASA Microfiche CR-126941, p. 56, illustrates the continuation of the military-aerospace complex and its unique problems of fuel preparation and supply that began with German criteria of seeking the development of special fuels and the necessary means for their safety and deployment.

II. THE GERMAN ENGINEER AND THE NATIONAL SOCIALIST MOVEMENT
pages 26-32

[1] Gottfried Feder, Nationalsozialismus und Technik: Die Geistigkeit der nationalsozialistischen Bewegung. J.L. Lehmans Verlag, 1930.

[2] Deutsche Technik published by the Verein Deutscher Ingenieure, Nationalsozialistischen Bund Deutscher Technik (NSBDT), Ingenieurhaus, Hermann-Goering Strasse 27, from 1933.

[3] Fritz Todt's articles appear in the Deutsche Technik from 1933-1939. A statement on the personal charisma of Todt as a technical adviser to the Third Reich leadership is provided by Xaver Dorsch, Former Head of the Chief Office of the Organization Todt in documents NA MS B-670, National Archive, for 1 September 1946, pp. 1-52.

[4] Jeffrey Herf, "Reactionary Modernists in Weimar and Nazi Germany," in Journal of Contemporary History. Vol 19 (1984), pp. 637-645.

[5] In short, it prohibited any link between the relativity theory and a general relativity while upholding theoretical physics with all of its mathematical aids. See D. Walker, German Nuclear Scientists Under Hilter. Princeton: Princeton University, 1987, p. 176

[6] The classical text for this concept is given in R. Walter Darré, Neuadel aus Blut und Boden. Munich: J.F. Lehmanns Verlag, 1933.

[7] One of the earliest tracings for the National Socialist philosophy in modern European times goes back to 1724 in a work by Karl Theodor Heigel, Geschichtliche Bilder und Skizzen. Munich: J.F. Lehmanns Verlag, 1934, although most NSDAP histories begin with Hermann der Cherusker 17 v. Chr., see George Buschan, Altgermanische Ueberlieferungen in Kult und Brauchtum der Deutschen, Munich: Lehmanns Verlag, 1934; also, W.von Mueffling, Deutschlands Erneuerung. Munich: J.F. Lehmanns Verlag, 1936. See also various issues of Technik und Kultur. published by the Verein Deutscher Ingenieure from 1933 to 1943.

[8] K.R. Ganzer, Das deutsche Fuehrergesicht. Munich: J.F.Lehmanns Verlag, 1937, p. 233; M.Staemmler, Rassenpflege im voelkischen Staat. Breslau: Lehmanns, 1937.

[9] Bundesarchiv documentation from the Wirtschaftstab Ost, Chefgruppe W, document number Ast. i. W.K.I./I wi Nr. 494/42 g. from 28 March 1942 entitled, Das metallurgische

Kombinat; Alan F. Wilt, War From the Top. Bloomington: Indiana University Press, 1990, p. 84. Table 4.1.

[10] The ideal of the Hitler personality cult having complete power over the intention and belief structure of its adherents can be studied from various perspectives. See Peter Huttenberger, Die Gauleiter. Stuttgart: Deutsche Verlags-Anstalt, 1969.The maximal sacrifice needed for the "Fuehrer principle" is summaried in the study of the life of a Rudolf Hess or a Baldir von Shirach, Ich Glaube an Hitler. Hamburg: Mosaic Verlag, 1961. See also C. Mortiz, Current Biography Yearbook. H.Wilson Co., NYC, 1974, or 1987 under their names for confessional statements.

III. GOERING AND THE FOUR-YEAR PLAN pages 33-45

[1] Specialized documents from the Beauftragter fuer den Vierjahresplan covering the neuer Erzegungsplan, Karinhallplan, Chemieprogramm, Ruestungschemie, and Ausbauplan des GB-Chemie can be found as Niederschrift ueber die Tagung des Vierjahresplans mit dem Fuehrungsstab der Wirtschaft for 15 Jan. 1942, and 21 Jan. 1942, and in the order of the Chef des Heereswaffenamts, Gen. Leeb, for 2 Jan. 1943, Bundesarchiv-Militaerarchiv ZW 19/1922.

[2] See documentation from Bundesarchiv: Der Reichsmarschall Grossdeutschen Reiches Vorsitzender des Ministerrats fuer die Reichsverteidigung u. Beauftragter fuer den Vierjahresplan. file V.P. 6707g for 22 April 1942 which is an overview of the extended powers reserved for Goering. Also, Matthias Riedel, Eisen und Kohle fuer das Dritte Reich: Paul Pleigers Stellung in der NS-Wirtschaft. Goettingen: Musterschmidt, 1973.

[3] Arthur Schweitzer, "Der urspruengliche Vierjahresplan," in Jahrbuecher fuer Nationaloekonomie und Statistik. CLXVIII, 396.

[4] Martin Fritz, German Steel and Swedish Iron Ore 1939-1945. Goeteborg: Almquist, 1974.

[5] Schweitzer, op cit., pp. 395-396.

[6] See Dr. C. Krauch memorandum for 21 Jan. 1942, op. cit. Also Anlage zu OKW Wi Rue Amt/Rue (IIa) Nr. 4010/41 g.Kdos for the I Quarter 1942, and Rue IVa for 19 Dez. 1941, Bundesarchiv-Militaerarchiv ZW 19/1922.

[7] United States Army military document MS P-033T-580, General Thomas papers in National Archiv (NA), Washington D.C. See aslo General Warlimont, NA T-101, 1945.

[8] Ernst Poenagen papers, BA R2/30287 Eisenhuettenwerke in Lothringen und in Luxemburg.

[9] Arthur Schweitzer, "Business Power under the Nazi Regime," Zeitschrift fuer Nationaloekonomie. 20 (3-4), 1960, 425.

[10] Allan Bullock, Adolf Hitler: A Study in Tyranny. New York: Harper & Row, 1962, p. 376.

[11] Synthetic Lubrication, Oil Production in France," CIOS report, item 30 file XVIII-5. Also work of Daniel Yergin, The Prize. Cambridge: Harvard University Press, 1990.

[12] Freudenberger and LuZa, "Germany and Austrian Industry," in William Wright (editor), Austria Since 1945. Minneapolis: University of Minnesota Press, 1982, pp.78-79.

[13] Matthias Riedel, Eisen und Kohl fuer das Dritte Reich. Paul Pleigers Stellung in der NS-Wirtschaft Goettingen: 1973, pp. 273f.

[14] Konrad Kwiet, Reichskommissariat Nederlande: Versuch und Scheiter der nationalsozialistischer Neuordnung No. 17, Stuttgart, (Schriftenreihe der Vierteljahrshefte fuer Zeitgeschichte), 1969.

[15] Personal conversation with Dr. Hermann Blenk, former director of the Hermann Goering Luftfahrtforschungsantalt during World War II, at Braunschweig, October 12, 1988.

[16] Heinz Giller, Zur Geschichte der Deutschen Forschungsanstalt fuer Luftfahrt in Braunschweig. monograph of the Deutsche Forschungsantalt fuer Luftfahrt, Braunschweig: DLF Verlag, 1987, pp.1-23.

[17] The registered association was an eingetragener Verein (e.V.), a legal form that does not exist in the Anglo-American realm. This "registered association" permits the inclusion of an unlimited amount of members without having to reincorporate each time. Somewhere between a partnership and non-profit incorporated entity, this particular business form is stable, yet flexible, which makes it ideal for such an undertaking as a research institute.

[18] Conversation with Hermann Blenk, op. cit.

[19] Ibid.

[20] Ernst Schmidt, (unpublished ms.), Verzeichnis von veroeffentlichungen und Berichten des Institutes fuer Motorenforschung. Braunschweig, October 15, 1945, pp. 1-33.

IV. THE GERMAN ARMED FORCES HIGH COMMAND IN THE SPHERE OF ARMAMENT PRODUCTION pages 46-64

[1] E.J. Gumbel, "Disarmament and Clandestine Rearmament under the Weimar Republic." In Seymour Melman, (ed.), Inspection for Disarmament. New York: Columbia University Press, 1958, pp. 205-219.

[2] Prior to Hitler a solid groundwork had been laid for the Reichswehr acquisition of tanks and planes built outside of Germany. This involved secret design work at Krupp's Landwerk tank factory in Sweden, secret trials and training of pilots in Kazan and other places in Russia, and maneuvers inside Germany with dummy tanks. See Edward L. Homze, Arming the Luftwaffe: the Reich Air Ministry and the German Aircraft Industry, 1919-39. Lincoln: University of Nebraska Pres, 1970, pp. 258-259.

[3] Gen. Walter Warlimont, private testimony given to the U.S. Army in 1945. Stanford: Hoover Institution. See also files of Charles Burdick in declassified military documents NA T-101, Vol. 4, p.2

[4] See review of the German War Economy 1933 to 1943 according to Reich laws in 1934 and suggestions by Gen. Georg Thomas which may have underestimated German production ability so as to prevent presumptions of Hitler for a 1939 offensive. Private document No. 7 2355 entitled Die Organisation der Kriegswirtschaft by Georg Thomas. There is no date on this position paper circulated in early 1943.

[5] Thomas, Grundlagen Ch. XII, National Archives, 1946, p. 117.

[6] Ibid.,

[7] BA-MA RH 26-10/255. W. Blomberg, Bundesarchiv Wi/IF 5,3615, T-77/431.

[8] H. Schacht, Account Settled. London: Weidenfeld, 1949, pp. 103-05.

[9] BA-MA N 28/3 on the Blomberg-Fritsch crisis. Blomberg, op. cit. According to General Walter Warlimont, Deputy of the former Chief of the German Armed Forces Staff, the

significance of the 4 February 1938 act of Hitler was as follows: "(1) The OKW fully deserved the title "Armed Forces High Command"; (2)The military services refused to recognize the authority of OKW and this agency was incapable of imposing its authority over them; (3) the Chief of the OKW was capable of making decisions on his own and getting a response; and (4) had the Commanders in Chief of the services collaborated with the Chief of the OKW, he might have been more effective and would have had a chance to fulfil his mission; but they followed the opposite course." Landsburg testimony in 1945, US Document MS TT-101 Kl.

[10] IMT XXVIII, p. 355ff. Ibid. When on 27 September 1939, Hitler informed the commanders in chief of the three military services and their chiefs of general staff of the strategic decision, at which he had arrived all by himself, he immediately added the operational directivees for the execution of the campaign.

[11] Charles Burdick, "Die Unterlagen ueber Einheiten des deutschen Heeres im Zweiten Weltkrieg." Wehrwissen-schaftliche Rundschau. 16 (1966): 55-58.

[12] Hans-Juergen Mueller, Das Heer und Hitler. Stuttgart: Deutsche Verlags-Anstalt 1969, p. 636. The National Defense Branch in Germany first heard about the declaration of war on the United States from a radio broadcast of Hitler's speech in the Reichstag on 11 December 1941. Hitler failed to inform many of his chiefs-of-staff. Not only was this a complete reversal of German policy, but the chiefs of the military services were dumbfounded at not being prepared for this significant decision.

[13] BA-MA RW 6/Vol 56.

[14] Warlimont, NA T-101, The National Defense Law was subsumed under the Kriegwirtschaftsgesetz and signed by Hitler, Der Generalbevollmaechtigte fuer die Wirtschaft, Der Generalbevollmaechtigte fuer die Verwaltung, Der Reichsminister des Innern, Der Reichsminister der Justiz, Der Reichsminister der Finanzen, Der Reichsarbeitminister, and Der Reichskommissar fuer die Preisbildung which was issued in early 1939.

[15] One example of this can be seen in the Gesetz ueber die Entschaedigung von Personenschaeden. Zu I Ra 1174/39 g 240--for 1938, Bundesarchiv.

[16] See document on the role of the Leiter der Reichswirtschaftskammer in the documents of the Beauftragter fuer den Vierjahresplan. RfPr. A-24-4335--for

9 September 1939, Bundesarchiv-Freiburg.

[17] Ibid.

[18] Warlimont, Im Hauptquartier der Wehrmacht 1939-1945. Bonn: Formem, 1964; and Kurt Zeitzler, "Stellungnahme zu der Ausarbeitung 'Die oberste Fuehrung des deutschen Herres (O.K.H.) im Rahman der Wehrmachtfuehrung," in Foreign Military Studies. MS #P-041ii, 14, NA.

[19] Klaus-Juergen Mueller, Armee und Drittes Reich 1933-1939. Padererborn: Schoningh, 1989, pp. 96-103.

[20] Warlimont, NA T-101.

[21] Speer's personal letter to Professor Dr. Ing. W. Osenberg, Bildung einer Wehrforschungs-Gemeinschaft. 7 September 1944.

[22] Peter Huttenberger, Die Gauleiter. Stuttgart: Deutscher Verlags-Anstalt, 1969, pp. 18-40.

[23] Letter of Oberkommando des Heeres, Document 3 a Wa A. Wa K Rue, Nr. 1140/41 for 23 Mai 1941. Bundesarchiv ZW 19/1924.

[24] Document of Der Reichsminister der Luftfahrt Nr. 8308/41 (GL 1 V for the 22 Mai 1941 concerning Industrierat des Reichsmarschalls.

[25] Warlimont, NA T-101.

[26] Mueller, Armee und Drittes Reich 1933-1939. pp. 272-298.

[27] General Zeitzler to Heinrici, N/63/15, BA-MA.

[28] Ibid.

[29] Thomas, Grundlagen. Ch. XV, p. 147.

[30] Charles Burdick, op. cit., for Warlimont, Keitel and Xaver Dorsch papers in NA MS B-670, pp. 112-116.

[31] Correspondence of Reichsminister Dr. Fritz Todt to Generalfeldmarschall Keitel, Chef des Oberkommandos der Wehrmacht, G.I. Nr. 3986/40 for 27 September 1940.

[32] Oberkommando der Wehrmacht documents Aktz 66 b 30, W Stb Abt. W Ro 2899/38 g II c for 22 August 1938.

[33] Klaus Mueller, Armee und Drittes Reich 1933-1939.

Paderborn: Schoening, pp. 118-126.

[34] Warlimont, NA T-101, Annex 11, OKW/WiSt/Abt. L (I.Op.) Vol 5, pp. 2-5.

[35] Ibid. See Walter Baum, "Der Zusammenbruch der obersten deutschen Militaerischenfuehrung 1945." Wehrwissenschaftliche Rundschau. 10 (1960): 237-266.

[36] Der Reichminister der Luftfahrt und Oberbefehlshaber der Luftwaffe, Nr. 8308/41 (GL 1 V) for 22 Mai 1941. Compare with plan to increase Luftwaffe at crucial point of war, see document of Der Reichmarschall des Grossdeutschen Reiches, Hauptquartier, 24 Juli 1942, Bundesarchiv.

V. THE GERMAN PRE-WAR AND EARLY WAR ECONOMY pages 65-86

[1] Correspondence to Generalmajor Thomas, Chef des Wehrwirtschaftsstabes beim Oberkommando der Wehrmacht from Paul Pleiger, 11 September 1939, Bundesarchiv-Militaerarchiv RW 10/2011.

[2] Georg Thomas, Geschichte der deutschen Wehr-Ruestungswirtschaft 1918-1945. Boppard: Boldt, 1966, Chapter 1.

[3] Ibid.

[4] Selbstverantwortung der Industrie (industrial Self-responsibility) also translated as Industrial Autonomy. Full meaning of the word disclosed during the FIAT proceedings with Speer, June 1945.

[5] Conversation with Frederick I. Ordway III at the Smithsonian Institution on 9 August 1992 on the role of German women removed from the industrial working place.

[6] Avraham Blaich, "Wirtschaft und Ruestung in Deutschland, 1939-45," in K.D. Brachet, M. Funke, and H.A. Jacobsen, eds., Nationalsozialistische Diktatur 1933-1945. Duesseldorf: Droste Verlag, 1983, pp. 292ff.

[7] H. Aubin and W. Zorn, Handbuch der deutschen Wirtschafts- und Sozialgeschichte. vol. 2, Stuttgart: 1976, relevant chapters.

[8] R. Wagenfuehr, Die deutsche Industrie im Kriege, 1939-45. Berlin: Duncker and Humbolt, 1963, p. 18.

[9] Schacht EC-286, IMT XXXVI, pp. 282-91.

[10] Schacht, EC-286, IMT XXXVI, 290-91.

[11] Wi/IF 5,582 T-77/140/ 872710, -745, -772, and -811.

[12] D. Petzina, W. Abelshauser, and A. Faust, Sozialgeschichtliches Arbeitsbuch III: Materialien zur Statistik des Deutschen Reiches 1914-45. Munich: Beck Verlag, 1978, pp. 55ff.

[13] P. Kluke, "Hitler und das Volkswagenprojekt," in Vierteljahreshefte fuer Zeitgeschichte (1960), p. 341ff.

[14] Ibid.

[15] U.S. Strategic Air Command Paper: Germany's Preparations for War. (Edited by Burton Klein and Nathan Kaldor), Washington DC: Government printing, 1945.

[16] B.H. Klein, Germany's Preparations for War. Cambridge: Harvard University Press, pp. 295-299.

[17] Ibid.

[18] Ibid.

[19] Heinrich Stuebel, (Die Finanzierung der Aufruestung im Dritten Reich), Europa-Archiv. Vol. 6, 1951, pp. 4128-4136.

[20] NA T-77, 424, 777.

[21] Norbert Zdrowomyslaw, Wirtschaft, Krise und Ruestung, Bremen: Skarabaeus-Verlag, 1985, pp.95-102.

[22] Heinz Guderian, Panzer Leader. New York: Praeger, 1956. pp. 326-327.

[23] Max Domarus, Hitler-Reden und Proklamationen: Neustadt: Verlagdurckerei Schmidt, 1962, p. 867.

[24] For example, at the time of Speer's appointment, Goering and Todt were at odds with one another in an interdepartmental friction that had arisen out of Hitler's dissatisfaction with the low level of German war production. Cf. Interrogation of Speer in Report No 19, Part 3, FIAT Intelligence Report No. EF/MIN/3, OH file, 1945. Hoover Institution.

[25] Just two months after the start of World War II, General Thomas submitted a report to the National Economic Group for Industry recommending, among other things, (1) that production should be concentrated in a reduced number

of plants operating at full capacity; (2) that multiple shifts should be introducted into war plants; (3) that women should be mobilized in greater numbers than before; and (4) that the workday should be lengthened. After the war Field Marshall Keitel, Chief of the OKW, stated that is was gross negligence not to put this "Thomas Plan" into action." Cf. Keitel, USSBS Interview No. 55, NA RG 243, File 3b13.

[26] A. Blaich. "Wirtschaft und Ruestung," op.cit., p. 315.

[27] Chief of Staff notes by Dr. Klein for 14 May 1942 entited, "Gedanken ueber die Sicherstellung von Unterlagen fuer eine spaetere kriegsgeschichteliche Darstellung und Auswertung der Gesamt organisation des Wi Rue Amtes und der von ihm in Vorbereitung und Durchfuehrung der Aufgaben auf wehr- und ruestungswirtschaftlichem Gebiete getroffenen Massnahmen unter gleichzeitigem Festhalten der grossen Entwickelungslinien." ZW 19/1407.

[28] Generalmajor Thomas, Kriegstagebuecher. 25 August 42, pp.1-3, ZW 19/1407.

[29] Private discussions with Don Abenheim, Hoover Institution, Stanford University on the role of Fritz Todt, June 1992.

[30] H. Kellenbenz, Deutsche Wirtschaftsgeschichte. vol.2, Munich: Beck, 1981, p. 458. See also Willi Boelcke, Deutschlands Ruestung im Zweiten Weltkrieg. Frankfurt: Athenaeum, 1969.

[31] Ibid. p. 460.

[32] Milward, Alan Steele, The Germany Economy at War. London: Athione Press, 1965, pp. 30-38.

[33] Albert Speer, Inside the Third Reich. New York: Macmillian, 1971.

[34] M. Domarus, op. cit. p. 867ff. See also NA T-517, 365, 426.

[35] G. Schaefer, "Oekonomische Bedingungen des Faschismus," in Ist die Epoche des Faschismus beendet? Frankfurt a.M.: Beck, 1971, p. 19.

[36] A. Schweitzer, "Der organisierte Kapitalismus." in Hamburger Jarhbuch fuer Wirschafts und Geschellschafts-politik. 7 Jahr, Tuebingen 1962, p. 32ff.

[37] E. Hennig, "Materialien zur Diskussion der Monopolgruppentheorie" in Neue Politische Literature, XVIII/1973, p. 185.

[38] Gen. Georg Thomas, Vortrag des Herrn Amtschef des Wehrwirtschafts -u. Ruestungsamtes im Oberkommando der Wehrmacht. Anl.1 zu OKW/Wi Rue Amt/Rue I Nr. 210/42 g.K.v.23.1.42.

[39] H. Kehrl, Kriegswirtschaft und Ruestungsindustrie Ammerkung zum Vorwort. Duesseldorf: Droste, p. 271.

[40] G. Jansen, Das Ministerium Speer. Berlin: Ullstein, 1968, p.172.

[41] Karl-Dietrich Bracher, "Die Speer Legende" in Neue Politische Literatur. XV/1970, p.429ff.

[42] Hermann Boehm, "Zur Ansprache Hitlers vor den Fuehrern der Wehrmacht am 22 August 1939" in Vierteljahrhefte fuer Zeitgeschichte. 19 Julyl 1971, pp. 294-304.

[43] J.J. Hurtak Operation Paperclip. (unpublished) review of the technical transfer of Peenemuende technology to White Stands, New Mexico 1945-1947, for Dr. K. Brauer, University of Minn., May 1991.

[44] Norbert Zdrowomyslaw, Wirtschaft, Krise und Ruestung. Bremen: Skarabeus, 1985, pp. 98-102

[45] Conversations with Frederick I. Ordway III, Smithsonian Institution, July 1992.

VI. THE STRUCTURE OF THE ARMED FORCES HIGH COMMAND
pages 87-106

[1] BA-MA RH 2/v. 1158 regarding discussion of the problem with the SS troops, as well as in BA-MA RH 2/v. 1263 as a paramilitary force outside the three branches of service.

[2] Juergen Rohwer, "Der Einfluss der allierten Funkaufklaerung auf den Verlauf des Zweiten Weltkrieges." Vierteljahrshefte fuer Zeitgeschichte. 27 (July 1979), pp. 325-369.

[3] D. Swarek, Unternehmenkonzentration als Ergebnis und Mittel nationalsozialistischer Wirtschaftspolitik. Berlin 1972.

[4] See charts in this text that demonstrate economic control over military from 1926 to 1938 and compare

configurations.

[5] Bundesarchiv document entitled, Der Chef des Heereswaffenamtes. Nr. 16 644/41 geh. Wa Stab Chef-Gruppe.

[6] This can be seen as late as January 1945 in documents from Fuehrer headquarters, e.g., correspondence between Der Fuehrer und oberste Befehlshaber der Wehrmacht Chef OKW/Heeresstab (II) Nr. 2067/45. See Appendix C in this text.

[7] Warlimont's personal testimony to Allied command, NA T-101, 869, 1423 on German Armed Forces High Command.

[8] Wilhelm Keitel, Einzelheiten zur Fuehrung des Heeres durch Hitler als Ob. des Heeres seit 19.12.41 bis Winter 1942-43 BA-MA N54/7; and Zeitzler, "Stellungnahme," BA-MA N54/7.

[9] Ibid.; See also T-312: 28, 317, 526, 977 on German Armies.

[10] Gen. Georg Thomas, Vortag des Herrn Amtschef des Wehrwirtschafts -u. Ruestungsamtes im Oberkommando der Wehrmacht. document Anl.1 zu OKW/Wi Rue Amt/Rue I Nr. 210/42 g.K.v.23.1.42, (14 pages), a very important position paper on the state of affairs.

[11] Speer's protests to Hitler concerning Himmler's independence and control in economic affairs, Wi/IF 5.64, T-77/10/721476-7 N.A.

[12] Albert Speer's initiation paper to the NSDAP on the far-reaching improvements forseen. Rede Gauwirtschafts-berater. 17.4.1942 (30 pages), Bundesarchiv: Koblenz RIII, illustrating new changes necessary to fight the combined powers of England, the USA and Soviet Union.

[13] In order to create an effective ministry around the vested interests behind the a most complex economic command system, Speer maintained that he needed Goering's backing for support and persuaded Goering to allow him to carry out his new work under Goering's own authority as Plenipotentiary for the Four-Year Plan. In winning over General Thomas Speer praised the work of the Wi Rue Amt within the OKW organization under Thomas and of the Arament Inspectorates during his first weeks in office, and expressed a desire to work closely with Thomas and his organization. Speer stressed that the economy must be ruled by the needs of armament production and convinced Thomas that his great fund of experience and trained administrative apparatus were necessary with his power of

influence from Hitler to form a substantial economic policy. See Wi/VIII 138, Thomas papers T-77/441 NA, Thomas Memorandum entitled,"Aktennotiz ueber Besprechung mit Minister Speer an 2 March 1942.

[14] This can be seen in the early correspondence between Thomas and Speer on 11 May 1942 in terms of acquiring the proper chemical components essential for powder supplies. See Chemie-Plan "PSV-Erweiterungsprogramm v.1.5.42" zur Erfuellung des vom Fuehrer befohlenen erweiterten Munitions-Programmes. Az. 74 Wi Rue Amt/Ro III Nr. 1345/42 g.K.

[15] View of General W. Warlimont who served directly under Jodl and Keitel who stated to American military authorities in 1945 that Keitel was weak and unworthy of the position he held within the OKW is also confirmed by personal letter from Charles Burdick on 5 December 1992. At the time of his dismissal from office in 1943, General Keitel, head of OKW, told Thomas: "I must concede to you today, that your warnings and economic judgments before and during the war were correct. But you have made yourself intolerable to the Fuehrer and the Party, by expressing these views loud and often." Thomas testimony before FIAT, 16 August 1945.

[16] With the Blitzkrieg situation happening in many directions and no in-depth infrastructure for production the local German commanders were confronted with an awkward situation of supply. Invariably local commanders immediately seized all stocks of raw materialsm such as mineral ores even before the German command structure harnessed local production capacity to their own requirements. See Kellenbenz, Deutsche Wirtschaftsgeschichte. Weisbaden: Steiner, 1969, p. 460.

[17] Private conversation with Magnus von Braun, April 1987, in Sedona, Arizona. In spite of an enormous synthetic fuels program under Noeggerath and Lutz at Braunschweig the supply strategy for fuels was successful only for main-stream vehicles and not the highly specialized aircraft and weapons that needed special A-grade jet fuels and/or hypergolic components, leaving thousands of new 262 Messerschmits on the ground, according to Wolfgang Spaet, [see part two of this text on revolutionary weaponry] during the last year the war.

[18] The Kriegsarbeitsplan d. Abt. W. Wi with its full exposition of offices and suboffices. Bundesarchiv document OKW/Wii Rue Amt/Stb I O Nr. 2021/41g. RW 19/672.

[19] See, for example, questions about the Stabsabteilung in the effective carrying through of economic plans of the

OKW. Document Wehrwirtschaftsstab im Oberkommando der Wehrmacht Z 1/I (1) Nr. 2360/43 for 30 Sept. 1943. RW 19/601.

[20] Private testimony of General W. Warlimont, Im Hauptquartier der Wehrmacht 1939-1945. Stanford: Hoover Institution.

[21] When Speer took office in 1942 there were thirteen high-levels of administration and fifteen low-levels of administration determining economic policy in the Reich. See Bundesarchiv Wi/VIII 15. T-77/443, for Schematische Darstellung der augenblicklichen ruestungswirtschaftlichen Organization-1941.

[22] With an eye towards fulfillng the oil needs of the Reich, Goering made his move to establish a more efficient oil strategy in November 1936 which was to remain in place until the end of the war. He relieved the Ministry of Economics of its jurisdiction over the Supervisory Agency for Petroleum and, in part, of its supervision over the Economics Group Fuel Industry and its direction of Wifo. Authority over these agencies was given to the Bureau for German Raw Materials and Synthetics which ran smoothly until the end of the war. See Hedler's commands, Bundesarchiv Wi/IF 5.2726.

[23] See schematic in text titled, "Chief of the Oberkommando der Wehrmach. Chief of OKW" (p. 74a) to grasp the complicated picture that Wagenfuehr characterized as near-chaos after the war.

[24] See schematic mentioned above in footnote 14. Correspondence between Reichsminister Fritz Todt and Generalfeldmarschall Hermann Goering, Nr. M 4379/41 for 24 January 1941. Oberkommando der Wehrmacht Aktz 66 b 30 Fwi Amt (Inl) Nr. 4470/44g 2/IIIb for 29 Sept. 1944, re. Kohlenversorgung der Wehrmacht im Kohlenwirtschaftsjahr 1944/45.

[25] Hermann Foertsch, Schuld und Verhaengnis. Stuttgart: Deutsche Verlag, 1951, p. 127ff.

[26] Ibid. Abschrift Der Chef OKW WFSt (Org) FWi-Amt, Fuehrer's Headquarters, 19 Juli 1944.

[27] Hitler's economics throughout the war could be characterized as Blitzkrieg economics in the sense that Hitler, with the exception of Speer, had no use for men who sought to instruct him continually on the advantages of long-range economic planning. For Fuehrerbefehl Ruestung see A.S. Milward, War, Economy and Society 1939-45.

Berkeley, University of California Press, 1977, pp. 56f.

[28] Warlimont, NA T-101, 24, 25, pp. 18-28. See also T-311: 322 on German Army Corps.

[29] Ibid., also excerpts from Basic Order of the Wehrmacht High Command No 1050/39, (top secret declassified). Operations Office/National Defense IIc.

[30] Documents of Oberkommando der Wehrmacht, Aktz 66 b 30 W Stab (Inl.) Nr. 3546/43 g 2/II 2 for 20 Mai 1943, re. Richtlinien fuer die Verlegung und den Bau von Hauptversorgungsleitungen (Elektrizitaet, Gas, Wasser).

[31] Ibid. See also, Abschrift Der Chef OKW, WFSt (Org) FWi-Amt, Fuehrer's Headquarters, 19 July 1944, T-78: 335, 346, 430 on German High Command.

[32] Warlimont, op. cit., NA T-101, Vol. 5, Annex 17, pp. 7-81. In terms of the larger picture of establishing an Ordnance distribution uniformity throughout the Reich see document Kriegssachschaedenverordnung vom Oktober 1940. Nr. 4438,40 Wi Rue Amt, with specific sections of the Reichsgesetzbl. for 8 Sept. 1939, 21 Sept. 1939, 11 Dec. 1939, 18 Dec. 1939, 27 April 1940, 20 July 1940, and the 25 July 1940.

VII. BETWEEN TECHNOCRATS AND BUREAUCRATS pages 107-119

[1] K.H. Jansen, political editorial in Die Zeit. 20 July 1973.

[2] D. Schoenbaum, Hitler's Social Revolution. Garden City: Doubleday, 1965, p. 14. See also Hans Mommsen, Beamtentum im Dritten Reich. Stuttgart: Deutsche Verlags-Anstalt, 1966, reviews the problems of the authoritarian personality.

[3] Arthur Schweitzer, Big Business and the Third Reich. Bloomington: Indiana University Press, 1958, Chapters 5-8.

[4] Hans von Kotze and H. Krausnick, Es spricht der Fuehrer. Sieben exemplarische Hitlers-Reden, Guetterloh: S. Mohn, 1966, p. 132.

[5] Klaus-Juergen Mueller, op. cit., pp. 62-70.

[6] M. Broszat, Der Staat Hitlers. Munich: Deutsche Taschenbuch Verlag, 1969, p. 372ff.

[7] D. Petzina, "Grundriss der deutschen Wirtschafts-geschichte 1918 bis 1945" in Deutsche Geschichte seit dem Ersten Weltkrieg, Bd. II, Stuttgart: Deutsche Verlags-Anstalt 1973, pp.663ff.

[8] Hans Ulrich Wehler, "Zum Verhaeltnis von Geschichtwissenschaft und Psychoanalyse" in Historische Zeitschrift. 208/3, 1969, p.549.

[9] H. Ridder, "Zur Vefassungsdoktrin des NS-States" in Kritische Justiz. Hefte 3, 1969, p. 236.

[10] Albert Speer, Spandauer Tagebuecher. Frankfurt a.M.: Propyläen, 1975, p. 61, SP-18 fn.. See also H. Mommsen, Beamtentum in Dritten Reich. Stuttgart: Deutsche Verlags-Anstalt, 1966, p. 13, 15, and 123; M. Broszat, Der Staat Hitlers. Munich, 1969, p. 301ff.

[11] M. Broszat, op. cit., p. 229.

[12] Walter Funk, FIAT proceedings testimony, June 1945.

[13] Ibid.

[14] E. Welter, Der Weg der deutschen Industrie. Frankfurt a.M.: Fischer, 1943, p.12.

[15] Hjalmar Schacht, op. cit., p. 282.

[16] A. Frisch, Die Zukunft der Technokratie. in C. Koch/D. Senghaas, Texte zur Technokratiediskussion. Frankfurt a.M.: Europaische Verlags-Anstalt, 1970, p. 92f.

[17] Hans Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. Duesseldorf: Droste, 1973. pp. 534-35.

[18] Ibid,. See also J. Kocka, Industrielles Management: Konzepte und Modelle in Deutschland vor 1914. in Vierteljahresschrift fuer Sozial und Wirtschaftsgeschichte. 56/1969, pp. 358-370.

[19] Kehrl, op. cit., p. 537.

[20] J. Habermas/M. Greiffenhagen, "Demokratie und Technokratie, in C. Koch/D. Senghaas" in Ruestung und Militerismus. Frankfurt a.M.: Suhrkamp, 1979.

[21] Broszat, op. cit., pp. 326, 353ff., 361ff.

[22] J. Habermas, Technik und Wissenschaft als Ideologie.

Frankfurt a.M.: Suhrkamp, 1968; See also Broszat, op. cit., p. 159ff.

[23] Ridder, op. cit., p. 254. See also T-53, 140, 151.

[24] Hans Mommsen, Beamtentum in Dritten Reich. Stuttgart: Deutsche Verlags-Anstalt, 1966. See also Harold Deutsch, Hitler and His Generals. Minneapolis: University of Minnesota Press, 1974.

VIII. THE FORMATION OF THE REICH MINISTRY FOR ARMAMENT AND MUNITIONS pages 120-140

[1] The frustration that circulated among the Economics and Armament Office and by members of the Todt Organization as to the priorities of the war which was no longer a local campaign into Poland, but a major offensive being prepared against the West can be seen in an extensive Arbeitsprogramm position paper as internal memorandum for 8 November 1939. The title is Die wehrwirtschaftliche Lage vor Erlass des Befehls fuer die Durchfuehrung des X -Falles. See also F.W. von Mellenthin, The German Generals. Norman: University of Oklahoma, 1981, Chapter 1.

[2] On 10 February 1942 Goering appointed Speer as Plenipotentiary for Control of Construction, replacing Todt's position with an eye towards reintegration of the middle and lower levels of the economic administration. On 13 February, Speer with General Milch and other members of the asir force, the OKW, and Industry (represented by Zangen and Voegler) met to discuss general economic planning. At that time neither Goering of the Four Year Plan or the Ministry of Economics was represented. It was agreed by all that such planning should be concentrated under Speer. Wi/IF 5119, T-77/15/726919 NA.

[3] Speer's quick success with Thomas' team was to seek a more comprehensive leadership in the actual sphere of armaments which would come under the full power of Speer's new organization with Hitler's backing. As head of the Ruestungsamt in Speer's ministry, Thomas would work out the combined armament requirements of the services, and allocate labor and raw materials for armament production. Thus, as head of the Wehrwirtschaftsamt in the OKW, Thomas would continue to keep watch over economic developments in general and the Wehrmacht's economic interest in particular so as to collect economic intelligence on foreign countries, and to advise the OKW in all economic armament matters. See Wi/WIII 138, T-77/441 NA. See also Helmut J. Schmeller, Hitler and Keitel: An Investigation of the Influence of Party Ideology on the

Command of the Armed Forces in Germany between 1938-1945. Fort Hays, Kansas: Fort Hays State College Press, 1970. For a more sympathetic picture see Walter Goerlitz, Generalfeldmarschall Keitel: Verbrecher oder Offizier? Erinnerungen, Briefe, Dokumente des Chefs OKW Goettingen: Musterschmidt, 1961.

[4] See detailed overview of economic picture by Oberst Jansen entitled, Erlaeuterungen zum Arbietsprogram. 18 Berlin 1939, Bundesarchiv RW 19/1407.

[5] The technical language Speer used was the "Selbstverantwortung der Industrie" (The Autonomy of Industry). Accorrding to the 1945 FIAT report Speer stated that "beginning with the spring of 1944, the system of Autonomy of Industry was increasinglly weakened by Commissioners (Beauftragte) of the Ministry who were placed in the most important plants....Basically the system of plant Commissioners meant that the administration of armaments was now overruled, that is, that there was one command authority too many. I published an order limiting the activity of the plant Commissioners, but the order remained only paprtiaolly successful." File in Hoover Institution.

[6] Xaver Dorsch, NA B/670, Vol 21. pp. 12-22.

[7] Report by Dr. Klein for 30 Jan. 1943 entitled, Kurzer Ueberblick ueber die Behandlung und Entwicklung des Problems der "kriegsgeschichtlichen Bearbeitung der Aufgaben und Massnahmen des Wehrwirtschaftsamtes im Rahmen der Kriegfuehrung. RW 19/1407.

[8] Fuehrerbefehl documents covering economic changes in 1942. See Bundesarchiv-Freiburg RW 19, 20, 21, 22, 23, 24.

[9] The Wehrwirtschaftsamt change was finally brought by gross military loss. The first military reverses in the winter of 1941-42 brought Fritz Todt to share the sentiments of Thomas' design for total war. Todt called NOT for military control of the economy, however, but control through his own civilian Munitions Ministry. See correspondence to General Thomas from Fritz Reu Ueber Reichsministerium fuer Erziehung, Wissenschaft und Volksbildung for 25 February 1940. RW 19/1407.

[10] Details of the changes are reviewed by Reg. Rat Dr. Klein as follows: 1 Anlage. Sofern bei der Neuorganisation das zukuenftige Wi Amt und Rue Amt einen gemeinsamen Chef des Stabes haben, bei der Chefgruppe, andernfalls in unmittelbarer Unterstellung under den Herrn Amts-Chef, wird ein Sonderreferat SF (Sicherstellung der

Forgschungsunterlagen) eingerichtet. Verfuegungsenwurf anliegen. 2 Der Herr Amts-Chef erlaesst einen Aufruf zur freiwilligen Mitarbeit der Referenten ausserhalb der Dienststunden gegen Sonderverguetung und Praemien fuer die brauchbarsten Ausarbeitungen. Enttwurf anliegend. RW 19/1407.

[11] Speer sought the full support of Hitler because of the labyrinth of offices. At the middle and lower levels there were:

1. The Ministry of Economics (Reich agencies and economic groups);
2. Chambers of Industry and Commerce;
3. District Economics Office;
4. The Wi Rue Amt in unity with Government Inspectorates (formerly W inspectorates);
5. Local Armament commands;
6. District Labor ofices in unity with the Ministry of Labor;
7. Military District Commissioners;
8. Armament Committees;
9. Working Associations in unity with Munitions Ministry.

The Schematische Darstellung der augenblicklichen ruestungswirtschaftlichen Organization for the end of 1941 is given in the Bundesarchiv Wi/VIII.15. See also Fischer in Aubin and Zorn, Handbuch. p. 824f.K. Borchardt in Aubin and Zorn, Handbuch. p. 716; Kellenbenz, Deutsche Wirtschafsgeschichte. p. 464.

[12] FIAT proceedings on Speer, June 1945, with testimony by Albert Speer on Fixed Pricing.

[13] The U.S. Army Forces' classified history of Ultra's role in target planning reached the following damming conclusions: "Now that the full returns are coming in (Fall 1945), it seems probable that Allied intelligence officers did not at the time have a full appreciation ofo what railway bombing was doing to the German economy." USAAT, Target Planning. p. 29.

[14] Postwar interrogation of Speer, CIOS, Report 53, and postwar interrogation of Keitel, USSBS Interview No. 56 NA RG 243, files with the ONI in Washington D.C., and at Hoover Institution.

[15] Fuehrerbefehl documents for economic changes in 1942, Bundesarchiv-Freiburg R 19, 20 and Zengenschriftum Schwerin von Krosigk Zs/A-20, Munich.

[16] The infighting between Thomas-Goering, and Thomas-Speer was apparent to all to worked in the Economic administration and various agencies. In January 1937, Thomas had his staff prepare a memordanum defending the authority of Schacht as "Plenipotentiary," or GBK, against Goering as Commissioner for the Four-Year Plan. The argument began with the premise that the functions of the Four Year Plan were to cease with the outbreak of war; it was intended simply to build up in peacetime the economic foundation for war. After the death of Todt on 10 April 1942 Thomas' deputy wrote that Speer had in mind a complete dismemberment of the Wi Rue Amt. The Ruestungsamt and the Wehrwirtschaftsamt were to be physically seperate offices, each with their own personnel. According to Thomas, Grundlagen. pp.454-61, in January 1937 Thomas had his staff prepare a memorandum defending the authority of Schact as "Plenipotentiary" (GBK) against Goering as Commissioner for the Four Year Plan. The argument began with the premise that the functions of the Four Year Plan were to cease with the outbreak of war; it was intended simplyh to build up in peacetime the economic foundation for war.

[17] With his changes underway Speer suggested to Thomas that the staff of the Ruestungsamt be subordinated to his ministry, while the staff of the Wehrwirtschaftsamt be subordinated to the OKW. Only General Thomas himself, as head of both offices, would for the time being secure coordinated action by both offices. See Thomas, Grundlagen. pp. 454-63. By April 1942 Speer had made up his mind to ease out of existence the Wi Rue Amt. In dong this he formed a Central Planning Board (Zentrale Planung) in which Thomas was to be only a peripheral participant.

[18] Wi/VIII 138, T-77/441, Thomas Memorandum entitled, "Aktennotiz ueber Besprechung mit Minister Speer am 2 March 1942. Speer had to reverse the many layers needed for allocation. By early 1942 a draft agreement had been drawn up between Thomas and Speer following closely the pattern Thomas suggested. This agreement caused a storm of protest to rise from the department heads in Speer's ministry, viz., Schieber of the "Armament Sub- Contracts Office" and Saur of the "Technical Office." Their protests were supported by Speer's deputy, State Secretary Schultze-Fielitz.

[19] See Wi/WIII 138, T-77/441; and Thomas, Grundlagen. NA USA-035, pp. 454-61.

[20] See Thomas, re. Kriegstagebuecher sind von den Abteilungen und selbstaendigen Gruppen des Wi Amts (zugleich fuer das Rue Amt) zu fuehren. Nr. 10629/42 Wi Z 1/ I c for 25 August 1942.

[21] Thomas, Grundlagen. 035, ch. XIX-XXIII; Wi'VIII 267, T-77/441; and Wi/VI 204 "Wochenberichte W Stb (Fwi Amt) Ausland," T-77/667.

[22] Warlimont, NA T-101, Vol 5. Reichminister fuer Bewaffung und Munition, re. Der Beauftragte fuer den Vierjahresplan. VI b 5552/3357/43, 29 April 1943.

[23] Cf. Oberkommando der Wehrmacht for Field Economic policy, Aktz. 66 b 30 Fwi Amt (Inl) Nr. 4470/44g 2/IIIb.

[24] Ibid.

[25] Schnellbrief to the Praesidenten der Landesarbeitsamter, VI b 5552/3357/43, 18 May 1943.

[26] See Albert Speer, Inside the Third Reich. pp. 305ff. For general policy of Oberkommando der Wehrmacht-Feldwirtschaftsamt at the late stage of war see document Az. 63 Fwi Amt (Inl) 1/IIb for 22.9.1944.

[27] By early 1943 to emphasize the new scope of his office, Speer changed its name to "Reich Ministry for Armaments and War Production." By September 1943 he had departments within the ministry to control consumers' production, and to oversee "general economic matters," including foreign trade, taxes, finance, etc. He did not direct all of these but could intervene in them. Also through a number of corporations sponsored by his Armament and War Production Ministry such as the Rohstoff-Handelsgesellschaft m.b.H.. Speer was also responsible for raw materials acquisition from foreign countries. Milward, Die deutsche Kriegswirtschaft 1939-45. Stuttgart: Schriftenreihe der Vierteljahreshefte fuer Zeitgeschichte, 1966, Vol. 12, p. 80ff.

[28] Franz Eppenstein, Die Deutsche Industrie im Kreige 1939-1945. Berlin: Dahlem, 1954, pp. 88-97.

[29] Warlimont, NA T-101 K1, pp.128-129. Tescimony from the Fuehrer's staff in 1945.

[30] Ibid.

[31] Ibid.

[32] In early 1943 even Reichminister Funk gave up his perogative to save face. He was invited to join Zentrale Planung. but at the same time most of the important decisions about allocations were turned over to Kehrl's new Planungsamt. within the Speer Ministry. Zentrale Planung

remained as an appeal board against the decisions of the Planungsamt. In effect, Speer took over the effective direction of the Reich Agencies, and acquired the right to command all the lower organs of Funk's ministry: the economic groups, the district economic offices, the Gau Economic Chambers, and so forth. Kehrl, Krisenmanager in Dritten Reich. Dusseldorf: Drost, 1973, p. 288ff. and 531ff.

[33] See Speer Charts in this dissertation chapter, IX, 'The Speer Managerial Plan.'

[34] Ibid. Charts See also Letter from Reichsminister Speer to Reichsmarschall Goering, No. M 2341/44 (TAE-Nr. 11957/44) for 7 August 1944.

[35] See tremendous acceleration of second quarter growth in study entitled, Landesausnutzung und Wirtschaft. H.Gr.Nord./O.Qu., Abt. Wi/Rue, Nr. /44 geheim (Ri) for 3.12.1944. RW 19/1333.

[36] The statistics and indices available, though not entirely in agreement, suggest a doubling or tripling of general armament production between early 1942 (when Speer took over) and mid-1944, with increases in some items (especially tanks) of nearly 500 percent. See B. Klein, op.cit., pp. 99, 207, 211, and 215.

[37] Speer became Reichsminister for 5 supreme command structures that he coordinated:

1. Four-Year Plan.
2. OKW (Wi Rue Amt).
3. Ministry of Economics.
4. Ministry of Labor.
5. Speer's Ministry (Armaments and Munitions).

Slightly lower there were at least eight more agencies:

1. Ordnance office of the Army.
2. Ordnance office of the Navy.
3. Ordnance office of the Luftwaffe.
4. Plenipotentiary of Four Year Plan, Iron and Steel.
5. Plenipotentiary of " for Construction.
6. Plenipotentiary of " for Chemical Industry.
7. Plenipotentiary of " for Machinery.
8. Plenipotentiary of " for Water and Power.

[38] A very important step taken by Speer to consolidate and regulate iron and steel was through the formation of a new association of industrial giants, the Reich Iron and Steel, headed by Voegler and Roechling. The participated with Speer at the first meeting of Zentral Planung on 27 April 1942. In May 1942 the Reich Coal Union was formed

under the direction of Paul Pleiger, theretofore prominent in the Hermann Goering Werke.

[39] See Chart, Gutehoffnungshuette 400101305/9, "Statistische Angaben aus den Ruhrkohlenbergbau" in John Gillingham, Industry and Politics in the Third Reich. New York: Columbia University, 1985, p. 113.

[40] See Footnote 36. See also H. Kellenbenz, Deutsche Wirtschaftsgeschichte. Weisbaden: Im Kommission bei Franz Steiner Verlag, 1969, p. 461

[41] H. Kehrl, Kriegswirtschaft und Ruestungsindustrie Ammerkung zum Vorwort. Duesseldorf: Droeste, 1971, pp. 270-276.

[42] Norbert Zdrowomyslaw, op.cit., pp. 92-95.

IX. THE SPEER MANAGERIAL PLAN pages 141-162

[1] The higher production levels was due directly to the Rings and Committees. On 20 April 1942 Speer issued a lengthy decree applying the responsibility system. Producers of end-products were to be organized in Main Committees, Special Committees, and Working Committees. Both Committees and Rings were given extensive powers over distribution of contracts to their members and over production planning and rationalization at the plants. Wi/IF 5.117.

[2] Speer addressed the Gauleiter in a lecture given 17 April 1942. Document J020327, Bundesarchiv: Freiburg.

[3] Remarks of Dr. Don Abenheim, specialist on the history of the NSDAP and the Speer organization at Hoover Institution on 18 May 1992.

[4] FIAT proceedings, Speer interview June 1945 regarding industrial Self-responsbility.

[5] See Speer organizational flow charts, 1,2 and 3 in relationship to the Funk organizational block within the Speer organization in this text. See Willi A. Boelde, Deutschlands Ruestung im Zweiten Weltkrieg und Ingenieure im Dritten Reich. Duesseldorf: Droste, 1974, pp. 403-40310.

[6] Speer applied his responsibility system not only to weapons, munitions, and war equipment, but to end products imiportant to the war (kriegswichtige Fertigungszweige) in general, as well as to production of component parts

(Zulieferungsproduktion). Producers of end-products were to be organized in Main Committees, Special Committees, and Working Committees; producers of components would be placed in a new structure of Main Rings, Special Rings, and Working Rings. Wi/IF 5.117. NA T-77/15/726121.

[7] Karl-Heinz Ludwig, "Die wohlreflektierten 'Erinnerungen' des Albert Speer. Einige kritische Bemerkungen zur Funktion des Architekten, des Ingenieurs und der Technik im Dritten Reich" in Geschichte in Wissenschaft and Unterricht 21 (1970), pp. 695-708.

[8] Untitled paper, Die organisation der Kriegswirtschaft No. 72355, BA RW 19/513.

[9] Ibid.

[10] Zentrale Planung approved by Hitler on 4 April 1942, consisted of only three permanent members: Speer himself, for the armament industry; Paul Koerner, for the Four-Year Plan, and the civilian economy; and General Milch, for the Wehrmacht. In effect, Koerner's appointment was merely a concession to Goering, and Koerner's "General Council for the Economy," which had wielded some slight influence until that time in German domestic economy, was informally dissolved with its functions being assumed by Zentrale Planung. Milch, by contrast, represented a powerful organization: the Luftwaffe. See Thomas papers in NA T-84/35/1310620ff.

[11] Document from BMW Flugmotorenbau G.M.B.H. Patent listing for 19 November 1943. Private collection Dr. Schmidt.

[12] Document from Reichsminister fuer Ruestrung und Kriesgsproduktion Lg/Ku N. 309, Berlin, 27 July 1944 BA RW 19/613

[13] Ibid.

[14] See Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 386. Speer. DDIK, pp. 41-54. Jurisdiction over all these new areas remained for the time in the Ministry of Economics. With these extensions of his authority and its checks and balances, Speer was able to effect an increase of about fifty per cent in general armaments production by the summer of 1942.

[15] Ibid. Both Committees and Rings were given extensive powers over distribution of contracts to their members and over production planning and rationalization at the plants. From the memorandum to Hitler on 20 September 1944, Speer

wrote: "Geometrically speaking, the Hauptausschuesse, Sonderausschuesse. and Arbeitsausschuesse correspond to a vertical organization, while the Hauptringe and Sonderringe represent the corrresponding horizontal organization. It is imperative that personal union be created at the intersection."

[16] Speer succeeded in simplifying the system of Reich Agencies through mergers, in particular several Reich Agencies for special fibers were combined into a single agency for textiles. Bundesarchiv Wi/IF 5.58, NA T-77/10/721259 for 27 April 1942.

[17] Through a number of coporations sponsored by his Auswaertige Amt (1944), such as Rohstoff-Handelgesellschaft G.m.b.H.. Speer was also reponsible for raw materials acquisitions from foreign countries. However, many factories did not know whether they belonged at all to a committee or a ring, and there were only a few committees and rings which had a clear picture of the number of their member firms. Rolf Wagenfuehr, Die Deutshe industrie im Kriege 1939-1945. Berlin: Deutsche Institut fuer Wirtschaftsforschung, 1954, pp. 41.

[18] See Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 386. See also Speer, FIAT testimony, 1945.

[19] Speer's Ministry of Armaments and War Production became more complex. The Committees and Rings were not clearly differentiated between finished products and components as had been intended, with the consequence that a "clear picture of the existing capacities of the component parts was not available." See Rolf Wagenfuehr, Die Deutsche Industrie im Kriege. introduction, RG 243.

[20] Document of Arbeitsplan. Nr. J. 016420 from 25 May 1944, BA RW 19/613.

[21] See Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 386. Speer. DDIK, pp. 41-54. See also letter from Otto Saur, head of the Technical Office, to SS Obergruppenfuehrer Frank in Prague, 28 August 1944 (Bundesarchiv Ba R 3/1578).

[22] Document from Reichsminister fuer Ruestrung und Kriesgsproduktion Lg/Ku N. 309, Berlin 27 July 1944 BA RW 19/613.

[23] See Appendix F for the diverse cartel functioning within Speer's managerial plan.

[24] Peter Huttenberger, Die Gauleiter. Stuttgart: Deutsche Verlags-Anstalt, 1969, pp. 121-141.

[25] Ibid.

[26] Bernard Wegner, Hitlers politische Soldaten, Die Waffen-SS, 1933-1934. Paderborn: Schoeningh, 1982, chapter 5.

[27] Der Reichsminister fuer Ruestung und Kriegsproduktion, special document on advanced flak and aircraft systems for 10.10. 1944, WK-Nr. 61 036, BA R 19.

[28] See Karl Koller, Der letzte Monat: Die Tagebuchaufzeichnungen des ehemaligen Chefs des Generalstabes der deutschen Luftwaffe von 14 April bis 27 Mai 1945. Mannheim: Norbert Wohlgemuth, 1949. Also private document of Dr. Ing. G. Ackermann, Technische Hochschule Danzig, to Luftwaffe firms involved with Katapultierte Raketengeschosse problems, (13b) Alerheim, for 23 March 1945.

[29] Ibid.

[30] Document of Katapultierte Raketengeschosse from the Lehrstuhl fuer Waermemechanik, Professor Dr. Ing. G. Ackerman written on 23 March 1945.

X. THE ASSAULT ON THE SPEER ORGANIZATION pages 163-190

[1] Gregor Janssen, Das Ministerium: Deutschlands Ruestung in Krieg. Berlin: Ullstein, 1968, p. 70f. These view were also affirmed in a personal interview Don Abenheim, July 1992, Hoover Institution, Stanford University.

[2] The long-range achievements of war production worked in the years 1943 to 1944 because of the clear power of command, the strict authhoritarian direction of the war economy, close cooperation of all pertinent agencies, particularly between Speer and the air industry, and on the part of the people, great discipline and great-sacrifice. See Wagenfuehr, op.cit., p. 27.

[3] Kehrl was Chef des Rohstoff und Planungsamtes im Reichsministerium fuer Ruestung und Kriegsproduktion. After the war he authored the article "Kriegswirtschaft und Ruestungsindustrie," in Bilanz des Zweiten Weltkrieges Oldenburg: G. Stalling, 1953, pp. 265-285. Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 394ff.

[4] Ibid., p. 531ff.

[5] Ibid. See also M. Broszat, Anatomie der SS-Staates. Munich: Institut fuer Zeitgeschichte, 1968.

[6] From Ohlendorf's testimony during cross examination by his attorney Dr. Aschennaur, 6 October 1947, at the Nuremberg Military Court IIa, case IX (BA Allg. Proz. 1, XXVII A/5,6).

[7] Interviews with Landfried, 11 May 1944, BA R 7/2013.

[8] Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 290.

[9] Ohlendorf's letter to Himmler, 16 October 1942 (Bundesarchiv Ba NS 19/new 2039). Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 65.

[10] Helmut Krausnick, Anatomy of the SS State. New York: Walker, 1968 pp. 270-274; Ohlendorf on Himmler, 16 October 1942, HZ-Film, Personal Staff RFSS.

[11] Heyrich's contention with Speer revolved around securing factories in the occupied territories for the establishment of SS bases, the manufacture of raw materials for settlements, and procurement of raw matrials for the construction of large-scale building in Berlin and Nuremberg. BA R 58/951. George H. Stein, The Waffen-SS: Hitler's Elite Guard of War, 1939-45. Ithaca, N.Y.: Cornell University Press, 1966.

[12] Bernard Wegner, Hitlers politische Soldaten: Die Waffen SS, 1933-45. Paderborn: Schoeningh, 1982, p. 329. BA NS 20/114-27.

[13] Ibid.

[14] Otto Ohlendorf's article "Staat und Wirtschaft," in the special issue of the Organ of the Reich Chamber of Commerce for President Pietzsch's seventieth birthday, partially reprinted in Deutsche Allgemeine Zeitung. 8 August 1944.

[15] Nuernberg document NI-1294.

[16] Berrnard von Lossberg, Im Wehrmachtfuehrungsstab: Bericht eines Generalstabsoffizier. Hamburg: Nolke, 1949.

[17] BA NS 20/114-27. See also Klaus-Juergen Mueller, "The Army in the Third Reich: An Historical Interpretation," Journal of Strategic Studies. 2 (Sept. 1979), pp. 123-152.

[18] Speer, Erinnerungen. 3rd edition, Berlin: Propyläen, 1969, p. 339.

[19] Ibid., p. 317. Hayler, Bundesarchiv BA R7/2133, p.5.

[20] Ibid., p. 343.

[21] BA R/2026.

[22] 30 November 1943 BA R 3/154ff.

[23] Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p. 345f. See also BA R 43 II/1141.

[24] Ludolf Herbst, Der Totale Krieg und die Ordnung der Wirtschaft. Stuttgart: Deutsche Verlags-Anstalt, 1982, pp. 267-280.

[25] Ibid. For discussions between Speer, Ohlendorf and Kehrl see BA R/2016.

[26] FIAT interrogation of Speer, CIOS Evaluation Report No. 53, NA RG 243, File 4d51.

[27] Herbst, op.cit., pp. 273-275. Also discussions with military historian Charles Burdick, San Jose State University, May 1992. Braunschweig.

[28] A. Zilbert, Albert Speer and the Nazi Ministry of Arms. Ruthford: Fairleigh Dickenson University Press, 1981, p. 107-109. See also L. Herbst, op.cit., pp. 276.

[29] FIAT interrogation of Speer by U.S. authorities on 11 June 1945. Also Heavy Industry Branch. Friedrich-Alfred Huette Rheinhausen, Germany. Washington D.C., U.S. Government Printing Office, January 1947.

[30] Ibid. A picture emerges of mutually competative elites.

[31] FIAT Report of Saur and Kehrl, Control Commission for Germany, Economic Division, NA RG 243. File 4d42.

[32] Ibid. Hans-Erich Volkmann, Kriegswirtschaft und Ruestung. Duesseldorf: Droste, 1977, pp. 280ff.

[33] FIAT Interrogation of Gen. Thomas, USSBS Interview No. 74, NA RC 243, File 4d43.

[34] Janssen, op. cit., Berlin: Ullstein, 1968, p. 162.

[35] Kehrl, Kriegswirtschaft und Ruestungsindustrie Anmerkung zum Vorwort. p. 396.

[36] Document from Lammers to Schwerin von Krosigk, 29 September 1944, BA R 2/24244.

[37] Speer, Erinnerungen. p. 325ff., and BA R/7/2016.

[38] Herbst, op. cit., pp. 383ff.

[39] Kehrl, "Kriegswirtschaft und Ruestungsindustrie" in Bilanz Des Zweiten Weltkriegen. Hamburg 1953, pp. 267-285.

[40] Ibid.

[41] BA R 7/2026 of Speer documents.

[42] Ibid.

[43] Fuehrerbefehl Ruestung cited in A.S. Milward War, Economy and Society 1939-45. Berkeley: University of California Press, 1977, p. 56f. See also Speer, Inside the Third Reich. p. 305f.

[44] Ibid.

[45] Liebel's letter to Speer, 12 October 1944, BA R 3/1631.

[46] For Kehrl's trust in Andreas Florian, see Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. p.290f.

[47] BA NS 19 for 31 August 1942 of Speer documents.

[48] BA R 3/1739 for 24 April 1944 of Speer documents.

[49] BA R 3/1516 for 19 April 1944 of Speer documents.

[50] Ibid.

[51] Rolf Wagenfuehr, Die Bedeutung des Aussenmarktes fuer die Deutsche Industrie Wirtschaft. Hamburg: Hanselltische Verlag Anstalt, 1954.

[52] Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg., pp. 387ff.

[53] Ibid., pp. 392ff. Also Speer, Technik und Mach. Esslingen: Bechtle, 1979, memorandum to Hitler.

[54] Ibid.

[55] A. Speer, op. cit., pp. 74-80.

[56] Kehrl, Krisismanager im Dritten Reich, op. cit., pp. 393ff.

[57] Compare Speer's views with Horst Boog, "Higher Command Leadership in the German Luftwaffe, 1935-36," Proceedings of the Eighth Military History Symposium. US Air Force Academy, October 1978, 128-158.

[58] This is discussed in Speer's Infiltration. New York: Macmillian, 1981, pp. 224, 281 and elsewhere, but also in Heinrich Winkler, Mittelstand, Demokratie und Nationalsozialismus. Koeln: Kiepenheuer and Witsch, 1972, with respect to the problems of growing dissatisfaction with Speer by the Party.

[59] Kehrl, Krisismanager im Dritten Reich: 6 Jahre Frieden-6 Jahre Krieg. pp. 393ff.
[60] A. Milward, War Economy. p. 80f; Kellenbenz, Deutsche Wirtschaftsgeschichte. p. 461

[61] Xaver Dorsch papers in NA MS B-670, Vol 24., pp. 18-19 and pp. 61-64.

XI. THE USE OF FOREIGN AND FORCED LABOR: THE HIDDEN ECONOMIC EQUATION FOR THE ORGANIZATION OF THE AIR INDUSTRY
pages 191-218

[1] See the USSBS, The Effects of Strategic Bombing on the German War Economy (Washington D.C., 1945); C. Webster and N. Frankland, The Strategic Air Offensive Against Germany 1939-1945, London: H.M.S.O. Publishing 1961; Deutsches Institut fuer Wirtschaftsforschungs and Rolf Wagenfuert, Die deutsche Industrie im Krieg, 1939-1945, Berlin: Deitz, 1954; Alan S. Milward, "The End of the Blitzkrieg," Economic History Review 16, no. 3 (April 1965), 499-501; and Combined Intelligence Objectives Subcommittee, Underground Factories in Central Germany, Report No. XXXII: 17, London: H.M.S.O., 1945.

[2] Carl Huber's article, "From Hell to Heaven, The Story of the American Nazi Rudolph Otto" in San Jose News. San Jose: 6 October 1985, pp. 3-6.

[3] Rainer Froebe, "Der Arbeitseinsatz von KZ-Haeftlingen und die Perspektive der Industrie" in Froebe et al., Kozentrationslager in Hannover. Hildesheim: A. Lux, 1981, p.353.

[4] Froebe, Ibid., p. 356. Also Ba/MA, RL 2 II/5, Reichsmarschall, 21.11.43., An Lft. Kdo., 4, Chef d. Genst., Lft. Kdo, 6., Genst. Gen. d. Kampffl, General-Major Peltz. See also Speer writings, Sklavenstaat, Meine Auseinandersetzungen mit der SS. Stuttgart: Deutsche Verlag-Anstalt 1981. 2.fn.17; 2.fn.26. Letter from SS Standard Commander Klumm, personal assistant of SS Headquarters, to SS Hauptsturmfuehrer Meine on the Personal Staff of the SS Reichsfuehrer, Nov. 15, 1944 Ba NS 19/old 294.

[5] Janssen, op. cit., p. 97ff

[6] Alan Steele Milward, Die deutsche Kriegswirtschft 1939-1945. Stuttgart: Deutsche Verlags-Anstalt, 1966, pp. 30-38.

[7] Berhold Gerber, Staatliche Wirtschaftslenkungen in den besetzten und annektierten Ostgebieten waehrend des zweiten Weltkrieges unter besonderer Beruecksichtigung der treuhaenderischen Verwaltung von Unternehmungen und der Ostgesellschaften. Tuebingen 1959. (Studien des Instituts fuer Besatzungsfragen in Tuebingen zu den deutschen Besatzungen im zweiten Weltkrieg 17), pp. 25-68.

[8] Rainer Froebe, Claus Fuellberg-Stolberg, Christoph Gutmann, Rolf Keller, Herbert Obenaus and Hans Schroeder, Kozentrationslager in Hannover. KZ--Arbeit und Ruestungswindustrie in der Spaetphase des Zweiten Weltkriegs. Vol. 1, Hildesheim: A. Lux, p. 22ff.

[9] Ibid. Also Josef Henke, "Das Schicksal deutscher zeitgeschichtlicher Quellen in Kriegs- und Nachkriegszeit. Beschlagnahme--Rueckfuehrung--Verbleib", in Vierteljahreshefte fuer Zeitgeschichte 30 (1982). pp. 557-620.

[10] Speer, Sklavenstaat, Meine Auseinandersetzungen mit der SS. Stuttgart: Deutsche Verlag-Anstalt, 1981. pp. 20-35.

[11] Interview with Dr. Frederick I. Ordway III, Smithsonian Institution, Washingtion D.C., 12 August 1992.

[12] Janssen, op. cit., p 102ff.

[13] Trials of War Criminals before the Nuernberg Military Tribunal under Control Council Law No. 10. Nuernberg October 1946-April-1949. Volumes 1-15. Washington D.C., 1950.

[14] Falk Pingel, Haeftlinge unter SS-Herrschaft. Widerstand, Selbstbehauptung und Vernichtung im Konzentrationslager. Hamburg 1978 (Historische Perspektiven 12).

[15] Albert Speer, Infiltration. 1981, chapter 3. Rainer Froebe, op. cit., pp. 352-355.

[16] Hans Kehrl, Krisenmanager im Dritten Reich. 6 Jahr Frieden--6 Jahre Krieg. Duesseldorf, 1976, chapter 10.

[17] Hans-Eckhardt Kannapin, Wirtschaft unter Zwang. Anmerkungen und Analysen zur rechtlichen und politischen Verantwortung der deutschen Wirtschaft unter der Herrschaft des Nationalsozialismus im Zweiten Weltkrieg, besonders im Hinblick auf den Einsatz und die Behandlung von auslaendischen Arbeitskraeften und Konzentrations-lagerhaeftlingen in den deutschen Industrie- und Ruestungsbetrieben. Koeln: Deutsche Industrie Verlagsgesellschaft, 1966. Also Albert Speer. op. cit., pp. 296-297.

[18] Hans Kehrl, "Kriegswirtschaft und Ruestungsindustrie," Bilanz des Zweiten Weltkrieges. Erkenntnisse und Verpflichtungen fuer die Zukunft. Oldenburg and Hamburg 1953, pp. 265-285.

[19] French Minister of Industrial Production, Jean Bichelonne, said during the height of the war, "Now Germany, with its Reichstellen, Fachgruppen, and Wirtschaftsgruppen, with its Ministry of Ecnonomics and above all through its unquestionable successes attained by means of such institutions--Germany, I say, has provided us with the model of economic leadership, methohdically organized with a view to practical accomplishment. J. Bicheloone, "Vortrag von Generalsekretaer Bicheloone" in Auswaertiges Amt Ha Pol IIa Frankreich, Wirtschaft 6/7976f. in Bundesarchiv.

[20] Bichelonne, in a speech delivered on 21 September 1942 stated: "The Great Depression which began in the United States in 1929 has given pause to both business and economists...." claiming that the Germans have given the French a way out of the world depression. BA/MA, RL 3/7, fol. 3201; See also Combined Intelligence Objectives Sub-committee, Underground Factories in Central Germany. Report No. XXXII, 17, London, H.M.S.O.), pp. 95-109

[21] Dieter Petzina, Autarkiepolitik im Dritten Reich. Der nationalsozialistische Vierjahresplan. Stuttgart: (Schriftenreihe der Vierteljahreshefte fuer Zeilgeschichte 16) Deutsche Verlags-Anstalt, 1968. See also Speer, op.

cit., pp. 92-97.

[22] Speer, Sklavenstaat. p. 22f; see also Falk Pingel, Haeftlinge under SS-Herrschaft. Widerstand, Selbstbehauptung und Vernichtung im Konzentrationslager. Hamburg, 1977, p. 791ff.

[23] Gerald Reitlinger, Der SS--Tragoedie einer deutschen Epoche. Basel: Baumann Verlag, 1956.

[24] Ulrich Herbert, Europa und der "Reichseinsatz". Bonn: Klartext, 1989, p. 373.

[25] Martin Broszat, Nationalsozialistische Konzentrationslager 1933-1945, Vol. 2, Munich 1984, pp. 1-133.

[26] Rainer Froebe, Claus Fuellberg-Stolberg, et al., Konzentrationslager in Hannover: KZ-Arbeit und Ruestungindustrie in der Spaetphase des Zweiten Weltkrieges. 2 Vol., Hildesheim: A. Lux, 1985, p. 22f.

[27] Ibid.

[28] Falk Pinkel hat kuerzlich zu Recht darauf hingewiesen, dass die wirtschaftliche Rationalitaet des Haeftlingseinsatzes und "die Seite des Gewinns fuer den Ausbeuter" nur selten in einer eigenstaendigen Argumentation nachgezeichnet wuerden," "Die KZ-Haeftlinge zwischen Vernichtung und NS- Arbeitseinsatz," in Wolfgang Michalka, Der Zweite Welktkrieg, Analysen, Grundzuege, Forschungsbilanz. Munich: Beck 1989, pp. 784-797.

[29] Herwart Vorlaender, (ed.) Nationalsozialistische Konzentrationslager im Dienst der totalen Kriegsfuehrung. (Sieben wuerttembergische Aussenkommandos des Konzentrationslagers Natzweiler/Elsass). Stuttgart: Kohlhammer, 1978, Chapter 1.

[30] Alan Steele Milward, Die deutsche Kriegswirtschft 1939-1945. Stuttgart: Deutsche Verlags-Anstalt, 1966, pp. 30-38.

[31] Conversation with Dieter Huzel in Los Angeles, July 1987.

[32] Christa Naumann, Das arbeitsteilige Zusammenwirken von SS und deutschen Ruestungskonzernen 1942-45, dargestellt am Beispiel der Aussenkommndos des Konzentrationslagers Buchenwald. Diss. phil. Berlin (DDR) 1973.

[33] Enno Georg, Die Wirtschaftlichen Unternehmungen der SS. Stuttgart: Deutsche Verlags-Anstalt, 1963, p. 155f. Also, Rainer Froebe, op. cit., p. 358.

[34] Enno Georg, op.cit., pp. 58-69.

[35] Ibid., 74-77.

[36] Adalbert Rueckerl, Die Strafverfolgung von NS-Verbrechern. Heidelberg: Mueller Verlag, 1979.

[37] Letter from SS Standard Commander Klumm, personal assistant of SSVH (SS Verwaltungshauptamt), to SS Hauptsturmfuehrer Meine on matters of the personal staff of the SS Reichsfuehrer, 15 November 1944. Erich Kosthorst, Kozentrations- und Strafgefangenenlager im Dritten Reich. Beispiel Emsland. Dokumentation und Analyse zum Verhaeltnis von NS-Regime und Justiz. Vol. 1-3, Duesseldorf, 1983.

[38] Speer, Sklavenstaat, passim. pp. 235-237.

[39] Enno Georg, op.cit., p. 6ff.

[40] See Combined Intelligence Objectives Subcommittee, Institut fuer Physikalische Forschung; London: New Drossenfeld Report, No. XXVIII-41, H.M.S.O., 1945.

[41] Froebe, op.cit., p. 370f.

[42] Ibid.

[43] Enno Georg, op. cit., pp. 42-66.

[44] Froebe, op. cit., p. 372f.

[45] Enno Georg, op. cit., pp. 135-138.

[46] Ibid. See also Speer, Sklavenstaat, op. cit.

[47] See also Rainer Froebe, Claus Fuellberg-Stolberg, Christoph Gutmann, Rolf Keller, Herbet Obenaus, Hans Schroeber. Konzentrationslager Hannover. KZ-Arbeit und Ruestungsindustrie in der Spaetphase des Zweiten Weltkreige. 2 Vols., Hildesheim: A. Lux, 1985, Vol. 1, p. 22 ff.

[48] Ibid.

[49] Enno Georg, op.cit., pp. 48-52.

[50] Gregor Janssen, op. cit., p. 97.

[51] Speer, Sklavenstaat, passim. p. 290ff

[52] Ibid. See also Rene Erbe, Die Nationalsozialistische Wirtschaftspolitik 1933-1939. Zurich: Basic Center for Economic and Financial Research, 1958

[53] Ibid.

[54] Danuta Czech, Kalendarium der Ereignisse im Konzentrationslager Auschwitz-Birkenau 1939-1945. Reinbek bei Hamburg: Rowonlt, 1989, p. 83ff.

[55] Albert Speer, Der Sklavenstaat., passim. p. 291ff.

[56] Ibid.

[57] Ibid.

[58] Hans Buchheim, "Befehl und Gehorsam," in Anatomie des SS-States. Vol. 1, Olten and Freiburg 1965, pp. 255-380.

[59] OKW/WI Ruestung Amt document, Dienstanweisungen fuer Fuehrer und Einheiten eines Wehrmacht--Erfassungs--Kommandos. for 20 May 1942.

[60] Enno Georg, op.cit., p. 140f.

[61] Personal conversation with Magnus von Braun, 27 April 1987.

[62] Himmler in his writing to the leader of the Economics Management Office of the SS (SS-WVHA), Oswald Pohl, on 29.5. 1942, Bundesarchiv BA, NS 19/3698.

XII. PEENEMUENDE AND THE DEVELOPMENT OF THE V-2
pages 218 - 233

[1] Frederich I. Ordway III, The Team. New York: Crowell, 1979, Chapter 2.

[2] Ibid.

[3] Walter Dornberger, V2--Der Schuss ins Weltall. Esslingen, Bechtle, 1952, chapter 1.

[4] Willi Ley, op. cit., pp. 355-56.

[5] Ibid., See also John Hubner, The Americanization of a Nazi Scientist. Conversation with Arthur Rudolf, op. cit., pp.6-30.

[6] Personal conversation with Dieter Huzel, August 1987, Los Angeles.

[7] Walter Dornberger, op. cit., chapter 1.

[8] Conversation with Magnus von Braun, 26 April 1987 at Sedona, Arizona on the personal history of how his mother selected the location of Peenemuende from recalling "duck hunting experiences" of the von Braun family.

[9] Ibid.

[10] Ibid.

[11] Dornberger, op.cit., pp. 268-288.

[12] Ibid.

[13] Gerhard Fieseler, Bundesarchiv document K IV C 85, unmarked pages.

[14] Ibid.

[15] Private conversation with Admiral Del Fahrney on Robert Lusser, 18 February 1983.

[16] Fieseler, op.cit.

[17] Robert Lusser, Technical Report No. 75, A Study of Methods for Achieving Reliability of Guided Missiles. declassified US Na Air Missle document, Pt. Mugu, 1950.

[18] Del Fahrney, op.cit., pp. 972-977.

[19] Ibid.

[20] Willi Ley, op. cit., p.146ff.

[21] Personal documents of Degenkolb and Dornberger re. Zusammenarbeit zwischen dem Sonderausschuss A 4 und den Dienststellen des Beauftragten des Wa 4 fuer das A 4- (V-2 Program. Document Az.: 11 HAP/Krd. Bd. Nr. 1875/45g -- Karlshagen 8.6. 1943.

[22] Documents to Speer from Director G. Degenkolb-- Rundschreiben Nr. 3/43g. for 11 June 1943.

[23] Dornberger, op.cit., chapter 4.

[24] Frederich I. Ordway III, op. cit., Chapter 5. See also Walter Hubatsch, Hitlers Weisungen fuer die Kriegsfuehrung 1939-1945. Frankfurt a.M.: Bernard and

Graefe, 1962.

[25] Documentation for high-altitude perfection of modern rocketry can be found in Aktz.67 b 23 Wa Prw 1/VII, Bd.Nr.0 for 23 November 1935 re. Auf Grund der Borkumer Ergebnisse Neukonstruktion und Entwicklung eines Aggregats fuer 1500 kg Rueckstoss, 45 Brennsekunden mit Steuereinrichtung nach Boykow by von Braun.

[26] Dornberger, op.cit., chapter 3.

[27] Correspondence to Speer from Der Vorsitzer der Ruestungskommission der Wehrkreisbeauftragten XII des Reichsministers fuer Bewaffnung und Munition covering A-4 assembly at Neustadt, Saarbruecken and Metz for 3. August 1943.

[28] Neustadt document Nr. 502/43 g for 3 August 1943 BA RH 8/V 1020.

[29] Del Fahrney, op.cit., pp. 972-977.

[30] Ibid.

[31] Ibid.

[32] Ibid.

[33] USSBS, The Effects of Strategic Bombing on the German War Industry, Appendices Tables 101, 102.

[34] Ibid. Also conversation with Krafft Ehricke, June 1985.

[35] Frederick I. Ordway III (editor), op. cit., pp. 92-98.

[36] Discussion with Dieter Huzel, member of Von Braun team, on 22 June 1986. Huzel authored the book, From Peenemuende to the Cape. 1961, looking at the remarkable achievements the German team made in the USA with resources that equalled the Manhattan Project.

XIII. MITTELWERK AND THE DEPLOYMENT OF THE V-WEAPONS
pages 234 - 254

[1] Frederick I. Ordway III, op.cit., pp. 64-67.

[2] Document Der Beauftragte des Heeres fuer das z.b.V -- Program Bb Nr. 810/43 g. Kdos for 11 September 1943 BA RH 8/v. 1178.

[3] Reinhold Hirt, Vom Schicksal der weissen Kohnsteinberger. Hannover: Nordhaeuser Heimatbuch, 1965.

[4] Frederick I. Ordway III, op.cit., pp. 64-67.

[5] At Hitler's behest, the expansion of a pilot plan to diversify was to be checked by Kammler in the use of concrete cellers for launching V-1s throughout the Reich. See Kammler documents in Ba NS 19 for October 1943.

[6] Kriefsauftrag Nr. (war contract number) 0011-5565/43 called for the manufacture of 12,000 A4s at a monthly rate of 900 at at a unit price of RM 40,000. Speer was originally of the opinion that this new weapon would alter the course of the war in Germany's favor and authoritized small funding for it until Hitler made it a priority of production in late 1943. See Bundesarchiv K 4 C 18 file.

[7] The budget called for a tooling and equipment investment of RM 11,500,000 ($2.75 million) a high percentage of which was subject to tax depreciation. The money was to be made available through the Ruestungskontor (the special accouont for war industries) and was to be drawn out at an interest rate of 3.25 percent. Ruestung und Kriegsproduktion TA 227-47 financial reports for 1943. K 4 C 18. See also Albert Speer, Spandauer Tagebuecher. Frankfurt a.M.: Fischer, 1975, p. 61, SP-18 fn.

[8] Frederick I. Ordway III, op.cit., pp. 64-67.

[9] The Mittelwerk was to operate on funds supplied from Hettlage's Ruestungskontor G.m.b.H. Amt fuer Wirtschaft und Finanzen at Speer's Munitionsministerium--a sort of war production fund. Under the direction of Dr.Kurt Kettler, Dr. Hans Kammler, and Dr. Degenkolb (chair), the other principles were to be Dr. Karl Maria Hettlage of the Speer Munitions Ministry, Dr. Walter Dornberger, and Dr. Schmidt-Lossberg. Personal conversation with Frederick Ordway III on 9 August 1992.

[10] Document Der Beauftragte des Heeres fuer das z.b.V -- Program Bb Nr. 810/43 g. Kdos for 11 September 1943 BA RH 8/v. 1178.

[11] Albert Speer, Spandauer Tagebuecher. p. 61, SP-18 fn.

[12] K. Kettler handled the contract number 4/XL-0900-3071/43H that also governed the manufacture of important parts and subassemblies. K 4 C 18.

[13] Special notes of the Verein deutscher Ingenieure in NSBDT in Berlin at the Ingenieurhaus on 5 April 1943. Private letters 1943-1944 by Dr. Ernst Schmidt, Munich: Technische Hochschule.

[14] Private correspondence between Menzel, President of the Reichsforschungsrates, and Speer for 9.9. 1943, document number 2007/43 geheim.

[15] Document by SS Obersturmfuehrer Rolf Engel for 6.9. 1943, Br. B.M. 20/43 geheim, to Dr. Ernst Schmidt.

[16] HAP Document No. 1875/43 g. 8 June 1943 BA RH 8/v 3528.

[17] Frederick I.Ordway III, op.cit., chapter 17. See also Document Sonderausschuss A-4 for 10 November 1943 BA RH 8/v. 3548.

[18] Ulrich Herbert, Mittelwerk. Stuttgart: Deutsche Verlags-Anstalt, 1968, p. 102.

[19] Ibid. p. 103

[20] SS brief on the role of the SS Fuehrungshauptamt with the building of an infrastructure for anticipated A-4 operations re. Zusammenarbeit des Heereswaffenamtes mit dem SS-Fuehrungshauptamt (Zentralzeugamt). Nr. 2015.6.43-Wa Stab Chefgruppe for 17.6.43.

[21] Albert Speer, Infiltration. pp. 206-207.

[22] Ibid. p. 207ff.

[23] Ibid. p. 207ff.

[24] David Irving writes in The Mare's Nest. Boston: Little Brown, 1965, pp. 121-122.

[25] Albert Speer, Infiltration. p. 208.

[26] Personal documents of Degenkolb and Dornberger re. Zusammenarbeit zwischen dem Sonderausschuss A 4 und den Dienststellen des Beauftragten des Wa 4 fuer das A 4- (V-2 Program. Document Az.: 11 HAP/Krd. Bd. Nr. 1875/45g -- Karlshagen 8.6. 1943.

[27] Albert Speer, Infiltration. p. 233ff.

[28] Dornberger, op. cit., chapter 7.

[29] Ulrich Herbert, Mittelwerk. p. 102.

[30] Himmler's letter to Kammler, 6 August, 1944 (Ba NS 19/new 2055)] Copies were received only by SS Obergruppenfuehrer Huetter, chief of staff in Himmler's new capacity, and an SS Obersturmbannfuehrer Grothmann.

[31] Himmler's telegram to Speer, 29 September 1944 (BA NS 19/new 949.

[32] Speer's letter to Himmler, 11 November 1944 (BA R 3/1583).

[33] Document for Der Reichsminister fuer Ruestung und Kriegsprodukion Za/Org 200gen-364/44, 22 December 1944.

[34] Ulrich Herbert, Mittelwerk. op. cit. p. 103.

[35] David Irving, The Secret Weapons of the Third Reich. London: Routhledge, 1964, p. 354.

[36] Ibid.

[37] Document entitled Anhang weitere Skizzen und Zeichnungen BA KIV C85.

[38] FIAT interview of Speer by the Allied High Command staff on edited on 15 June 1945 archived at Hoover Institution.

[39] Private discussions with Don Abenheim, Hoover Institution, Stanford University on the role cost of the V-2 program, June 1992.

[40] Ibid.

[41] Albert Speer, Inside the Third Reich. p. 452ff.

[42] W. Dornberger, op. cit., pp. 143-170.

[43] Ibid.

[44] Ibid.

[45] Thomas at FIAT interview, 18 August 1945. Hoover Institution.

[46] Ibid.

[47] Dwight D. Eisenhower, Crusade in Europe. New York: Doubleday, 1947, pp. 254-260.

[48] Winston Churchill, Memories of the Second World War. London: Houghton and Mifflin, 1959.

[49] Willi Ley, The Rockets Red Glare. New York: Norton, 1965, pp. 355-56.

[50] Ibid.

[51] Albert Speer, Inside the Third Reich. New York: Avon, 1968, pp. 455-475.

[52] Ibid.

[53] Ibid.

[54] Ibid.

[55] Dornberger, op. cit., chapter 14.

[56] See Armin Hermann, Wie die Wissenschaft Ihre Unschuld Verlor. Stuttgart, Deutsche Verlag-Anstalt, 1982. pp. 148-170; Jost Herbig, Kettenreaktion; Heisenberg, Exile. chapters four to six for a reexamination of the problems the Germans had with their embryonic atomic research exploration. See also J. Walker, Nuclear scientists in the Third Reich. Princeton: University Press, 1991.

XIV. THE LUFTWAFFE: AIRCRAFT AND MISSILE PRODUCTION
pages 255-290

[1] Samuel Mitchell, Hitler's Commanders. Norman: University of Oklahoma Press, 1992, pp. 177-178.

[2] Ibid.

[3] Ibid. Beginning with a new design for top-speed maneuverbility with the He-111, the Reich fund for the new Luftwaffe was budgeted accordingly. From a small budget of $30 million (RM) in fiscal 1933-34, the Luftwaffe budget jumped to $85 million in fiscal 1935-36. At the same time through Reichsbank President Schacht an elaborate scheme was worked out to create a $750 million Reichsmark special fund financed by interest-bearing notes. This was done secretly so as to escape inflation inside Germany and loss of financial confidence in the reichsmark abroad. Herbert M. Mason, Rise of the Luftwaffe: Forging the Secret German Weapon 1918-40. New York: Dial press, 1973, p. 196.

[4] Personal conversation with Dr. Hermann Blenk, former director of the Hermann Goering Luftfahrtforschungsantalt during World War II, at Braunschweig, October 12, 1988.

[5] See Appendix C.

[6] Private document No. 111 758 II a/46 a of Dr. Hans Haussman for 8 June 1944.

[7] H. Walter, "Hydrogen Peroxide Rockets," NATO military document, Nato Headquarters 1951.

[8] Special patent L98804 re Hypergol-Inhalt von L92822 for 16.8.1939.

[9] Special patent L 105690 re Organische Amine als BY. fier WMM mit Luft for 27.10.1941. Special patent L 111757 re. Spezielle Verbindungen von hohem Reduktionspotential (Entwicklersubstanzen) for 24.1.42.

[10] Special patent L 106550 re Stickstofffreie von hohem Rad for 16.8.1939. Noeggerath letter document for 25.11.41 at I.G. Hauptlabor Ludwigshafen--reference 359.

[11] Special patent L 106728 re Andere ungesaettigtenkusalo in L 106550 for 7.2.1942. Noeggerath personal photographs of Hecht-propulsion unit for the V-2 vehicle, document 814.

[12] Ibid. I.G. Farbenindustrie Aktiengesellschaft Ludwigshafen A. Rm. Correspondence with Dr. Haussmann for 16.9.42 {Ref.22 private collection.

[13] Walter Document on Ergol 59 bm FE/OLD/RW for 14 November 1944.

[14] Special patent L 109238 re. Ammonnitrat-Amin Monergole for 14.10.1942.

[15] Noeggerath diagram documents No. 649, 751, 805, 808. Private document 2424, 1816.

[16] Noeggerath document 328-352-383 Treibstoffe fuer Waermekraftmaschinen, die von der Aussenluft unabhaengig sind for 19.5.1944.

[17] Ibid.

[18] Noeggerath personal documents (pictures) #4658, 4659, 4661, 4660, and 4662 showing explosions.

[19] Ibid.

[20] Ibid.

[21] Personal photographs and documents for 26.3.45 from Noeggerath for FLN-ST, Besprechungs-Niederschrift. covering 8.1.1. Injections, 8.1.2 thrust chambers & nozzles.

[22] Ibid.

[23] Special patent L92822 re. Andere ST als Ammonnitrat Hypergol Charakter for 5.7.1937. Special patent L 111758 re. Speziele Stickstofffreie Kohlen offverbindungen mit hohem Reduktionspotential (einschl. Visole, Furfurylalkohol) for 17.7.44.

[24] Noeggerath, personal notebook, Braunschweig, 1941-1945, sections 597-602.

[25] Ibid.

[26] Ibid.

[27] Special correspondence between the LFA, the WK, the HWK and Air Force specialists. Noeggerath docuoment Nr. 407 F 9, entitled, Verbrennungsreaktionen mit Salpetersaeure for 24.7.1941. W. Noeggerath, private journal graphs No. 649.

[28] Noeggerath, "History of Hypergols," paper given to the New York Rocket Society, 1947, p. 10.

[29] Ibid. p. 10.

[30] Noeggerath, personal notebook, sections 597-602.

[31] Private document Besprechungsniederschr. 303. for 27.3.1945.

[32] Ibid.

[33] E. Krushka, Das Walter-Verfahren, ein Verfahren zur Gewinnung von Antriebsenergie. VDI Zeitschrift 97 (1955), No. 3, pp. 65-72. Note also T-stoff: development of familiar manganese cement mixture which contained salt. Once set, the salt is washed out of the pellets leaving the T-Agent to penetrate completely through the pellets.

[34] Spaete, op. cit., p. 48.

[35] John Humphries, Rockets and Guided Missiles. New York: MacMillan Co., 1956, pp. 73-76.

[36] Walter, H. Berichte uber R-Triebwerke auf Gundlage des T-Stoffes. R-Antriebe. Schriften der Deutschen Akademie der Luftfahrforschung, Heft 1071, Nr. 82 (1943).

[37] John Humphries, op. cit., pp. 66-71.

[38] Documents from office of Dienstelle Direktor Kunze and Direktor Figge to Wehrner von Braun, March-April 1944, RH 8/ v. 1966.

[39] Ibid.

[40] Roy J. Harris, "Evidence Points to Secret U.S. Spy Plane," in The Wall Street Journal. 4 December 1992. Review of aircraft that has flown Mach 8 for years that is based on SR-71 which is based on the German Comet of Lippisch.

[41] Wolfgang Spaete. Top Secret Bird: The Luftwaffe's M3-163 COMET. Missoula: Pictoral Histories Publishing, 1989, p. 72.

[42] Ibid.

[43] Personal conversation with Willi Messerschmidt co-inventor, Dr. Richard Boelkow in the offices of Messerschmitt-Boelkow-Blohm GmbH, Karching, West Germany, 17 October 1988.

[44] Wolfgang Spaete, op. cit., p. 115.

[45] Ibid., pp. 115-117.

[46] Humphries, op. cit., p. 174.

[47] Personal conversation with Willi Messerschmidt co-inventor, Dr. Richard Boelkow in the offices of Messerschmitt-Boelkow-Blohm GmbH, Karching, West Germany, 17 October 1988.

[48] Personal conversation with Frederick I. Ordway III at the Smithsonian Institution on 9 August 1992 on the development of the V-weapons.

[49] Georg Thomas, Geschichte der deutschen Wehr-und-Ruestungswirtschaft, Thomas to Keitel, Betr.: Forderungen an die Ruestung, 23.12.41.

[50] Irving, The Rise and Fall of the Luftwaffe. Boston: Little Brown, 1974, p. 380f.

[51] F.W. von Mellenthin, The German Generals. Norman: University of Oklahoma, 1981.

[52] Hermann Plocher's two studies, The German Air Force Versus Russia, 1941 (USAF Historical Study No. 154, 1967), and The German Air Force Versus Russia, 1943 (USAF Historical Study, No. 155, 1967).

[53] Irving, op. cit., p. 310f.

[54] BA/MA, RL 3/50, Der Staatssekretaer der Luftfahrt und Generalinspekteur der Luftwaffe, Nr 118/41 g. Kdos., Dem Herrn Reichsmarschall, 24.10.41.

[55] BA/MA, RL 3/64, Industrierat des Reichsmarschalls fuer die Fertigung von Luftwaffengeraeten, Umstellausschuss. Stand der Umstellarbeiten Mitte November 1942, 21.11.41., Anlage 1.

[56] Richard J. Overy, German Aircraft Production. London: Macmillan, 1975, pp. 206-210

[57] Ibid.

[58] Richard J. Overy, "The Luftwaffe and the European Economy 1939-1945" Militaergeschichtliche Mitteilungen. Vol. 26 (1979):55-78.

[59] Ibid.

[60] Richard J. Overy, The Air War 1939-45. London: Macmillan, 1980, pp. 168-70.

[61] David Irving, The Rise and Fall of the Luftwaffe. London: Routhledge, p. 148.

[62] Ibid.

[63]. BA/MA, RL 3/865, Generalstab, Generalquartiermeister, 6. Abt. No. 3474/42, 23.6.42., Betr. Flugzeug-Forderungen, An den Staatssekretaer und Generalinspekteur der Luftwaffe.

[64] From British government files, figures based on totals for 24.1.42. in AHB, "Luftwaffe Strength and Serviceability Tables, August 1938-April 1945," Translation No. VII/107.

[65] Ibid.

[66] BA/MA, RL 3/61, Generalmajor Galland, 28.7.43., Aktennotiz ueber Besprechung beim Herrn Reichsmarschall on 27.7.43.

[67] BA/MA RL 2 II/365, Der Oberbefehlshaber der Luftwaffe. Fuehrungsstab Ic. Nr. 4222/43, 2.11.43; also

"Reichsmarchall Hermann Goering--I" memo in Air Ministry Weekly Intelligence Summary. issued by Air Ministry A.C.A.S., No. 315 for 17.9.45.

[68] Adolf Galland, The First and the Last. London: Methusen, 1955.

[69] Spaete, op. cit., p. 133.

[70] David Irving, op. cit., p. 155f.

[71] Richard Overy, Goering: The Iron Man. London: Routledge, 1984.

[72] Personal conversation with Willi Messerschmidt co-inventor, Dr. Richard Boelkow in the offices of Messerschmitt-Boelkow-Blohm GmbH, Karching, West Germany, 17 October 1988.

[73] Spaete, op. cit., p. 43f.

[74] Ibid. p. 44.

[75] H. Walter Kommanditgesellschaft Kiel, Sv-Stoff-Triebwerke. document, Br. Nr. 2627/43 g for 11 April 1943.

[76] Conversations in 1992 with Lee Dobbs, MS (California Institute of Technology).

[77] Spaete, op. cit., p. 44.

[78] Ibid. pp. 132-133.

[79] Hans Kehrl, Kriegswirtschaft und Ruestungsindustrie Ammerkung zum Vorwort. p. 386f.

[80] Frederick I. Ordway III, personal conversation in Washington D.C., 9 August 1992.

[81] OKW Wehrwirtschaftsstab, "Erfahrungen bei Luftangriffen," von Oberst Luther, WWI D/WK Kdo X, 15 January 1944, NARS T-79/81000641.

[82] Richard Overy, Goering: The Iron Man. London: Macmillian, p. 290f.

[83] Report on the Harz Zementwerk activity for early 1945, K IV c 23.

[84] "Luftflotte Strength and Serviceability Tables, August 1938 to April 1945, AHB, Translation No. VII/107.

[85] BA/MA, RL 2 III/1025, "Front-Flugzeug-Verluste," i. Genst. 6. Abt. (III A), May 1940-Jun 1944.

[86] Report from Direktor Kunze to Sonderausschuss A IV for 11.8.43 on Degenkolb's scope of activities.

[87] Kammler's radio message on 16 April 1945 (Ba NS 19/old 1278).

[88] Document Sonderausschuss A-4 beim dem Reichsminister fuer Ruestung und Kreigsproduktion. 29 February 1944, BA R 19 1922.

[89] Radio message from SS Obersturmbannfuehrer Staeding, Plenipotentiary of the Fuehrer for Jet Planes, 14 April 1945, tc Professor Messerschmitt and Director Degenkolb (Ba NS 19/old 1278).

[90] See the interesting exchange between Milch and Sauer on the one hand and an offending official on the other in Messerschmitt-Regensburg papers on the decline of the Luftwaffe, BA/MA RL 3/1 for 10.3.44.

[91] Personal conversation with Dieter Huzel, Los Angeles, California 4 June 1986.

XV. TOP SECRETS IN LUFTWAFFE ENGINEERING pages 291-307

[1] A series of unique adaptations of the A-4 program was discussed between Wernher von Braun and Dr. E. Schmidt, Dr. Lueschen, Saur, Prof. Petersen, Major von Henduck, Secretary Plendel, Prof. Wagner, Oberstlt. Halder and others in a special commission meeting sponsored by the office of Der Reichsminister fuer Bewaffung und Munition, Bb.-Nr. 2859/43 g.Rs/ FK/Bah for 9.9.1943.
Also Letter from W. von Braun to Buero Dir. Figge for 22 March 1944.

[2] Document Versuchsanstalt Peenemuende Archiv Nr 110/2 g Kdos.

[3] Ernst Klee and Otto Merk, The Birth of the Missile: The Secrets of Peenemuende. New York: Dutton, 1965, p. 57f.

[4] Private correspondence with Brigitta Wagner, wife of H. Wagner, in 1989, concerning his work with Henschel and BMW industrial documents.

[5] Ibid.

[6] Admiral Delmar S. Fahrney, The History of Pilotless Aircraft and Guided Missiles. 1959, Vol. 1 and Vol. 2. Pt. Mugu Naval Air Station-USN records and personal documents from Dr. Helmut Wagner, Dr. Otto Lutz, and Dr. William Kramer (unpublished), Pt. Mugu Naval Weapons Station, FREEDOM OF INFORMATION, p. 954.

[7] Ibid., pp. 957-957.

[8] Ibid., p. 957.

[9] Ibid., p. 958.

[10] Ibid., pp. 959-960.

[11] Ibid., pp. 963 -965. See also Fritz Muenster, A Guiding System using Television. a private paper covering work of Prof. H. Wagner of the Hs-293 tele-guided bomb at Henschel in Rear Admiral Del Fahrney collection. Classified with US navy papers until 1988.

[12] Ibid., p. 964f.

[13] Ibid., p. 967f.

[14] Ibid., p. 260.

[15] Ibid., p. 260f.

[16] Ibid., p. 260f.

[17] Ibid., p. 260f.

[18] Private correspondence with Admiral Del S. Fahrney, in 1983, concerning Kramer's work on missiles, Del Mar, California.

[19] Private correspondence with Admiral Del S. Fahrney, in 1983, concerning Kramer's work on missiles and the earliest computer guidance system inherited by the United States, Del Mar, California.

[20] Del Fahrney, op.cit., pp. 972-977.

[21] Private correspondence with Admiral Del S. Fahrney, in 1983, concerning Kramer's work on missiles and the earliest computer guidance system inherited by the United States, Del Mar, California.

[22] Rudolf Lusar, Die deutschen Waffen und Geheimwaffen des Zweiten Weltkrieges. Munich: Deutsche Verlag, 1958.

[23] Ibid.

[24] Ibid.

[25] Ibid.

[26] Ibid. Von Rautenfeld, "Impulsfreie elektrische Rueckstrahl-Verfahren (CW-Radar)." Lehrbuecherei der Funkortung. Vol. 5, Deutsche RADAR-Verlagsgesellschaft mbH, Garmisch-Partenkirchen, 1957.

[27] Ibid.

[28] Ibid.

[29] M.P. Blanc, "The Calculation of Step-Rockets," Memorial Artillerie Francaise. 26, 705-734 (1952); G. Siegel, "The Guidance of Rockets" in Verein deutscher Ingenieure. 94, 1193-1194 (21 December 1952).

[30] Ibid.

[31] Viktor Schauberger, Implosion (journal) no. 29, Freiburg, 1963.

[32] H. Walter, "Hydrogen Peroxide Rockets," (unnumbered) NATO military document translated from German, 1951. Saenger archives.

[33] Eugene Saenger and Irene Brendt, Ueber einen Lorinantrieb fuer Strahljaeger. Zentrale fuer wissenschaftliches Berichtswesen, Berlin-Adlerhof, Untersuchungen und Mitteilungen 3509 (1943). Private library collection of Richard Harmuth Saenger.

[34] Ibid.

[35] Eugene Saenger Hoechstemperature-Strahltriebwerk. Deutsche Reichspatent DP 165 144, Berlin 1941. Private library collection of Richard Saenger.

[36] Eugene Saenger, Discussion contribution at the Meeting of the German Academy for Aeronautical Research. 5th August 1943. Schriften der Deutschen Akademie fuer Luftfahrtforschung, Heft 1071, Berlin 1943.

[37] Ibid.

[38] Eugene Saenger, Erfahrungen mit Staustrahlantrieben grosser Abmessungen im Unterschallflug. 29th September 1943. Conference of the Reichsforschungsrat.

[39] Ibid.

[40] Ibid.

[41] Eugene Saenger, Ueber die Eignung des Lorinantriebes fuer unbemannte Flugkoerper. Zentrale fuer wissenschaftliches Berichtwesen. Berlin-Adlershof, Forschungsbericht 1958 (1944).

[42] Ibid.

[43] Ibid.

[44] Eugene Saenger. Die Stellung des Lorinjaegers in der Familie der Strahljaeger. Zentrale fuer wissenschaftliches Berichtswesen, Berlin-Adlershof. Untersuchungen und Mitteilungen 3536 (1944).

[45] Ibid.

[46] Private papers of Saenger via Richard Saenger (son) in May 1988.

[47] See document on the deployment of A-4 with new gas turbine system that would provide for greater range of operation: Project TAE 6509/44g from Der Reichsminister fuer Ruestung und Kriegsproduktion for 17 August 1944.

[48] This program was systematically reviewed on 10.10.1944 in a document of twelve pages going into the Who's Who of Flak countermeasures. See document WK-Nr. 61 036 from the Der Reichsminister fuer Ruestung und Kriegsproduction covering the major defense posiitions. Personal overview of W. von Braun according to William Pickering, former President of Jet Propulsion Lab, and colleague of von Braun in interview for October 1990.

[49] Frederick I. Ordway III (editor), Blueprint For Space, Washington D.C.: Smithsonian Institution, 1992, pp. 97-103.

[50] Committee of Operations Analysis, British War Cabinet Technical Sub-Committee on Axis Oils, "A Review of the Substitute Fuel Position in Continental Europe," L211a/1Z (6 January 1944), pp. 1-28. Roll A-1004, reference 118.04Q-10. Albert F. Simpson Historical Research Center, Maxwell Air Force Base. See also US document on British position, D696/35 (18 December 1944), Record Group 242/1032. Modern Military Records Division, National Archives, Washington D.C.

XVI. THE END SIGNALS A NEW BEGINNING pages 308-317

[1] In his Essen speech on 9 July 1944, on "Selbstverantwortung der Industrie," Speer said, "This unique organization of the Autonomy of Industry is now composed of 6000 unpaid technicians and engineers put at our disposal by industry. These honorary collaborators from industry carry the detailed responsibility for what individual plants will manufacture and in what ways they will manufacture it. They have powers to issue all orders necessary to enforce their point of view,and to give the necessary directives to the plant managers."

[2] FIAT interview of Speer by Mr. Selwyn on 8 August 1945.

[3] BA/MA, RL 2 III/728. Genst. Qu. Gen. 6, Abt. (III A), Front-Flugzeug-Verluste; and BA/MA, RL 2 II/730. Uebersicht ueber Soll, Istbestand. Einsatzbereitschaft, Verlust und Reserven der fliegenden Verbaende.

[4] Fuehrerbefehl Ruestung in A.S. Milward War, Economy and Society 1939-45 (Berkeley and Los Angeles, 1977) p. 56f.

[5] Kehrl, op.cit., pp. 387-388.

[6] Ba NS 19. A statistic of manpower available in for armed preparation in the face of the advancing Russians from 30 November 1944 shows that the Todt Organization had 1,284,000 workers. This figure breaks down into 260,000 free Reich Germans; 752,2000 free foreigners (forced to work by Sauckel's administration); 21,800 imprisoned Reich Germans; 115,700 foreign prisoners, and 134,000 prisoners of war.

[7] Kehrl, op.cit., chapter 26, pp. 366-372.

[8] Ibid. See also Rene Berbe, op. cit., Chapter 3-5.

[9] Ibid.

[10] Ibid.

[11] Ibid.

[12] AOK 19, "Kriegstagebuch," 29 August 1943, T312/977/9167902.

[13] Hans Kehrl, "Dogma, Not, Freiheit Planen und Lenken im totalen Krieg" in DAS REICH Nr. 43, 22 October 1944.

[14] Kehrl, op. cit., p. 387.

[15] Ibid., pp. 373-380.

[16] Werner Joachmann, Adolf Hitler, Monologe im Fuehrerhauptquartier, 1941-1944: Die Aufzeichnungen Heinrich Heims. Hamberg: Albrecht Knaus, 1980.

[17] M. Domarus, op. cit., p. 803f.

[18] Kehrl, op. cit., p. 387.

[19] Ibid.

[20] Ibid.

[21] Ludwig Erhard, Kriegsfinanzierung und Schuldenkonsolierung von 1943-1944. Franfurt am Main: Propyläen, 1977.

[22] Ibid.

[23] Ibid.

[24] Personal discussions with Magnus von Braun, specialist at Peenemuende and first member of the Peenemuende team to convey sensitive information to the American forces in Bavaria on the decision of Wernher and Dornberger to "come over to the American side." Documented in Sedona, Arizona, April 1987.

[25] Ibid.

[26] The first report prepared by the German scientists for General Toftoy and Dr. Herman Liebhaftsky was entitled, Uebersicht ueber die bisherige Entwicklung der Fluessigskeitsrakete in Deutschland und deren Zukunftsaussichten by Wernher von Braun in June 1945. A copy of this document is registered at Pt. Mugu Naval Weapons Center.

[27] Conversation with Krafft Ehricke in Los Angeles, July 1985.

[28] Personal discussions with Admiral D.S. Fahrney on the assembly and protection of the von Braun team. August 1984, Del Mar, California. On the glimpse of the immense scientific possibility for the American efforts in space see Memo. Aer-E-313-RPH, p. 41 from R.P. Haviland, Beacon Desk Identification Section. Elect. Materials Branch. Subject: Comments Concerning Use and Development of Rockets, 10 August 1945. Office of Naval Research, Washington D.C.

[29] Ibid.

[30] Conversation with Dieter Huzel in Los Angeles, July 1987.

XVII. CONCLUSIONS pages 318-333

[1] United States Strategic Bombing Survey. The effects of Strategic Bombing on the German War Economy. Overall Economic Effects Division. London: Office of the Royal Historical Society, 1945. Also interview with Foster Haley, former Assistant Director of Public Affairs Office, Marshall Space Flight Center, 8 June 1986.

[2] Gerald Reitlinger, The SS, Alibi of a Nation. New York: The Viking Press, 1957, 253-288; Enno Georg, Die wirtschaftlichen Unternehmungen der SS. Stuttgart: Deutsche Verlags Anstalt, 1963.

[3] Hjalmar Schacht, Account Settled, London: Weidenfeld, 1949, p. 180f. Gerhard Schreiber, Hitler Interpretationen, 1923-1983: Ergebnisse, Methoden und Probleme der Forschung. Darmstadt: Wissenschaftliche Buchgesellschaft, 1984, p. 52f. Conversation with Magnus von Braun, 18 April 1987, Sedona, Arizona.

[4] Specialized documents from the Beauftragter fuer den Vierjahresplan: neuer Erzegungsplan, Karinhallplan, Chemieprogramm, Ruestungschemie, and Ausbauplan des GB-Chemie can be found as Niederscrift ueber die Tagung des Vierjahresplans mit dem Fuehrungsstab der Wirtschaft for 15 Jan. 1942, and 21 Jan. 1942, and in the order of the Chef des Heereswaffenamts, Gen. Leeb, for 2 Jan. 1943, Bundesarchiv-Militaerarchiv ZW 19/1922.

[5] Ludolf Herbst, Der Totale Krieg und die Ordnung der Wirtschaft, Stuttgart: Deutsche Verlags-Anstalt, 1982, pp. 267-280. Also Hannah Arendt, The Origins of Totalitarianism. New York: Doubleday, 1960.

[6] Gen. Georg Thomas, Vortrag des Herrn Amtschef des Wehrwirtschafts -u. Ruestungsamtes im Oberkommando der Wehrmacht. Anl.1 zu OKW/Wi Rue Amt/Rue I Nr. 210/42 g.K.v.23.1.42.

[7] Speer emphasizes this in his, Sklavenstaat, Meine Auseinandersetzungen mit der SS. Stuttgart: Deutsche Verlag-Anstalt 1981.

[8] Hermann Rauschning observed: "He (Hitler) rejected at the outset (1931) the idea that technical inventions could seriously affect the basic principles of strategy. He

rejected altogether the lay conception of the possibility of revolutionary inventions of any sort, and pointed out that in spite of the invention of firearms there had been no change in the great fundamental strategy in military history." The Revolution of Nihilism. New York: Alliance Book Corporation, 1937. But, as Rauschning observed later with others in Zurich during the war, some twelve years later it was precisely the technology of "wunderwaffen" which Hitler preached as a saving grace of the German state. By 1943 Gottfried Feder and many of the early revolutionaries had been forced from the political stage by increasing demands of Speer's new agenda.

[9] David Schoenbaum, Die braune Revolution. Eine Sozialgeschichte des Dritten Reiches. Koeln, 1968. Although there was no American counterpart to Hitler's racist, anti-intellectual glorification of the German peasantry at the beginning of the Nazi revolution, Nazi thinking in the early thirties was at least superficially similar to that of generations of American farm radicals. David Schoenbaum has aptly called Gottfried Feder "a kind of Central European William Jennings Bryan." However, the typical American farmer was no more like a German peasant than the owner of a Southern plantation like the old Junker elite.

[10] Wolfram Fischer, Deutsche Wirtschaftpolitik 1918-45, Opladen, 1968, p. 77. Also Henry Turner Jr., "Hitler's Einstellung zu Wirtschaft und Gesellschaft vor 1933," in Geschichte Gesellschaft 2 (1976) pp, 89-117.

[11] Albert Speer's writings, Sklavenstaat, Meine Auseinandersetzungen mit der SS. Stuttgart: Deutsche Verlag-Anstalt 1981.

[12] Correspondence from Feldwirtschaftsamt to Chef H. Ruest u BdE/Stab Nachr.: Chef W.Z.A. --SSD- WNOF Nr. 5892 27.9.) 00400-from Keitel. Helmut J. Schmeller, Hitler and Keitel: An Investigation of the Influence of Party Ideology on the Command of the Armed Forces in Germany between 1938-1945. Fort Hays, Kansas: Fort Hays State College Press, 1970.

[13] Gen. Georg Thomas, Vortrag des Herrn Amtschef des Wehrwirtschafts -u. Ruestungsamtes im Oberkommando der Wehrmacht. g.K.v.23.1.42.

[14] Ibid. At the beginning of the Speer period in 1942, Committees, Rings, and other new organizations wre in a constant process of formation and reformation. According to Rolf Wagenfuehr, who worked in the Planungsamt: "Many factories did not know whether they belonged at all to a committee or to a Ring, and conversely there were only few

committees and rings which had a clear picture of the number of their member firms and which could direct them accordingly." Die Deutsche Industrie im Kriege, Berlin: Institut fuer Konjunkturforschung, 1954, p. 41.

[15] Avraham Barkai, "Das Wirtschaftssystem des Nationalsozialismus," Koeln 1977, pp. 7, 20f. See also Werner Sombart, German Economic Politics. Munich: Lehmanns Verlag, 1933.

[16] Conversation with Krafft Ehricke, former director at Peenemuende and president of Luna Industries in San Diego, on 20 June 1987.

[17] According to conversations (April 1992) with Michael Kater of Harvard University the Party rapidly picked up members of the old elite after it was firmly established since members of the old German elite were accustomed to ruling, they jumped to the side of the N.S.D.A.P. in order to avoid losing their old positions of influence to gain enlarged new powers of authority. Such an attitude of cynical opportunism was exemplified by Gerhard Degenkolb and others like Ludwig Prandtl who had exemplary degrees from major universities.

[18] Jorg-Johannes Jaeger, Die Wirschaftliche Abhaengigkeit des Dritten Reiches vom Ausland. Berlin: DDR Gestellt Verlag, 1969. The theory of Walter Eucken that the National Socialists established a centrally planned economy is not confirmed by the formerly secret documents. See Arthur Schweitzer, "Plans and Markets: Nazi Style," KYKLOS, Vol. 30, 1977, pp. 88-115.

[19] Ludolf Herbst, op. cit., pp. 267-280. Berenice A. Carroll, Design for Total War. The Hague: Mouton, 1968, pp. 191-231.

[20] Personal conversation with Dr. Thomas Pickering, former director of Cal Tech's JPL in Pasadena, California, 15 January 1988. Dr. Pickering who worked with Dr. W. von Braun and Dr. James Van Allen in the American Apollo program in 1969 attributed its success to the lead-time provided by the German teamwork which was seen as a type of engineering elite. This echoes the private views of Admiral Delmar S. Fahrney who explained the German team as the "engineering vanguard that worked with the Americans to provide the free world with crucial protection during the early years of the Cold War." Personal notes taken on 21 February 1985 at the Del Fahrney home in La Mesa, California. See also, R.A. Smith III, "An Old Saint in New Robes: Saint Bureaucrats Defrocked." Taped interview by William Stubno Jr. of R.A. Smith III, 1 January 1977.

Redstone Missile Program files, Army archive, Huntsville, Alabama.

[21] Conversation with Dr. Ludwig Buelkow of Messerschmidt-Buelkow and Bohm and Messerschmidt at Buelkow Industries in Karching, Germany, October 1988, on his role in the design of the famed Me 262 aircraft and the earlier jet craft that were successfully tested by the early winter of 1941 for military use. Ironically, these revolutionary jets were held up by the shifting of Hitler's policy to the development of a jet-bomber. It occurred to me while Buelkow was describing how he and Willi Messerschmitt were "technicians at the front line," that Buelkow and others were the natural counterparts of Speer exemplifying a new type of warrior class not only working for the "total war design" of the Third Reich, but the "total war design of the West and Nato" in an ongoing technical war that did not end with the Second World War.

[22] BA R 58/56-59 details the control exercised by Speer's Ministry for Armaments and War Production and the SS at the end of the war who had different agendas in carrying on with new experimental weapon systems while making a massive effort to prevent certain technology from falling into Soviet hands. The accomplishments of the "Paperclip Team" are superbly known by the preeminent American historian of German-American postwar reconstruction, Dr. Frederich I. Ordway III. Personal conversation with Dr. Ordway at the Smithsonian, Washington D.C., took place in July 1992. Interview with Magnus von Braun, former member of the Peenemuende team, Sedona, Arizona, 21 June, 1987.
The latest book on this grey area of the problems of modern physics within closed political institutions and post-war technology is Thomas Power's, Heisenberg's War, New York: Alfred Knopf, 1993.

[23] David DeVorkin, Science with a Vengeance. Berlin-New York: Springer-Verlag, 1992, p. 167f.

[24] In post-war terminology this could be called "The Site for the Seminar," or the new location for the struggle between the Marxist and non-Marxist that began according to some Cold War historians as early as 1919, or as late as 1947. See Donald Fleming, Intellectual Migration: Europe and America 1930-1960, New York: Simon and Schuster, 1967.

[25] The role played by the union of "the bomb" with the V-2 team in the building of an intercontinential delivery system played a very important role in the creation of the American national security state. See for example, Fritz Zwicky views on the emerging importance of the German team recorded in, "Report on Certain Phases of War Researches in

Germany," Aerojet Engineering Corporation Memorandum for 1 October 1945, pp. 8, 66-72. Herbert York, formerly of Lawrence Livermore and the Pentagon has provided two excellent studies: Making Weapons, Taking Peace, New York: Simon and Schuster, 1987; Race to Oblivion. A Participant's View of the Arm's Race, New York: Simon and Schuster, 1970. Other reconstructionist views are, for example, Seymour Melman, The Permanent War Economy: American Capitalism in Decline, New York: Simon and Schuster, 1974. Perhaps, the most important views for the early post-war era are those of Rand Corporation's Bernard Brodie. See B. Brodie, "New Techniques of War and National Politics," The Development of American Strategic Thought 1945-69, editor M. Trachtenberg, New York: Garland Press, 1987, pp. 150-179. Finally, see the late John Gimbel's Science, Technology, and Reparation; Exploitation and Plunder in Postwar Germany, Stanford, California: Stanford University Press, 1990, pp. vii, 183.

[26] Referred to in the classified papers of Delmar S.Fahrney on the leading German missile experts and the OSS wartime reports on Werner Heisenberg. See also, James A. Van Allen, Space Astronomy Oral History Project, No. 1, 18 February 1981, Department of Space History, National Air and Space Museum, Washington D.C., and No. 2 and 3, 12 June and 18 June, 1981, Space History, National Air and Space Museum. See R. Cargill Hall, ed., 1986, History of Rocketry and Astronautics. AAS History Services. Proceedings of the Third through the Sixth History Symposium of the International Academy of Astronautics. Vol. 2. Washington D.C.: NASA Conference Publications 2014: 1977.

BIBLIOGRAPHY

Primary Sources: Public Archives

BDC Berlin Document Center:

Personalakten in NSDAP-Zentralkartei Parteikorrespondenz,
Oberstes Parteigericht, Wirtschaftspolitische Abteilung.
NS 3 I SS-Wirtschafts-Verwaltungs-Hauptamt, Amtsgruppe W.

Bundesarchives: Koblenz

R. 2 Reichsfinanzministerium
R. 3 Reichsministerium fuer Bewaffung und Munition/
Reichsministerium fuer Fuestung und Kriegsprodukion

R. 7 Reichswirtschaftsministerium
R. 8 Reichsstellen
R. 9 I Reichsstelle fuer den Aussenhandel
R. 11 Reichswirtschaftskammer
R. 12 IReichsgruppe Industrie
IIReichsgruppe Energiewirtschaft
IIIReichsgruppe Handel
IVReichsgruppe Versicherung
R. 13 Wirtschaftsgruppe Eisen schaffende Industrie

Bundesarchives: Munich, Deutsches Museum, Museuminsel 1.:

Herbert Wagner Private Collection, 1987.
Von Braun, Wernher. Theory of the Space Rocket.
Document No. 10848 to 10852.

California Institute of Technology, Archives, California:

George Ellery Hale Papers, microfilm edition.
Cargill R. Hall. Proceedings of the Third through the Sixth History Symposia of the International Academy of Astronautics, Vol. 2. NASA Conference Publications 2014: 1977.

Bundesarchives: Freiburg Bundesarchiv-Militaerarchiv (BA-MA):

RH. 19/ I-IV Heeresgruppen
RH. 19.16 Institut fuer Metallkunde

RH. 19.22 Degenkolb-Programm
19.22 HAP 11-Prof. von Braun
19.488 Goering und Reichsministers des Innern
RL. 2II/ Luftwaffe
RM. 7 Kriegsmarine
RW. 4 Oberkommando der Wehrmacht/WFSt
RW. 19 Vierjahresplan
RW. 19/513 Organisation der Kriegswirtschaft

Hoover Institution, Stanford University, California:

FIAT Collection, 1945.
File on General Walter Warlimont, 1945.7

Institut fuer Zeitgeschichte, Munich:

Aufzeichnungen Otto Wagener (RD 60), Walter Darré (ED 110), Zengenschriftum Schwerin von Krosigk (ZS/A-20). Assorted documents on microfilm.

NA National Archives, Washington D.C.:
(assorted documents on microfilm)

T-77: 424, 777, 869, 1423	German Armed Forces High Command
T-78: 310,311, 317, 335, 346, 430,	German Army High Command
T-311: 322, 24, 25, 27, 53, 140, 151	German Army Groups
T-312: 28, 317, 526, 977	German Armies
T-517: 365, 426	OKH

Foreign Military Studies, T-111: "The German Army High Command"

Foreign Military Studies, T-1-1: "The German Army High Command"

RG 457, SRS-548: B-Berichte & X-B Berichte, Dec. 1942-Mai 1943

Office of Naval Research, Washington, D.C.:

Bilek, V.H., and J.D. McPhilimy. Production and Disposition of German A-4 (V-2) Rockets (Project No. XT-1). Headquarters Air Material Commmand, Wright Field, Dayton, Ohio: Staff Study No. A-SS-2167-ND, 1948.

Fogel, H.M. Fuzing System of German A-4 Rocket (V-2). Combined Intelligence Objectives Subcommittee, G-2 Division, SHAEF, Items No. 3 and 4, File No. XXVII-37, April 1945.

Liebhafsky, Hermann. Uebersicht ueber die bisherige Entwicklung der Fluessigskeitsrakete in Deutschland und deren Zukunft aussichten. Braunsweig: H. Goering Institute, 1945. Office of Naval Research, Washington, D.C.

Martenson, C.D. Operations "Backfire" and "Clitterhouse" (British Firing of V-2 Rockets). Military Attache, London, Report R 5499-45, 1945.

Mossop, I.A. The Electrolytic Integrating Accelerometer for the Automatic Control of Range of the German A-4 Rocket. Royal Aircraft Establishment, Farnborough Hants, R.A.E. Report EL. 1387, 1946.

Oberkommando des Heeres [High Command of the Army]. Das Geraetr A-4, Baureihe B, [The Assembly A-4, Model B], 2 January 1945.

Oberth, Hermann. Die Rakete zu den Planetenraumen. Munich and Berlin: Verlag von R. Oldenbourg, 1923, NASA TT F-9227.

United States Army Ordnance Corps and the General Electric Company. Hermes Guided Missile Research and Development Project 1944-54. Technical Liaison Branch, Chief of Army Ordnance, 25 September 1959.

United States Strategic Bombing Survey, Aircraft Division Industry Report. Strategic Bombing of the German Aircraft Industry. Chapter IX, "Report on V-Weapon Production," London: Office of the Royal Historical Society, 1945.

United States Strategic Bombing Survey. The Effects of Strategic Bombing on the German War Economy. Overall Economic Effects Division. London: Office of the Royal Historical Society, 1945.

White, L.D. Final Report, Project Hermes V-2 Missile Program. General Electric Co., Schenectady, N.Y. Report #R52A0510, 1952.

Smithsonian Institution, Washington, DC:

V2/NASM: Reports of the V-2 Panel, from 1946 through 1962, portions collected from the NASA History Office, Homer Newell Papers; from the James Van Allen Papers, University of Iowa; from the Harry Wexler Papers, Library of Congress Manuscripts Division; and from the personal collections of Nelson Spencer and William Stroud. Complete copy dating from January 1946 through 1962 housed in the Space Astronomy Oral History Project, Department of Space History, National Air and Space Museum.

Technische Hochschule, Munich:

Zengenschriftum Ernst Schmidt (assorted documents)
1941 (box) Volkenrode-Braunschweig Motorinstitut.

1942 (box) Kennwerte und Kosten fuer Luftwaffe (Braunschweig).

1943 (box) Correspondence: Praesident des Reichsforschungsrates. Planungsamt des Reichsforschungsrates: Werner Osenberg.

1944 (box) Correspondence: Deutsche Waffen-und Munitionsfabriken. Planungsamt des Reichsforschungsrates: Werner Osenberg. Der Reichsmarschall des Grossdeutschen Reiches. Institut fuer Physikalische Chemie der Universitaet:F-Main.

1945 (box) Correspondence: Sonderausschuss A 4. Planungsamt des Reichsforschungsrates: Werner Osenberg. Zentralplanungsamt: Albert Speer.

Schmitt, Ernst. "Waermetransport durch Fluessigkeiten in der Naehe ihres kritischen Zustandes." in Jahrbuch 1939 Deutsche Luftfahrtforschung Vol. 2, 53-58.

Schmitt, Ernst. Verzeichnis von veroeffentlichungen und Berichten des Institutes fuer Motorenforschung. Braunschweig, 15 October 1945, 1-33.

Primary Sources: Personal Archives

Noeggerath, Wolfgang (Personal Archives):
(Personal papers and notebooks from Braunschweig located in San Jose, California)

1936-43 (notebook box) HLN-Anmeldungen: Triebstoff Beispiele.

1942-45 (diary): Monergol, Brennstoff and other experiments: sections 345-361, 603-609, 643-648, 661-667857-963.

1943 (box) BMW Flugmotorenbau G.M.B.H.

1944 (box) Luftfahrtforschungsanstalt Muenchen: St. Institut. Luftfahrtforschungsanstalt Braunschweig.

1945 (box) Luftfahrtforschungsanstlat Braunschweig.

Saenger Family Collection, Braunschweig, Germany:

Saenger, Eugene and Irene Brendt, Ueber einen Lorinantrieb fuer Stahljaeger. Zentrale fuer wissenschaftliches Berichtswesen, Berlin-Adlerhof, Untersuchungen und Mitteilungen 3509 (1943). Private library collection of Richard Saenger.

Saenger, Eugene: Hoechstemperatur-Strahltriebwerk. Deutsche Reichspatent DP 165 144, Berlin 1941. Private library collection of Richard Saenger.

Von Braun Family Achives, Phoenix:

1945-46 (box) Drawings on adaptation of Sonderausschuss A 4 project to White Sands; Marsprojekt drawings.

Personal papers, unpublished, from Peenemuende. Family of Magnus von Braun, Phoenix, Arizona.

Primary Sources: Private Archives

U.S. Naval Research Center, Point Mugu, Oxnard, California:

AVKO (Altenwalde Versuchs-Kommando). Die Fernrakete [The Long Range Rocket]. Unpublished manuscript. Document prepared by German personnel working on Operation Backfire, 1945. Navy archives at Pt. Mugu, California.

Fahrney, Delmar. The History of Pilotless Aircraft and Guided Missiles. Bureau Aeronautics. Unpublished manuscript. (1951) Archives Office of Naval Research, Washington, D.C. and Pt. Mugu.

Interim Report on Large Sites, Rocket Firing Platforms and Rocket Storage Sites in the Pas de Calais Area. A.I. 2. (L) Report No. 114, October 7, 1944 in Navy archiv, Pt. Mugu, California.

Lussar, Robert. Technical Report No. 75, A Study of Methods for Achieving Reliability of Guided Missiles. Unpublished US Naval Air Missile manuscript, Pt. Mugu, 1950.

Personal interviews:

Ludwig Boelkow (Nov 1988, Munich)
Hermann Blenk (Nov 1989, Braunschweig)
Krafft Ehricke (February 1983, San Diego)
Delmar S. Fahrney (Nov-Dec 1982, San Diego)
Dieter Huzel (June 1987, Los Angeles)
Friederick Ordway III (July 1992, Washington DC)
William Pickering (November 1989, Los Angeles)
Magnus von Braun (April 1987, Sedona, AZ)

Secondary Materials: Books

Arendt, Hannah. The Origins of Totalitarianism. New York: Doubleday, 1960.

Aspray, William. John von Neumann and The Origins of Modern Computing. The MIT Press: Cambridge 1990.

Aubin, H. and W. Zorn, Handbuch der deutschen Wirtschafts- und Sozialgeschichte. vol. 2, Stuttgart: Union Verlag, 1976.

Barkai, Avraham. Das Wirtschaftssystem des National-sozialismus, Der historische und ideologische Hintergrund 1933-39. Koeln: Wissenschaft -und Politik, 1977.

Bellon, Bernard. Mercedes in Peace and War: German Automobile Workers, 1903-1945. New York: Simon and Schuster, 1990.

Bendersky, Joseph W. Carl Schmitt: Theorist for the Reich. Princeton: Princeton University Press, 1983.

Bielfeldt, Carla. Ruestungsausgaben als Instrument der Wirtschaftspolitik in Karl-Ernst Schulz (Hrsg.), Militaer und Oekonomie. Goettingen: Vanderhoeck u. Ruprecht, 1977.

Birkenfeld, Wolfgang. Der synthetische Triebstoff 1933-1945: Ein Beitrag zur nationalsozialistischen Wirtschafts- und Ruestungspolitik. Goettingen: Berger Verlag, 1964.

Blaich, Avraham. "Wirtschaft und Ruestung in Deutschland, 1939-45," in K.D. Brachet, M. Funke, and H.A. Jacobsen, eds., Nationalsozialistische Diktatur. Bonn, 1983.

Boelde, Willi A. Deutschlands Ruestung im Zweiten Weltkrieg und Ingenieure im Dritten Reich. Duesseldorf: Droste, 1974.

Boelkow, Ludwig. Ein Jahrhundert Flugzeuge: Geschichte und Technik des Fliegens. Duesseldorft: Droest, 1990.

Boog, Horst. "Higher Command Leadership in the German Luftwaffe, 1935-36," Proceedings of the Eighth Military History Symposium. US Air Force Academy, October 1978.

Borchardt, Knut. Wachstum und Wechsellagen 1914-1970. in H. Aubin and W. Zorn (Ed.), Handbuch der deutschen Wirtschafts- und Sozialgeschiche. Bd. II, Stuttgart 1975.

Bracher, Karl-Dietrich. The German Dictatorship: The Origins, Structure, and Effects of National Socialism. New York: Praeger, 1970.

Broszat, Martin. Der Staat Hitlers. Munich: Deutsche Taschenbuch Verlag, 1969.

Broszat, Martin. Nationalsozialistische Konzentrations-lager 1933-1945, Vol. 2, Munich 1984.

Buchheim, Hans. "Befehl und Gehorsam," in Anatomie des SS-Staates. Vol. 1, Olten and Freiburg 1965.

Bullock, Allan. Adolf Hitler: A Study in Tyranny. New York: Harper and Row, 1962.

Carroll, Berenice, A. Design for Total War. Arms and Economics in the Third Reich. The Hague: Mouton, 1968.

Czech, Danuta. Kalendarium der Ereignisse im Konzentrationslager Auschwitz-Birkenau 1939-1945. Reinbeck 1989.

Darré, Walter. Neuadel aus Blut und Boden. Munich: J.F. Lehmanns Verlag, 1933.

Deutsche, Harold, Hitler and His Generals. Minneapolis: University of Minnesota Press, 1974.

DeVorkin, David. Science with a Vengeance. Berlin-New York: Springer Verlag, 1992

Domarus, M. Autarkiepolitik im Dritten Reich. Stuttgart: Deutsche Verlags-Anstalt, 1968.

Domarus, M. Hitler-Reden und Proklamationen: Wuerzburg: Gesamtherstellung und Auslieferung, 1962.

Dornberger, Walter. V2--Der Schuss ins Weltall. Esslingen: Bechte, 1952.

Ehricke, Krafft. Statement on the Socio-Economy and Socio-Technology of Space Industrialization. Before the Committee on Science and Technology, U.S. House of Representatives, 95th Congress, Washington D.C., January 1978.

Ehricke, Krafft. Philosophy and Outline of Long-Range Space Planning for the Needs of this Nation and Mankind. NASA Report PO71-16, Washington, D.C., Gov. Printing, January 1978.

Engelhardt, Klaus and Karl-Heinz Heise. Der militaerisch-industrielle Komplex im heutigen Imperialismus. Koeln 1974.

Eppenstein, Franz. Die Deutsche Industrie im Kreige 1939-1945. Berlin: Dahlem, 1954.

Erbe, Rene. Die nationalsozialistische Wirtschaftspolitik 1933-1939 im Lichte der modernen Theorie. Zuerich: Polygraphischer Verlag: 1958.

Erhard, Ludwig. Kriegsfinanzierung und Schulden-konsolidierung, Faksimiledruck der Denkschrift von 1943/444 mit Vorbemerkungen von Ludwig Erhard, Theodor Eschenburg, Guenter Schmoelders. Frankfurt am Main: Propyläen, 1977.

Feder, Gottfried. Das Manifest zur Brechung der Zinsknechtschaft. Munich: Lehmanns Verlag, 1919.

Fischer, Wolfram. Deutsche Wirtschaftpolitik 1918-45. Opladen: Westdeutscher Verlag, 1968.

Fleming, Donald. Intellectual Migration: Europe and America 1930-1960. New York: Simon and Schuster, 1967.

Foertsch, Hermann. Schuld und Verhaengnis. Stuttgart: Deutscher Verlag, 1951.

Forstmeier, Friedrich/Volkmann, Hans-Erich, Wirtschaft und Ruestung am Vorabend des Zweiten Weltkrieges. Duesseldorf: Droste, 1975.

Freudenberger, Hermann and Luza Radomir. "National Socialist Germany and Austrian Industry, 1938-45" in William E. Wright, Austria Since 1945. University of Minnesota, 1982.

Frisch, A. "Die Zukunft der Technokratie." in C. Koch and D. Senghaas, Texte zur Technokratiediskussion. Frankfurt a.M., Europaische Verlagsanst, 1970.

Fritz, Martin. German Steel and Swedish Iron Ore 1939-1945. Goeteborg: Almqvist and Wiksell, 1974.

Froebe, Rainer, Claus Fuellberg-Stolberg, Christoph Gutmann, Rolf Keller, Herbert Obenaus and Hans Schroeder, Kozentrationslager in Hannover. KZ-Arbeit und Ruestungsindustrie in der Spaetphase des zweiten Weltkriegs. Vol. 1, Hildesheim.

Galland, Adolf. The First and The Last. London: Methusen, 1955.

Garstens, M.A., Newell, H.E., Jr., and J.W. Siry. Upper Atmosphere Research Report Number 1. Naval Research Laboratory Report No. R-2955, Washington D.C.: Office of Naval Research, Washington D.C., October 1, 1946.

Georg, Enno. Die Wirtschaftlichen Unternehmungen der SS. Stuttgart: Deutsche Verlags Anstalt, 1963.

Gerber, Berhold. Staatliche Wirtschaftslenkungen in den besetzten und annektierten Ostgebieten waehrend des zweiten Weltkrieges unter besonderer Berueck-sichtigung der treuhaenderischen Verwaltung von Unternehmungen und der Ostgesellschaften. Tuebingen 1959. (Studien des Instituts fuer Besatzungsfragen in Tuebingen zu den deutschen Besatzungen im zweiten Weltkrieg 17).

Giller, Heinz. Zur Geschichte der Deutschen Forschungsanstalt fuer Luftfahrt in Braunschweig. monograph of the Deutsche Forschungsantalt fuer Luftfahrt, Braunschweig: DFL Verlag, 1987.

Gillingham, John. Industry and Politics in the Third Reich. New York: Columbia University, 1985.

Gimbel, John. Science, Technology, and Reparations: Exploitation and Plunder in Postwar Germany. Stanford: Stanford University Press, 1990.

Gispen, Kess. New Profession, Old Order: Engineers and German Society, 1815-1914. New York: Cambridge University Press, 1989.

Goerlitz, Walter. History of the German General Staff. Praeger: London 1957.

Goerlitz, Walter. Generalfeldmarschall Keitel: Verbrecher oder Offizier? Erinnerungen, Briefe, Dokumente des Chefs OKW. Goettingen: Musterschmidt, 1961.

Gottfried, Paul Edward. Carl Schmitt. Politics and Theory. New York: Greenwood Press, 1990.

Guderian, Heinz. Panzer Leader. New York: Praeger, 1956.

Habermas, J. Technik und Wissenschaft als Ideologie. Frankfurt a/M.: Suhrkamp, 1968.

Heigel, Karl Theodor. Geschichtliche Bilder und Skizzen. Munich: J.F. Lehmanns Verlag, 1934.

Helfers, M.C. The Employment of V-Weapons by the Germans During World War II. Office of the Chief of Military History, U.S.Army, Washington, D.C., 31 May 1954.

Henning, Friedrich W. Das industrialisierte Deutschland 1914 bis 1972. Paderborn 1974.

Heininger, Horst. Der Nachkriegszyklus der deutschen Wirtschaft 1945-1950. Berlin 1959.

Herbert, Ulrich. Europa und der "Reichseinsatz". Bonn: Klartext, 1989.

Herbert, Ulrich. Mittelwerk. Stuttgart: Deutsche Verlags-Anstalt, 1968.

Herbst, Ludolf. Der Totale Krieg und die Ordnung der Wirtschaft. Stuttgart: Deutsche Verlags-Anstalt, 1982.

Hermann, Armin. Wie die Wissenschaft Ihre Unschuld Verlor. Stuttgart, Deutsche Verlags-Anstalt, 1982.

Hillgruber, Andreas. Hitlers Strategie. Politik und Kriegfuehrung 1940-41. Frankfurt am Main: Bernard u. Graefe, 1965.

Hirt, Rheinhold. Vom Schicksal der weissen Kohnsteinberger. Hannover: Nordhaeuser Heimatbuch, 1965.

Homze, Edward L. Arming the Luftwaffe: the Reich Air Ministry and the German Aircraft Industry, 1919-39. Lincoln: University of Nebraska Pres, 1970.

Huttenberger, Peter. Die Gauleiter. Stuttgart: Deutsche Verlags-Anstalt, 1969.

Irving, David. The Mare's Nest. Boston: Brown, 1965.

Irving, David. The Rise and Fall of the Luftwaffe. Boston: Brown, 1974.

Jaeger, Jorg Johannes. Die Wirschaftliche Abhaengigkeit des Dritten Reiches vom Ausland. Berlin: DDR Gestellt Verlag, 1969.

Jansen, Georg. Das Ministerium Speer. Berlin: Ullstein, 1968.

Joachmann, Werner. Adolf Hitler, Monologe im Fuehrerhauptquartier, 1941-1944: Die Aufzeichnungen Heinrich Heims. Hamberg: Albrecht Knaus, 1980

Kannapin, Hans-Eckhardt. Wirtschaft unter Zwang. Anmerkungen und Analysen zur rechtlichen und politischen Verantwortung der deutschen Wirtschaft unter der Herrschaft des Nationalsozialismus im Zweiten Weltkrieg, besonders im Hinblick auf den Einsatz und die Behandlung von auslaendischen Arbeitskraeften und Konzentrationslagerhaeftlingen in deutschen Industrie- und Ruestungsbetrieben. Cologne: Bundeszentrale fuer Politische Bildung, 1966.

Karman, Theodore von. Where We Stand. a report prepared for the AAF Scientific Advisory Group, August 1945, published May 1946 by Headquarters, Air Material Command 13, Washington D.C.: Government Printing Office.

Kehrl, Hans. Kriegswirtschaft und Ruestungsindustrie. Ammerkung zum Vorwort. Duesseldorf: Droste, 1971.

Kehrl, Hans. Kriegswirtschaft und Ruestungsindustrie Ammerkung zum Vorwort. in Bilanz Des Zweiten Weltkriegen. Oldenburg: G. Stalling, 1953.

Kellenbenz, Hermann. Deutsche Wirtschaftsgeschichte. vol. 2, Wiesbaden: In Kommission bei Franz Steiner Verlag, 1969.

Klee, Ernst, and Otto Merk. The Birth of the Missile. New York: E.P. Dutton & Co., 1965.

Klein, B. and Nathan Kaldor (eds.) U.S. Strategic Air Command Paper: Germany's Preparations for War. Washington D.C., 1945.

Klein, B. Germany's Preparations for War. Cambridge: Harvard University Press, 1959.

Koller, Karl. Der letzte Monat: Die Tagebuchaufzeichnungen des ehemaligen Chefs des Generalstabs der deutschen Luftwaffe von 14 April bis 27 Mai 1945. Mannheim: Norbert Wohlgemuth, 1949.

Koellner, Lutz. Militaerausgaben und Militaerstruktur in Deutschland. Ansaetze und Beitraege zur langfristigen Analyse seit 1900. Munich: Sozialwissenschaftliches Institute der Bundeswehr, 1978.

Kotze, Hans von, und H. Krausnick, Es spricht der Fuehrer. Sieben exemplarische Hitler-Reden. Guettersloh 1966.

Krausnick, Helmut. Anatomy of the SS State. New York: Walker, 1968.

Kriegstags des Oberkommandos der Wehrmacht. Edited by Hans-Adolf Jacobsen, Vol. 1-4/2, Frankfurt am Main: Bernard und Graefe, 1965

Lewis, Richard. Appointment on the Moon. New York: Harper and Row, 1968.

Ley, Willy. Rockets, Missiles, and Men in Space. New York: Viking Press, 1968.

Ludwig, Karl-Heinz. Technik und Ingenieure im Dritten Reich. Dusseldorf: Droste, 1974.

McClelland, Charles. The German Experiece of Professionalization: Modern Learned Professions and Their Organizations from the Early Nineteenth Century to the Hitler Era. New York: Cambridge University Press, 1991.

Markowski, Zbigniew. Armaments and Macroeconomic Development Performance. An Empirical Examination of the Experience in Various Regions and Systems

1960-78. Report submitted to the United Nations Groups of Government Experts on the Relationship of Disarmament and Development, United Nations, 1981.

Melman, Seymour. The Permanent War Economy: American Capitalism in Decline, New York: Simon and Schuster, 1974.

Michalka, Wolfgang. Der Zweite Welktkrieg, Analysen, Grundzuege, Forschungsbilanz. Munich, 1989, 784-797.

Militaergeschichtliches Forschungsamt; Handbuck zur Militaergeschichte Bd. 4, Wehrmacht und Nationalsozialismus 1933-39. Munich, 1978.

Milward, Alan S. Arbeitspolitik und Produktivitaet in der deutschen Kriegswirtschaft unter vergleichendem Aspekt. in Kriegswirtschaft und Ruestung 1939-1945. ed. by Friedrich Forstmeier and Hans-Erich Volkmann, Duesseldorf: Droste, 1977.

Milward, Alan S. Die Deutsche Kriegswirtschaft 1919-1945. trans. The German Economy at War. London: Athlone, 1965.

Milward, Alan S. Die Deutsche Kriegswirtschaft 1938-45. Stuttgart: Kolhhammer, 1966.

Mitchell, Samuel. Hitler's Commanders. Norman, Oklahoma: University of Oklahoma Press, 1992.

Mommsen, Hans. Beamtentum Im Dritten Reich. Stuttgart: Deutsche Verlags-Anstalt, 1966.

Mueller, Hans-Juergen. Das Heer und Hitler. Stuttgart: Deutsche Verlags-Anstalt 1969.

Mueller, Hans-Juergen. Armee und Drittes Reich 1933-1939. Paderborn: Schoeningh, 1989.

Naumann, Christa. Das arbeitsteilige Zusammenwirken von SS und deutschen Ruestungskonzernen 1942-45, dargestellt am Beispiel der Aussenkommndos des Konzentrations-lagers Buchenwald. Diss. phil. Berlin (DDR) 1973.

Nebel, Rudolf. History of the Silver Bird. paper presented at the Sixth History Symposium of the International Academy of Astronautics, Vienna, Austria, October 1972.

Neumann, Franz. Behemoth: The Structure and Practice of National Socialism. New York: Oxford University Press, 1944.

Noordung, Hermann. Das Problem der Befahrung des Weltraums. Berlin: Springer Verlag, 1929.

Ordway, Frederick I. and Mitchell R. Sharpe. The Rocket Team. New York: Thomas Y. Crowell, 1979.

Ordway, Frederick I. Blueprint For Space. Washington D.C.: Smithsonian Institution, 1992.

Overy, Richard, J. The Air War 1939-45. London: Routledge, 1980.

Overy, Richard, J. Goering: The Iron Man. London: Routledge, 1984.

Petzina, Dieter, W. Abelshauser, and A. Faust, Sozialgeschichtliches Arbeitsbuch III: Materialien zur Statistik des Deutschen Reiches 1914-45. Munich: Deustcher Verlags-Anstalt, 1978.

Petzina, Dieter. Grundriss der deutschen Wirtschafts-geschichte 1918 bis 1945. in Deutsche Geschichte seit dem Ersten Weltkreig. Bd. II, Stuttgart, 1973.

Pfahlmann, Hans. Fremdarbeiter und Kriegsgefange in der deutschen Wirtschaft 1939-45. Darmstadt: Wehr und Wissen Verlagsgesellschaft, 1968.

Powers, Thomas. Heisenberg's War. The Secret History of the German Bomb. New York: Alfred Knopf, 1993.

Reitlinger, Gerald. The SS. Alibi of the German Nation. New York: Viking Press, 1957.

Roesler, Konrad, Die Finanzpolitik des Deutschen Reiches im Ersten Weltkrieg. Berlin: Duncker und Humblot, 1967.

Rueckerl, Aldabert, NS-Prozesse. Nach 25 Jahren Strafverfolgung: Moeglichkeiten--Grenzen--Ergebnisse. Karlsruhe: C.P. Mueller, 1971.

Schacht, Hjalmar. Account Settled. London: Weidenfield, 1949.

Schmeller, Helmut J. Hitler and Keitel: An Investigation of the Influence of Party Ideology on the Command of the Armed Forces in Germany between 1938-1945. Fort Hayes, Kansas: Fort Hayes State College Press, 1970

Schmitt, Carl. Political Romanticism. Translation and Introduction by Guy Oakes. Cambridge, Mass.: MIT Press, 1986.

Schoenbaum, David. Hitler's Social Revolution. Garden City: Doubleday, 1961.

Schott, Franz Josef. Der Wehrmachtfuehrungsstag im Fuehrerhauptquartier. Bonn: F.J. Schott, 1978.

Schwartz, Mortimer D. Proceedings of the Conference on Space Science and Space Law. New Jersey: Fred Rothman, 1964.

Schweitzer, Arthur. Big Business in the Third Reich. Bloomington: University of Indiana Press, 1964.

Seaton, Albert. The Fall of Fortress Europe 1943-45. London: B.T. Batsford, 1981.

Setlzner, Juergen. Arbeitsbeschaffung und Wiederaufruestung 1933-36. Natinoalsozialistische Beschaeftigungspolitik und Aufbau der Wehr- und Ruestungswirtschaft. Diss., Tuebingen 1976.

Schmeller, Helmut J. Hitler and Keitel: An Investigation of the Influence of Party Ideology on the Command of the Armed Forces in Germany between 1938-1945. Fort Hays, KS: Fort Hays State College Press, 1970.

Spaete, Wolfgang. Top Secret Bird: The Luftwaffe's M3-163 COMET. Missoula: Pictoral Histories Publishing, 1989.

Speer, Albert. Erinnerungen. Berlin: Propyläen Verlag, 1969.

Speer, Albert. Inside the Third Reich. New York: The Macmillan Company, 1970.

Speer, Albert. Infiltration. New York: The Macmillan Company, 1979.

Speer, Albert. Spandauer Tagebuecher. Frankfurt/M.: Propyläen, 1975.

Speer, Albert. Technik und Macht. Esslingen a/Neckar: Bechtle, 1979.

Swarek, Dieter. Unternehmenkonzentration als Ergebnis und Mittel nationalsozialistischer Wirtschaftspolitik. Berlin: Humblot, 1972.

Taylor, A.J.P. The Origins of the Second World War. London: Hamilton, 1961.

Tractenberg, Marc. The Development of American Strategic Thought: Writings on Strategy 1945-1951. New York: Garland Publishing, 1987.

Trials of War Criminals before the Nuremburg Military Tribunal under Control Council Law No. 10. Washington D.C., Government Printing Office, 1951-1952.

Volkmann, Hans-Erich. Kriegswirtschaft und Ruestung. Duesseldorf: Droste, 1977.

Von Braun, Wernher, and Frederick Ordway III. History of Rocketry and Space Travel. New York: Thomas Crowell, 1966.

Vorlaender, Herwart (ed.) Nationalsozialistische Konzentrationslager im Dienst der totalen Kriegsfuehrung. Sieben wuerttembergische Aussenkommandos des Konzentrationslagers Natzweiler/Elsass. Stuttgart: Deutsche Verlags-Anstalt, 1978.

Wagenfuehr, R. Die Bedeutung des Aussenmarktes fuer die deutschen Industrie Wirtschaft. Hamburg: Hanseltische Verlag Anstalt, 1954.

Wagenfuehr, R. Die deutsche Industrie im Kriege, 1939-45. Berlin: Deutsches Institut fuer Wirtschaftsforschung, 1954.

Walker, Mark. German Nuclear Scientists under Hitler. Princeton: Princeton University Press, 1991.

Warlimont, Walter. Im Hauptquartier der Deutschen Wehrmacht 1939-1945. Frankfurt am Main: Bernard und Graefe, 1962.

Wegner, Bernard. Hitlers politische Soldaten, Die Waffen-_ SS, 1933-1934. Paderborn: Schoeningh, 1982.

Weitzel, Otto. Die Entwicklung der Staatsausgaben in Deutschland. Erlangen/Nuernberg, 1968.

Whaley, Barton. Covert German Rearmament 1919-39: Deception and Mispreception. Frederick, Maryland: University Publications of America, Inc., 1984.

Williamson, Peter J. Varieties of Corporatism: A Conceptual Discussion. London: Cambridge University Press, 1985.

Winkler, Heinrich August. Mittelstandsbewegung oder Volkspartei? Zur sozialen Basis der NSDAP. in Faschismus als soziale Bewegung. edited by Wolfgang Schieder, Hamburg: Hoffman u. Campe, 1976.

Winkler, Heinrich August. Mittelstand, Demokratie und Nationalsozialismus. Koeln: Kiepenheuer and Witsch, 1972.

Wright, William (ed.). Austria since 1945. Minneapolis: University of Minnesota, The Center for Austrian Studies, 1982.

Woodman, Dorothy. Hitler treibt zum Krieg. Dokumentarische Enthuellungen ueber Hitlers Geheimruestungen. herausg. Dieter Lange, Berlin: Dietz, 1978.

Yergin, Daniel. The Prize The Epic Quest for Oil, Money and Power. Cambridge: Harvard University Press, 1990.

York, Herbert. Making Weapons, Talking Peace. New York: Simon and Schuster, 1987.

York, Herbert. Race to Oblivion. A Participant's View of the Arm's Race. New York: Sion and Schuster, 1970.

Zdrowomyslaw, Norbert. Wirtschaft, Krise und Ruestung, Bremen: Skarabaeus-Verlag, 1985.

Zumpe, Lotte. Wirtschaft und Staat in Deutschland 1933 bis 1945. Berlin: Dietz, 1979.

Zwicky, Fritz. Collapsed Matter of Nuclear Density and Nuclear Goblins. Berlin: VEB Deutscher Verlag der Wissenschaften, 1958.

Secondary Materials: Journals, Magazines and Serials

Baum, Walter. "Der Zusammenbruch der obersten deutschen Militaerischenfuehrung 1945." Wehrwissenschaftliche Rundschau. 10 (1960): 237-266.

Becker, Peter W. "The German Economy during World War II: Petroleum." in Proceedings of the South Carolina Historical Association 1975, 16-29.

Blankstein, Herbert and Turkenburg, William C. "Atoomenergie in Het Berde Rijk," in Spiegel Hist. 1981 16 (12), 690-697.

Boehm, Hermann. "Zur Ansprache Hitlers vor den Fuehrern der Wehrmacht am 22 August 1939. Vierteljahrshefte fuer Zeitgeschichte. 19 Julyl 1971, 294-304.

Boelde, Willi A. "Probleme der Finanzierung von Militaerausgaben" in Friedrich Forstmeier/Hans-Erich Volkmann, Wirtschaft und Ruestung am Vorabende des Zweiten Weltkrieges. Duesseldorf 1975.

Bracher, Karl-Dietrich. Die speer Legende. in Neue Politische Literatur. XV/1970, 429-431.

Braun, Hans-Joachim. "Fertigungsprozesse im deutschen Flugzeugbau 1926-1945." Technikgeschichte, 1990 (57), 11-135.

Burdick, Charles. "Die Unterlagen ueber Einheiten des deutschen Heeres im Zweiten Weltkrieg." Wehrwissenschaftliche Rundschau. 16 (1966): 55-58.

Cole, Robert. "A.J.P. Taylor and the Origins of the Second World War," in Problems in European History. 1979, 267-282.

Eichholtz, Dietrich. "Die Vorgeschichte des Generalbevollmaechtigen fuer den Arbeitstatz," in Jahrbuch fuer Geschichte. 1973 (9), 339-383.

Eucken, Walter. "On the Theory of the Centrally Administered Economy: An Analysis of the German Experiment," Economica. May 1948 (VIII), 79-100; Part Two, June 1948 (VIII), 173-193.

Froebe, Rainer. "Der Arbeitseinsatz von KZ-Haeftlingen und die Perspektive der Industrie", in Ulrich Herbert, Europa und der Reichseinsatz. Berlin: Klartext, 1992, 352-383.

Geyer, Michael. Deutsche Ruestungsprogramm (1930-34). in Militaergeschichtliche Mitteilungen 1/1975. 125-172.

Gimbel, Peter. "Project Paperclip: German Scientists, American Policy, and the Cold War," Diplomatic History. Dec. 1989.

Goldberg, Joerg. Kurs auf den Weltkrieg. Faschistische Wirtschaftspolitki und Kriegsoekonomie. in Blaetter fuer deutsche und internationale Politik 1/1983. 41-52.

Gottfried, Paul. Carl Schmitt: Politics and Theory. Westport, CT: Greenwood Publishing, 1990.

Grobelny, Andelin. "Projekt Dakoveho Plynovodu H Szezko-Ostravsko-Viden V Hoospodarske Politice Nacistu V Letech 1940-1944," in Prumyslove Oblasti. 1980 7:201-264.

Gumbel, E.J. "Disarmament and Clandestine Rearmament under the Weimar Republic." In Seymour Melman, (ed.), Inspection for Disarmament. New York: Columbia University Press, 1958, 205-219.

Henke, Joseph. "Das Schicksal deutscher zeitgeschichtlicher Quellen in Kriegs- und Nachkriegszeit. Beschlagnahme--Rueckfuehrung--Verbleib", in Vierteljahrshefte fuer Zeitgeschichte 30 (1982). 557-620.

Hennig, E. Materialien zur Diskussion der Monopolgruppentheorie. in Neue Politische Literature. XVIII/1973, 185-200.

Herf, Jeffrey. "Engineer as Ideologue. Reactionary Modernists in Weimar and Nazi Germany," in Journal of Contemporary History, 19 (1984), 631-648.

Hillgruber, Andreas. Der Faktor Amerika in Mitlers Strategie 1938-41. in Aus Politik und Zeitgeschichte 19 (1966), 3-20.

Huber, Carl. "From Hell to Heaven," San Jose News. October 1985.

Kluke, P. "Hitler und das Volkswagenprojekt," in Vierteljahreshefte fuer Zeitgeschichte. (1960).

Kocka, J. Industrielles Management: Konzepte und Modelle in Deutschland vor 1914. in Vierteljahresschrift fuer Sozial und Wirtschaftsgeschichte. 56/1969, 358-370.

Korolev, Sergei. "Rocket Flight in the Stratosphere," Voenizdat. October, 1934, 8-10.

Krammer, Arnold. "Fueling The Third Reich," in Technology and Culture 1978 19 (3), 394-422.

Kreidel, Hellmut. "Der Umgang mit der Zivilbevoelkerung in den deutschen Wehrmacht im 2. Weltkrieg besetzten Ostgebrieten," in Rev. Militaire Generale 1972 (10), 499-507.

Kwiet, Konrad. "Reichskommissariat Nederlande: Versuch und Scheiten nationalsozialistischer Neuordnung," in Schriftenreihe der Vierteljahrshefte fuer Zeitgeschichte. No. 17, Stuttgart, 1969.

Ludwig, Karl-Heinz. Die wohlreflektierten "Erinnerungen" des Albert Speer. Einige kritische Bemerkungen zur Funktion des Architekten, des Ingenieurs und der Technik im Dritten Reich. in Geschichte in Wissenschaft and Unterricht 21 (1970), 695-708.

Milward, Alan S. "The End of the Blitzkrief." in The Economic History Review 16 (1964), 499-500.

Olsson, Sven-Olof, "The Documents of Zentrale Planung as a basis for research on the German War Economy," in Scandinavian Economic History Review 1976 24 (1) 45-59.

Overy, Richard J. "The Luftwaffe and the European Economy 1939-1945" Militaergeschichtliche Mitteilungen. Vol. 26 (1979):55-78

Pingel, Falk. "Haeftlinge unter SS-Herrschaft. Widerstand, Selbstbehauptung und Vernichtung im Konzentrations-lager." Historische Perspektiven 12, Hamburg, 1978.

Riedel, Matthias, "Bergbau und Eisenhuettenindustrie in der Ukkraine unter deutscher Besatzung (1941-1944)," in Vierteljahrshefte fuer Zeitgeschichte 1973 21 (3), 245-284.

Ridder, H. Zur Vefassungsdokrin des NS-States. in Kritische Justiz. Hefte 3, 1969, 236-242.

Rohwer, Juergen. "Der Einfluss der allierten Funkaufklaerung auf den Verlauf des Zweiten Weltkrieges." Vierteljahrshefte fuer Zeitgeschichte. 27 (July 1979), 325-369.

Schaefer, G. "Oekonomische Bedingungen des Faschismus," in Ist die Epoche des Faschismus beendet? Frankfort am Main: Metzer Verlags, 1971, 68-88

Schumann, Wolfgang. "Die Wirtschaftspolitische Ueber-lebenstrategie des Deutschen Imperialismus in der Endphase des Zweites Weltkrieges," in Zeitschrift fuer Geschichtwissenenschaft 1979 27 (6), 499-513.

Schustereit, Hartmut. "Die Mineraloellieferungen der Sowjetunion an das Deutsche Reich 1940/41," in Vierteljahrschrift fuer Sozial-und Wirtschaftsgeschichte 1980 67 (3), 334-353.

Schweitzer, Arthur. "Business Power under the Nazi Regime," Zeitschrift fuer Nationaloekonomie. 20 (3-4), 1960.

Schweitzer, Arthur. Der organisierte Kapitalismus. in Hamburger Jarhbuch fuer Wirschafts und Gescellschaftspolitik. Tuebingen 1962,(14) 32-33.

Schweitzer, Arthur. "Der urspruengliche Vierjahrplan," in Jahrbuecher fuer Nationaloekonomie und Statistik. CLXVIII (168).

Schweitzer, Arthur. "Plans and Markets: Nazi Style," KYKLOS, Vol. 30, 1977, 88-115.

Stuebel, Heinrich. Die Finanzierung der Aufruestung im Dritten Reich. in Europa-Archiv 6/1951, 4128-4136.

Thomas, Georg. "Tiefe und Breite der Ruestung" in Militaerwissenschaftliche Rundschau, 1937.

Thomas, Georg. "Gedanken und Ereignisse," in Schweitzerische Monatshefte. XXV, 1945, 538-559.

Turner, Henry. "Hitler's Einstellung zu Wirtschaft und Gesellschaft vor 1933," Geschichte Gesellschaft, 1976 (2), 89-117.

Volkmann, Hans-Erich. "NS-Aussenhandel im geschlossener Kriegswirtschaftsraum (1939 bis 1941)." in Krieg-wirtschaft und Ruestung 1939-45. Berlin: Deutsches Institut fuer Wirtschaftsforschung, 1954.

Wehler, Hans Ulrich. Zum Verhaeltnis von Geschichtwissenschaft und Psychoanalyse. in Historische Zeitschrift. 208/3, 1969, 549-555.

Weinberg, Gerhard L. "The Nazi-Soviet Pacts" in Foreign Affairs. Fall 1989, 175-189.

Winter, Frank H. "Birth of the VfR: The Start of Modern Astronautics," Spaceflight. Vol. 19 (1977), Nos. 7-8 (July-August).

Zeitzler, Kurt. "Stellungnahme zu der Ausarbeitung 'Die oberste Fuehrung des deutschen Herres (O.K.H.) im Rahman der Wehrmachtfuehrung," in Foreign Military Studies. MS #P-041ii, 14, N.A., 1977.

Zwicky, Fritz. "The First Shots into Interplanetary Space," Engineering and Science. Pasadena: California Institute of Technology: NASA publication, January, 1958.

Films:

35mm film showing successful launch of V-2 in October 1942; personal discussion of Hitler's secret weapon projects with Dieter Huzel in 1968.

HZ-Film on Himmler, 16 October 1942, Personal Staff RFSS.