

PLOUGHSHARES TO SWORDS
THE POLITICAL ECONOMY OF WEAPONS PRODUCTION AT
VEB CARL ZEISS JENA, 1976-1989

Master of Arts in Law and Diplomacy Capstone Project

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I - Introduction

In December 1977, Wolfgang Biermann stood before his fellow *Sozialistische Einheitspartei Deutschlands* (SED) party members at the state-owned megafirm VEB Carl Zeiss Jena to announce the next step in its weapons production program in cooperation with the Soviet Union. Biermann, who had been selected as Zeiss's general director two years earlier, suggested that this new initiative was a response to capitalist hostility towards East Germany and the communist world. He blamed growing tension between the two sides on the West's efforts to develop new and more deadly weapons technology, proclaiming that "since our minds and our habits are directed towards peaceful work for the wellbeing of the people of our country, we often overlook how aggressive imperialistic industrial states employ their scientific and technical progress in the service of their armaments."¹ However, Zeiss's new partnership would soon place the firm's own scientific and technical knowledge at the disposal of the Soviet military.

After World War II, Stalin confiscated much of the Zeiss's equipment and removed many of its engineers to the Soviet Union. The Americans also assisted many former Zeiss employees in escaping to Oberkochen in the West. Two new versions of the firm were re-founded nearly from scratch beginning in the late 1940s.² The East German iteration of Zeiss focused on producing civil scientific instruments and its scientists largely associated weapons production with the country's Nazi past. In 1976, military production comprised only 2.2 percent of the firm's production and consisted mainly of optical equipment such as telescopic sights and night-vision equipment.³ By 1983, the SED Politburo would draw up

¹ Referat des Generaldirektors des VEB CZ zur Parteiaktivtagung Objekt 02 am 2.12.1977, 2 Dec. 1977, BACZ VA 1852.

² See: "The Company's History of ZEISS - at a Glance," Zeiss.com (ZEISS Archiv), accessed May 1, 2023, https://www.zeiss.com/content/dam/corporate-new/about-zeiss/history/downloads/the_companys_history_of_zeiss-at_a_glance.pdf.

³ Dietmar Remy, *Zeiss-Generaldirektor Wolfgang Biermann: Ein Sozialistischer Manager Im Traditionsunternehmen* (Gera, Jena: Garamond - der Wissenschaftsverlag, 2018), 372-374.

plans to increase military production to 30 percent with aspirations to become a key cog in the Warsaw Pact military supply chain.

This paper seeks to explain why and how Zeiss decided to employ its own scientific and technical progress in the service of Soviet armaments. Biermann's speech extolled the German Democratic Republic's (GDR) eagerness to "consequently and resolutely do everything necessary to fulfill the goals and requirements...to increase our collective security promptly and at the highest quality."⁴ However, Zeiss's about-face also demonstrates how the distorted incentives inherent in East Germany's Cold War economy motivated production of weapons components at the expense of civilian instruments. Increasingly unable to compete for sales of civil machinery in capitalist markets, Zeiss concluded that producing military goods for the Soviets could be more politically and economically pragmatic.

Indeed, Zeiss leadership detailed repeatedly how their products lagged Western competitors and failed to meet planned export targets year after year. Beginning in the 1980s, the firm would sacrifice its struggling Western export program in favor of feeding the Warsaw Pact military machine with advanced equipment including missile parts and tank optics. This effort involved rerouting significant sums of money, hiring and reassigning scientists and engineers, and constructing new facilities across multiple East German cities.

In his work on the political economy of communism, Hungarian economist János Kornai described socialist firms as exhibiting "export aversion" in their relationships with non-socialist economies. These firms found competing with Western companies to be difficult given their general lack of competitiveness in terms of "quality, modernity, or reliable delivery." Therefore,

⁴ Referat des Generaldirektors des VEB CZ zur Parteiaktivtagung Objekt 02 am 2.12.1977, 2 Dec. 1977, BACZ VA 1852.

firms such as Zeiss preferred to trade with other socialist economies when possible. They needed to be bureaucratically compelled by leadership to compete in the West and earn hard currency.⁵

Kornai also characterized products traded between socialist economies as either “soft” or “hard” goods. “Hard” goods were products that “could be sold without much trouble on a capitalist market for hard currency, or the buyer country’s current domestic economic situation is such that the good concerned is badly needed, likely cannot be acquired from any other socialist country, and is only obtainable, if at all, on a capitalist market for hard currency at a cost of great difficulty and sacrifice.” In contrast, “soft” goods were those of relative abundance or substandard quality that socialist countries would struggle to sell for hard currency. Socialist countries used “hard” goods as “bargaining chips” with fellow centrally planned economies to either obtain different “hard” goods or to get rid of as many of their own excess “soft” goods as possible.⁶

The high-tech military equipment provided by Zeiss from 1976 to 1989 could only be produced by very technically advanced firms in the Soviet Union and East Germany. In the context of the Cold War, these goods were not obtainable for any amount of hard currency at scale from the West. This paper argues that these goods could be characterized as especially “hard” because they were even more difficult to obtain than most goods for socialist economies. Zeiss’s weapons program soon took precedence over the firm’s failing Western export program. While collaboration with the Soviets seemed lucrative at first, Zeiss would eventually find that their partnership would be stymied by its inability to navigate the late Soviet Union’s impenetrable bureaucracy and shifting politics.

⁵ János Kornai, *The Socialist System: The Political Economy of Communism* (Princeton, NJ: Princeton University Press, 1992), 348-351.

⁶ *Ibid.*, 351-352.

Zeiss's attempt to become a hub of high-tech military equipment production is emblematic of SED General Secretary Erich Honecker's top-down strategy to develop technology in the GDR as a "panacea" for its economic woes during his tenure. He centralized research and production through the party apparatus by consolidating state-owned enterprises into *Kombinate* super-firms like Zeiss in the mid-1970s. Furthermore, both the Soviet Union and the United States were seen as models of using military R&D to drive technological progress for the economy as a whole.⁷ Honecker badly needed this technological progress not only to earn hard currency in Western markets and improve East Germany's domestic economy, but also to prove that communism was more adept at driving innovation than capitalism.⁸ Instead, this strategy, coupled with communism's warped incentives as described by Kornai, made Zeiss overly reliant on its Soviet partners at the expense of civilian production. Both Zeiss and the GDR as a whole soon found itself abandoned by the Soviets and uncompetitive on world markets by the late 1980s.

⁷ Dolores L. Augustine, *Red Prometheus: Engineering and Dictatorship in East Germany, 1945-1990* (Cambridge, MA: The MIT Press, 2007), 305-308; Bruce Kogut and Udo Zander, "Did Socialism Fail to Innovate? A Natural Experiment of the Two Zeiss Companies," *American Sociological Review* 65, no. 2 (April 2000): pp. 169-190, <https://doi.org/10.2307/2657436>, 175.

⁸ Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 9-10.

II – Rocket Man

Wolfgang Biermann was named the General Director of VEB Carl Zeiss Jena on October 1, 1975, following a decade in the same position at the 7. *Oktober* machine tool factory in Berlin. Biermann's success in this earlier role had already earned him candidate status on the SED Central Committee in 1966.⁹ He was then made a full member in 1976 shortly after taking over at Zeiss. However, Biermann's ultimate goal was not to wield pure political power within the party apparatus, but rather to be recognized as an exemplar of industrial management in the supposedly superior socialist mode of production. In this sense, his goals and those of the SED were aligned when it came to Zeiss. The party wanted to prove that the historic firm could be more innovative within East Germany's planned economy than as a capitalist firm in Oberkochen.¹⁰

Therefore, Biermann was determined to make Zeiss not only a successful socialist mega-firm, but also a political weapon wielded by the party in its ideological conflict with the West.¹¹ The SED had a three-pronged vision for Zeiss. First, the firm was to supply East Germany with the advanced scientific instruments needed by its factories and hospitals. Second, Zeiss was to play an important role in supplying the Soviet Union with "hard" goods, especially substitutions for scientific and high-tech equipment embargoed by the West. This category would soon also include advanced weapons components. Finally, Zeiss was tasked with exporting microscopes, lenses, medical equipment, and other scientific instruments to the West to earn hard currency for the East German economy.¹² Prior to Biermann's tenure, exports to the Soviet Union and other

⁹ Edith Hellmuth and Wolfgang Mühlfriedel, *Carl Zeiss. Die Geschichte Eines Unternehmens, Bd.3: Carl Zeiss in Jena, 1945-1990*, hrsg. Rolf Walter and Wolfgang Mühlfriedel, vol. 3 (Köln: Böhlau, 2004), 284.

¹⁰ Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 9-10.

¹¹ Hellmuth and Mühlfriedel, *Carl Zeiss*, 287.

¹² Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 13.

Eastern Bloc countries had been much more important to Zeiss, accounting for over 90 percent of its exports.¹³

Increasing exports to both fellow Council for Mutual Economic Assistance (CMEA) countries and to the West was “an existential issue” for the Zeiss and the GDR as a whole. Sales to other Eastern Bloc countries were set out in bilateral planning documents but limited in practice by limited production capacity. Party and firm leadership also believed that Zeiss was not active enough in Western markets.¹⁴ Biermann was therefore selected by the party as a dynamic new leader capable of leading the firm into the new five-year plan for 1976-1980.¹⁵ Although Biermann seemed willing to subordinate Zeiss ideologically and politically to the SED, he also obtained significant bureaucratic autonomy for the firm through a high-level reorganization in the first months and years of his tenure. In particular, Zeiss was allowed to have an in-house trade office embedded in the firm independent of the GDR’s Ministry of Foreign Trade. This reorganization allowed the Zeiss’s foreign trade officials to influence the firm’s long-term strategy in favor of exports.¹⁶

Sales to the non-socialist world (*Nichtsozialistisches Wirtschaftsgebiet*, NSW) were a focus given the firm’s nascent exports to these markets as well as the GDR economy’s desperate need for hard currency.¹⁷ The new five-year plan for called for a 318 percent increase in exports to NSW markets from 49 million *Valutamarks* in 1975 to 156 million by 1980. *Valutamarks* (“foreign currency marks”) were units of account created specifically to credit state-owned enterprises for each dollar or Deutschmark they earned abroad and deposited into the state’s

¹³ Ergebnisse der Wirtschaftstätigkeit im Fünfjahrplanzeitraum 1976-1980, 20 April 1978, BACZ VA 2177. (author’s calculations)

¹⁴ Hellmuth and Mühlfriedel, *Carl Zeiss*, 307.

¹⁵ *Ibid*, 284-286.

¹⁶ *Ibid*, 306-307.

¹⁷ *Ibid*, 307-308.

coffers. In Biermann's first year, Zeiss fell just short of the planned 63 million *Valutamarks* earned from capitalist markets, exporting only 61 million in goods to the NSW.¹⁸

Biermann acknowledged this failure in a speech at the 1976 Plenum of the SED's Central Committee, noting that the firm was particularly focused on this issue and that he personally appreciated the importance of earning hard currency for the firm and the country.¹⁹ His actions also make clear that he also recognized that "export aversion," as described by Kornai, was inhibiting the firm's sales to capitalist markets.²⁰ Biermann noted that his salesmen were "defensive" and content to focus on "comfortable" markets in the Middle East where they faced little competition rather than take Western firms head-on in Europe and North America.²¹ He also believed that his trade representatives likely came across as unfriendly when dealing with capitalist business partners in the West, in part because the East Germans assumed their Western partners thought less of them and their country. Biermann soon organized internal working groups responsible for individual Western markets and tasked them with establishing a broader range of contacts, including relationships with new representative firms in the West. The foreign trade division of Zeiss also sought to attract better talent.²² These efforts yielded some success, but never enough progress to meet the initial requirements of Biermann's first five-year plan. By 1980 Zeiss had increased NSW exports from 49 million marks to 123 million, representing a 150 percent increase but only a 79 percent fulfillment of the plan.²³

In contrast, Zeiss succeeded in growing its export business to other CMEA members, especially the Soviet Union, in the early years of Biermann's leadership. Exports to other Eastern

¹⁸ Ergebnisse, BACZ VA 2177.

¹⁹ Referat, BACZ VA 1852.

²⁰ See Kornai, *The Socialist System*, 348.

²¹ As quoted in Hellmuth and Mühlfriedel, *Carl Zeiss*, 308.

²² *Ibid*, 307-308.

²³ Ergebnisse, BACZ VA 2177; Hellmuth and Mühlfriedel, *Carl Zeiss*, 373, (table 41). (author's calculations)

Bloc countries climbed from 539 million marks in 1975 to 763 million by 1977, with the Soviet Union accounting for approximately half of this total. Beginning in the late 1970s, Zeiss hoped to supplement exports to the USSR with sales of high-tech weapons components licensed by the Soviets for production in East Germany. Given its scientific capabilities, Zeiss had dabbled in military equipment in the early years of the Cold War.²⁴ However, military production, known as “special production” in the GDR, encompassed only 1.3 percent of Zeiss production in 1975 according to Klaus-Dieter Gattnar, a key engineer and manager of the firm’s weapons programs.²⁵ Biermann reported that military equipment represented 2.2 percent of overall Zeiss production in 1976 during his oral report to the GDR Presidium of the Council of Ministers.²⁶

In March 1976, Soviet officials from the State Planning Committee, known as Gosplan, travelled to Jena to meet with their counterparts from the GDR and Zeiss and discuss the firm’s nascent weapons production programs. The Soviets undertook the journey to “make clear that the GDR had more to contribute to the defense of the socialist camp.”²⁷ East German officials realized that developing a high-tech weapons industry at Zeiss would make the GDR not only a valued participant in the Warsaw Pact’s efforts to match NATO, but also a critical supplier of advanced “hard” goods to the Soviet Union. Zeiss already provided many “hard” goods to the USSR, such as magnetic tape data storage units and lithography machines, that were difficult or impossible to find within the CMEA. The firm realized that high-tech weaponry could be another product for which the Soviets would be reliant on East Germany.²⁸ Whereas Kornai defines “hard” goods as any products that are of limited availability in the socialist world and only

²⁴ Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 374.

²⁵ Klaus-Dieter Gattnar, “Produktion Militärischer Erzeugnisse Im VEB Carl Zeiss JENA,” *Jenaer Jahrbuch Zur Technik – Und Industriegeschichte* 10 (2007): pp. 127-153, 152 (note 3).

²⁶ Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 374.

²⁷ Gattnar, “Produktion Militärischer Erzeugnisse,” 129.

²⁸ Klaus Mütze, *Die Macht Der Optik. Industriegeschichte Jenas 1846-1996, Bd. 2: Vom Rüstungskonzern Zum Industriekombinat (1946-1996)*, vol. 2 (Bucha bei Jena: quartus-Verlag, 2009), 671.

possible to obtain from capitalist countries with hard currency, weapons components would be even “harder” because weapons were not available at all from the West.²⁹

Following their visit to Jena, the Soviets decided to enlist Zeiss in producing the model “INEJ-70” infrared homing heads for the Soviet K13-M1 air-to-air missile (NATO Code AA-2 “Atoll”). The Soviet K13 was an evolved clone of the famous “Sidewinder” air-to-air missile first developed by the U.S. in the 1950s. The exact story of how the Soviets managed obtain an intact Sidewinder remains shrouded in Cold War legend, but Gattnar offers two possible versions of the story in his post-reunification writings. The most dramatic recounting attributes the successful theft to an unexploded Sidewinder embedded in a Chinese MIG-17 following a dogfight with a Taiwanese F-86 Sabre in 1958 during the Second Taiwan Straits Crisis. According to this version, the Soviets found out that the Chinese communists possessed an intact Sidewinder and negotiated for its transfer to the USSR. Another possibility is that a Soviet agent managed to steal a missile from an American airfield in Bavaria in 1967 and transport it over the border into East Germany, where it was passed on to the Soviet Union. In any case, Western technology formed the basis of the Soviet air-to-air missile program until the end of the Cold War. The K13 had already been in production in the Soviet Union since 1973 and was not only integrated into Warsaw Pact air forces but also exported to other unnamed “third world” countries according to Gattnar.³⁰

The Soviet Union signed a formal treaty with the GDR later in 1976 to license production of the INEJ-70, known in East Germany only as *Objekt 02*, at Zeiss. The Soviets agreed to hand over 60 copies of the finished product, deliver necessary technical documentation, and hold regular technical consultations between Soviet and East German experts. Zeiss was to produce

²⁹ See Kornai, *The Socialist System*, 351-352.

³⁰ Gattnar, “Produktion Militärischer Erzeugnisse,” 129-131.

2,000 units annually for the initial years of the program from 1978-1980.³¹ The Soviets also required Zeiss to build entirely new facilities separated from the rest of its workforce to ensure that their technology would not fall into the wrong hands.³² In all, Zeiss spent 47.1 million marks on new buildings and equipment for *Objekt 02* production, with two-thirds going to build out its facilities in the neighboring city of Gera. The plans also dedicated 535 employees to the project, many of whom were to come from Zeiss's prominent magnet memory tape production lines.³³

In the earliest years of production, Zeiss struggled to live up to its initial promises to its Soviet partners. The original treaty between the Soviet Union and East Germany promised delivery of 2,000 units per year beginning in 1978.³⁴ Zeiss was apparently forced to revise its plans and curtail expectations in 1977, projecting the delivery of just 300 prototypes in the first year of production.³⁵ In reality, Zeiss delivered 30 prototypes in 1978, 400 units in 1979, and only eclipsed 2,000 units in 1982.³⁶ At this point, Zeiss could report to its Soviet partners that the firm was able to deliver the agreed-upon volume of production, although there were still issues with quality control. In particular, Zeiss blamed faulty Soviet electrical components for poor quality deliveries in the earliest years of the program.³⁷

Following the launch of *Objekt 02* production in East Germany, the two sides signed a second agreement in late 1978 to produce a more modern iteration of the laser sighting system installed in the Warsaw Pact's T-72 tanks. The new component, officially called the TPD-K1 but

³¹ Abkommen zwischen der Regierung der Union der Sozialistischen Sowjetrepubliken und der Regierung der Deutschen Demokratischen Republik über die Vergabe einer Lizenz an die DDR für die Herstellung eines thermischen Selbstsuchkopfes "INEJ-70" und über seine Lieferung an die Sowjetunion, 1976, BACZ VA 2173.

³² Gattnar, "Produktion Militärischer Erzeugnisse," 129-130.

³³ Abschlussbericht Lizenzproduktion Zielsuchkopf INEJ-70, 1 Jan. 1988, BACZ GB 1596; Gattnar, "Produktion Militärischer Erzeugnisse," 144.

³⁴ Abkommen, BACZ VA 2173.

³⁵ Projektdokumentation des LVO-Projektes Optischer Zielsuchkopf INEJ-70, undated, BACZ GB 1933.

³⁶ Gattnar, "Produktion Militärischer Erzeugnisse," 147.

³⁷ Einschätzung der Arbeit an den Sondervorhaben des KCZ im Jahre 1982, undated, BACZ VA 2182.

designated as *Objekt 09* internally, was also produced in the GDR based on a Soviet license. However, the new version to be produced by Zeiss used new components developed in East Germany and sourced from East German materials. Zeiss would need to expand its facilities again to produce this new instrument and begin production in 1982.³⁸ Zeiss projected that *Objekt 09* would be at least as profitable as its top-selling civilian instruments in neighboring Eastern Bloc countries. The firm planned to sell *Objekt 09* to Poland and Czechoslovakia in addition to the Soviet Union, and the Soviets also reexported some of their units to non-Warsaw Pact countries such as India and Pakistan.³⁹

While Zeiss was beginning to ramp up its military production in the late 1970s, Biermann's initial efforts to increase civilian product exports to the West did not meet expectations. An internal progress review from 1977 noted that Zeiss had improved its exports to NSW markets by 138 percent in terms of value since 1975. Despite its early success, the firm would need to "quicken its pace" and learn more about how capitalist markets operated if they were to reach the goals mandated in the 5-year plan.⁴⁰ As the firm struggled to meet its ambitious targets, planners even discussed reducing deliveries of electronic components and high-tech equipment to other GDR firms and industries to make these resources available for export to the West instead.⁴¹ The firm never quite reached the NSW export goals set out in the 1976-1980 five-year plan, even as these sales increased from 61 million marks in 1976 to 123 million marks by 1980.⁴²

³⁸ Mütze, *Die Macht Der Optik*, 673-674.

³⁹ Klaus-Dieter Gattnar, "Der Zielfernrohr-Entfernungsmesser TPD-K1 Im Panzer T-72," *Jenaer Jahrbuch Zur Technik – Und Industriegeschichte* 14 (2011): pp. 367-394, 392.

⁴⁰ Ergebnisse, BACZ VA 2177.

⁴¹ Information zur Bereitstellung von Baugruppen, Geräten und Anlagen der Mikroelektronik und Prozeßautomatisierung zur beschleunigten Anwendung der Mikroelektronik in der DDR, undated, BArch DY 30/30556, fol. 1.

⁴² Hellmuth and Mühlfriedel, *Carl Zeiss*, 373 (table 41), Ergebnisse, BACZ VA 2177

In the new decade, the firm continued to fall short of NSW export quotas. By 1982, the firm targeted exports of 208 million *Valutamarks*, but only recorded 125.4 million, representing just 60.3 percent of the target. Exports fell in the following year to 85.4 million *Valutamarks*.⁴³ Perhaps more worryingly, the firm's NSW exports failed to achieve its targeted *Devisenertragskennziffer (DEK)*, which represented a product, firm, or sector's efficiency in terms of earning hard currency.⁴⁴ The central government closely tracked this metric to determine how many marks that different segments of the economy required to acquire each unit of badly needed foreign exchange abroad. Given the difficulty of this task, firms that prioritized exports to the West were not expected to cover their own costs. The central government also supplied generous subsidies to compensate them for losses incurred in pursuit of dollars and deutsche marks.⁴⁵

East German sales to NSW markets were recorded in *Valutamarks*, which represented the value in marks of their foreign exchange earnings at internal exchange rates set by the central government.⁴⁶ To construct its complicated exchange rate regime, the GDR first arbitrarily set one *Valutamark* equal to one West German deutsche mark (DM), and then calculated other global exchange rates based on their market values compared to the DM. For example, in 1982 the central government set one dollar equal to 2.40 *Valutamarks* based on the dollar's exchange rate with the DM. Because absolute parity between the *Valutamark* and the DM did not reflect economic reality, the GDR would further subsidize exporters' *Valutamark* earnings using an

⁴³ Information über die Ergebnisse der Qualitätsentwicklung im Jahre 1982 im Kombinat VEB Carl Zeiss Jena, 13 Feb. 1983, BArch DC 20/12452, pg. 86. (author's calculations)

⁴⁴ Gerhard Barkleit, "Moderne Waffensysteme Für Die Sowjetunion - Die SED Im Spagat Zwischen Ökonomischen Zwängen Und Ideologischer Gefolgschaft," in *Deutsche Fragen: Von Der Teilung Zur Einheit*, ed. Heiner Timmermann (Berlin: Duncker & Humblot, 2001), pp. 39-52, 44-45.

⁴⁵ George A. Akerlof et al., "East Germany in from the Cold: The Economic Aftermath of Currency Union," *Brookings Papers on Economic Activity* 1991, no. 1 (1991): pp. 1-105, <https://doi.org/10.2307/2534638>, 18.

⁴⁶ *Ibid*, 18.

economy-wide ratio called the *Richtungskoeffizient* (“directional coefficient”). Foreign exchange earnings were multiplied by this ratio to compensate East German firms for the actual costs incurred when manufacturing for export. In 1982, the *Richtungskoeffizient* was 95 percent. When multiplied by the 2.40 *Valutamarks* earned abroad, an East German firm would ultimately receive 4.68 marks from the central government for each dollar of foreign exchange income.⁴⁷ While firms such as Zeiss were ultimately reimbursed the full amount, including the marks tacked on by the *Richtungskoeffizient* subsidy, earnings in *Valutamarks* without adjustment were often used for internal planning purposes.⁴⁸

A firm’s DEK ratio was then calculated by comparing the producer price (*Betriebspreis*) of goods sold abroad with the *Valutamarks* it received from the central government in exchange for foreign exchange earnings.⁴⁹ In general, producer prices were determined based on the firm’s production costs for the good and any other subsidies or taxes levied by the central government.⁵⁰ In 1976, Zeiss reported a ratio of 0.647 *Valutamarks* earned for each mark spent on products exported to the West.⁵¹ By 1982, Zeiss’s NSW exports only earned 0.581 *Valutamarks* for each mark. Even so, Zeiss’s ratio was higher than average among all *Kombinate* and other firms under the purview of the Ministry of Electrical Engineering and Electronics (MEE), such as *VEB Kombinat Robotron* and *VEB Kombinat Mikroelektronik Erfurt*. This meant that despite its difficulties in the West, Zeiss was still better at earning hard currency for the central government than the rest of East Germany’s high-tech industry.⁵²

⁴⁷ Hat die DDR beim NSW-Export höhere Aufwendungen als beim SW-Export?, undated, BArch DL 2/16055, 1-2.

⁴⁸ In Durchführung der “Anordnung zur Anwendung der Umrechnungsverhältnisse der Mark der DDR zu den kapitalistischen Währungen,” Anlage 3, undated, BArch DL 2/16055.; See (yellen paper)

⁴⁹ Barkleit, “Moderne Waffensysteme,” 44-45.

⁵⁰ Willi Ehlert et al., eds., *Wörterbuch der Ökonomie Sozialismus* (Berlin: Dietz Verlag, 1969), 149-150.

⁵¹ Mütze, *Die Macht Der Optik*, 798 (table 29).

⁵² Information, BArch DC 20/12452, pg. 83.

Trade officials at Zeiss blamed the stagnation of the early 1980s on the economic turbulence taking place in the capitalist world. They also noted stiff competition from rivals in Japan that were undercutting both East German and other capitalist European firms. Zeiss trade officials acknowledged that their electronic components were more expensive to produce and often not as good as those found in Japanese and Western products. The Soviets also limited which types of technology the GDR was allowed to export to capitalist countries for security purposes.⁵³

Biermann used personal connections with top SED leadership, including the Central Committee's Secretary of the Economy Günter Mittag, to negotiate for reduced NSW export targets in the early 1980s when it became clear that Zeiss would not be able to achieve higher goals set by the party. The firm was also aided by an internal adjustment in 1982 that credited East German firms such as Zeiss 2.4 *Valutamarks* for each dollar earned in Western markets rather than only 1.8 as in prior years. While Biermann still fell far short of the targeted 208 million marks, already a smaller goal than previously demanded by the SED, this adjustment still made it appear as if Zeiss had increased its NSW exports relative to 1981.⁵⁴

Even so, Zeiss's difficulties exporting to the West were almost certainly worse than the official numbers suggest. Biermann manipulated the statistics that he and the firm used to show that Zeiss was making progress in terms of exports to NSW markets. While manipulation of production data and performance indicators was common throughout East Germany and other planned economies of the time, exports to the West were thought to be particularly difficult to fake since the sellers had to present proof of hard currency earnings. Even so, Biermann found ways to synthetically improve Zeiss's official numbers. For example, just before the end of each

⁵³ Hellmuth and Mühlfriedel, *Carl Zeiss*, 310-311.

⁵⁴ Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 347-357

new year Zeiss would often ship goods to western Europe that had not actually been sold to be stored in warehouses or with its representative firms in the region. This practice would make the firm's year-end numbers look higher on paper, but also cost Zeiss money again when the goods were to be shipped back to East Germany, rerecorded as imports, and often sold at a loss to other domestic firms. Stasi archival records show that the security services were aware of this practice.⁵⁵

Even allowing for statistical manipulations and bureaucratic scheming, Zeiss notably increased its exports to both the NSW and SW in the first several years of Biermann's tenure. Exports to the West grew from 49 million *Valutamarks* at the beginning of Biermann's tenure to 123 million by 1982. Sales to fellow socialist countries reached 1.3 billion marks, with 60 percent of these sales going to the Soviet Union.⁵⁶ A growing portion of this trade was comprised of advanced military technology, most notably *Objekt 02 and Objekt 09*. This growth did not go unnoticed by Zeiss's Soviet partners, who would soon ask the firm to contribute much more to the Warsaw Pact's competition with NATO and the West. Answering this call would demonstrate Zeiss's technological prowess to the rest of the alliance and ensure sales of hard goods to the Soviets for years to come. However, Zeiss leadership would have to decide whether raising the firm's economic and political profile within the Eastern Bloc was worth sacrificing its ambitions to compete in the West.

⁵⁵ Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 347-357; Hellmuth and Mühlfriedel, *Carl Zeiss*, 292.

⁵⁶ Hellmuth and Mühlfriedel, *Carl Zeiss*, 373-374 (tables 41, 42).

III – Dima and the Jets

While Zeiss was trying to revitalize its disappointing Western export business in the early 1980s, its growing partnership with the Soviet Union’s military procurement apparatus was only just beginning. Based on the firm’s initial progress, the Soviets presented a new opportunity that would make military technology a core part of Zeiss operations. Rather than simply continuing to produce components based on Soviet licenses, the GDR was given the challenge to design new products based on its own domestic technical expertise. Instead of continuing to force substandard products into competitive markets, Zeiss would soon be able sell extremely “hard” goods to the USSR that the Soviets themselves were not able to produce and could not procure anywhere else.

On April 6, 1983, Minister of Defense and Marshall of the Soviet Union Dmitriy Ustinov arrived in Jena with a delegation of other top defense officials to get a first-hand impression of Zeiss’s technological capabilities.⁵⁷ Joining him were Commander-in-Chief of the Soviet Ground forces Vasiliy Petrov and Chief of the General Staff Sergey Akhromeyev—both also Marshalls of the Soviet Union—as well as high-level representatives of the Soviet arms industry and air force. They were met in Jena by Biermann and Gattnar from Zeiss, high-ranking central government officials including the East German Minister of National Defense Heinz Hoffman and State Secretary of the Ministry of Electrical Engineering and Electronics Felix Meier, and other representatives from the Ministry of Defense and Ministry for State Security (Stasi).⁵⁸

Ustinov was a long-time proponent of technological advancement in the Soviet armed forces who “argued for an unrelenting arms race and feared that any arms limitations would

⁵⁷ Barkleit, “Moderne Waffensysteme,” 43; Erste Einschätzung zum Besuch der Militärdelegation der UdSSR im VEB Kombinat Carl Zeiss Jena, 7 Apr, 1983, BArch, MfS, HA XVIII, Nr. 10228, pg 4.

⁵⁸ Erste Einschätzung zum Besuch, BArch, MfS, HA XVIII, Nr. 10228, pg 8.

threaten Soviet security.”⁵⁹ He was tapped as a candidate member of the Politburo in 1965 and made responsible for the party’s supervision of the Soviet military-industrial complex, including weapons production and development. Despite his lack of formal military experience, Ustinov was chosen as Minister of Defense in 1976 following the death of his predecessor, Andrei Grechko. An engineer by training, Ustinov caught Stalin’s eye for his work near the Soviet-Finnish front directing a weapons factory in Leningrad. Based on his success, he was named People’s Commissar for Armaments in 1941 overseeing the entire Soviet military-industrial complex. In this role, he achieved the rank of colonel general, but had returned to civilian status by the time he was made Minister of Defense and a full Politburo member. However, he was quickly granted a four-star rank and then the title Marshall of the Soviet Union. Ustinov likely also had a key role in Yuriy Andropov being chosen as General Secretary over Konstantin Chernenko in 1982, subsequently forming a leadership bloc with Andropov and Foreign Minister Andrei Gromyko.⁶⁰

The United States viewed Ustinov as a key driver of the Soviet Union’s push to match the West’s conventional and nuclear capabilities, including nuclear-armed submarines. In particular, he cited the Soviet Union’s growing technological prowess as his country’s best chance to win a conflict with the U.S. and NATO. A Pentagon report published in 1984 estimated that the Soviets had outspent the U.S. on weapons and military equipment by US\$240 billion from 1973 to 1982. He oversaw this Soviet arms buildup while also blaming the West for heightened tensions caused by its military presence in Europe.⁶¹

⁵⁹ ; Vladislav M. Zubok, *A Failed Empire: The Soviet Union in the Cold War from Stalin to Gorbachev* (Chapel Hill, NC: The University of North Carolina Press, 2009), 205.

⁶⁰ Eric Pace, “Ustinov Had Key Roles in Military and Politics” (The New York Times, December 22, 1984), <https://www.nytimes.com/1984/12/22/obituaries/ustinov-had-key-roles-in-military-and-politics.html>; Zubok, *A Failed Empire*, 204-205.

⁶¹ Pace, “Ustinov.”

Indeed, Ustinov's first comments in Jena following Biermann's welcome remarks were to emphasize the growing military strength of NATO and the need for East Germany to contribute more to the arms race between the two sides, especially in terms of military technology. He asked the East Germans to quadruple its weapons production regardless of the economic implications of such a decision. Ustinov also stressed the need for secrecy and security against "the enemy" and its spies who would be interested in the outcome of the meeting.⁶²

During the meeting in Jena, the Soviets outlined their vision for the future of military cooperation between the Soviet Union and East Germany, especially in collaboration with Zeiss. The Soviet Air Force commander noted that the USSR was planning to phase out the current homing head for the K13 air-to-air missile and hoped to develop a component with a targeting range of up to 25 kilometers, compared to the 5 kilometer range provided by the current system.⁶³ The Soviets asked that the GDR continue to develop their production capabilities for a future model to be produced in East Germany.⁶⁴ They also requested that Zeiss increase its production of *Objekt 09* from between 300 and 600 per year to 3,000, but the East German representatives replied that Zeiss did not have the capacity for such dramatic growth. The remaining questions about Zeiss's capabilities largely concerned the development of laser weapons, thermal imaging, and optics for satellite imagery.⁶⁵

GDR and Zeiss officials were surprised, however, that another initiative known as *Projekt 152* were barely discussed. Two years earlier in April 1981, the GDR and the USSR signed a deal to jointly develop a new artillery ship, known as *Projekt 151*, and arm it with an

⁶² Erste Einschätzung zum Besuch, BArch, MfS, HA XVIII, Nr. 10228, fol. 4-6.

⁶³ Ibid, fol. 4.

⁶⁴ Information über den Besuch des Mitglieds des Politbüros des Zentralkomitees der KPdSU, Minister für Verteidigung der UdSSR, Genossen Marschall der Sowjetunion Ustinow im Kombinat VEB Carl Zeiss Jena am 6.4.1983, MfS, HA XVIII, Nr. 10228, fol 2.

⁶⁵ Information über den Besuch des Mitglieds, BArch MfS HA XVIII, Nr. 10228, fol. 2; Erste Einschätzung zum Besuch, 7. Apr. 1983, BArch, MfS, HA XVIII, Nr. 10228, fol. 4.

advanced new guided missile system, *Projekt 152*. The two sides planned to implement the new system for their own navies and before eventually selling them to other Warsaw Pact allies. Of most concern to Zeiss, the new ship's missiles would require a more advanced infrared optical homing head than currently existed in either the Soviet Union or in East Germany. In keeping with Zeiss's military product nomenclature, this component was known as *Objekt 016*.⁶⁶

The two sides barely discussed this project during the April meeting, only agreeing to further consultations at an undetermined later date. In his meeting summary, MEE State Secretary Karl Nendel wrote that Ustinov and his delegation "expressed appreciation" for the production facilities that he toured, and the Stasi wrote that Zeiss's capabilities in terms of missile technology "became clear" to Ustinov.⁶⁷ Even so, after a follow-up visit over the summer the East Germans still believed that their Soviet guests were still not fully aware that the GDR had ambitions to develop world-class infrared missile technology alongside the USSR through *Projekt 152*.⁶⁸

While the Soviet delegation seemed disinterested or ignorant about the new ship's development, East Germany planned to make the initiative the cornerstone of its budding military technology industry. Zeiss hoped to use the project to become a key player in the Warsaw Pact's military supply chain. On May 24, 1983, the SED Politburo met in Berlin to discuss plans for Zeiss's future development. Included with the day's agenda was approval of a strategy titled "Complex Concept for the Further Development of the Research, Production and Export Profile, Including the Development of the Special Production up to 1985 and for the

⁶⁶ Information über Stand und Probleme der Entwicklung eines Raketenwaffenkomplexes mit einer kleinen Schiffsabwehrrakete für die Bewaffnung des Raketenartilleriebootes, BArch, MfS, HA XVIII, Nr. 9521, fol. 98-99.

⁶⁷ Information über den Besuch des Mitglieds, undated, BArch MfS HA XVIII, Nr. 10228 fol. 3.

⁶⁸ Information über den Besuch einer sowjetischen Militärdelegation unter Leitung des stellvertretenden Ministers für Verteidigungsindustrie der UdSSR, Genossen Armeegeneral Schabanow, und des 1. Stellvertreters des Vorsitzenden von GOSPLAN der UdSSR, Genossen Masljukov, im VEB Kombinat Carl Zeiss Jena am 1. 6. 1983, 14 Sep. 1984, BArch, MfS, HA XVIII, Nr. 10228, fol. 10.

period 1986 to 1990, of the State Company VEB Carl Zeiss Jena.”⁶⁹ Written by the chair of East Germany’s State Planning Commission (SPK) Gerhard Schürer, the document argued that Zeiss should increasingly emphasize exports to both socialist economies and capitalist markets in the coming years given the firm’s successful product lines in the Soviet Union and relative success at earning hard currency compared to the rest of the MEE. Schürer forecasted an increase in total exports from 1.4 billion marks in 1982 to 2.85 billion by the end of the decade, including a nearly tripling of exports to the Soviet Union. Much of this increase was to be driven by weapons components sales, which Schürer argued could account for 28 percent of the firm’s entire production by 1990 and over 30 percent in the following decade.⁷⁰

The new plan called for an increase of total military production to over 1.6 billion marks by the end of the decade via several product lines delivered to the Soviets and Warsaw Pact allies. In particular, it called for increased annual delivery of 2,500 units of *Objekt 02* to the Soviets through 1990 to extract the most from the equipment and capability developed at Zeiss in the past several years. In 1983, Zeiss produced over 192 million marks worth of *Objekt 02* units according to internal calculations, accounting for 38 percent of total Zeiss military production. At volumes and prices projected in 1983, the INEJ-70 would bring in less than 15 percent of the firm’s weapons component sales by 1990. If Zeiss were to achieve these overall export ambitions, it would also need to figure out how to double production of *Objekt 09* from 500 units per year to 1,000 for an annual production value of 600 million marks.⁷¹

⁶⁹ Anlage Nr. 14 zum Protokoll Nr. 18 vom 24. Mai 1983 - Komplexe Konzeption zur weiteren Entwicklung des Forschungs-, Produktions- und Exportprofils einschließlich der Entwicklung der speziellen Produktion bis 1985 und für den Zeitraum 1986 bis 1990 des Kombinates VEB Carl Zeiss Jena, 24 May 1983, BArch DY 30/5118.

⁷⁰ Konzeption zur Entwicklung und Profilierung des Kombinates VEB Carl Zeiss JENA sowie zur Schaffung der dafür erforderlichen Voraussetzungen im Zeitraum bis 1990, 24 May 1983, BArch DY 30/5118, pg 499-505; Mütze, *Die Macht Der Optik*, 676.

⁷¹ Konzeption zur Entwicklung und Profilierung, BArch DY 30/5118, pg 514-516. (author’s calculations).

The core of the document, however, detailed the firm's plans for developing *Objekt 016* and delivering *Projekt 152* to the Soviets. This new weapons system would be the core of Zeiss's plans to become a key weapons producer for the Warsaw Pact and center for scientific innovation. Given the complexity of *Objekt 016*, Carl Zeiss Jena did not expect to begin production until 1989, several years in the future. However, once production was in full swing, planners expected it to be the centerpiece of Zeiss's "special production" business. The Politburo's plans projected an initial production run of 1,000 units at a price of 1,800,000 marks per unit, for a total value of 1.8 billion marks. The document also notes that the missile was projected to become standard issue for Warsaw Pact navies, ensuring Zeiss would have stable export markets for the foreseeable future. In comparison, the Politburo's goal to produce 2,500 units of *Objekt 02* per year would be worth 220 million marks annually, or 1.3 billion marks total from 1984 to 1990.⁷²

Whereas Zeiss's previous weapons projects for the Soviet Union were simply reproductions of previously designed equipment under Soviet license, *Objekt 016* would require East German industry to create new materials and technologies. Zeiss and other partner firms would need to develop new sensors and lenses, as well as the electronics needed to translate their signals into instructions for the missile. This research, as well as the new facilities required to develop and produce *Objekt 016*, would cost hundreds of millions of marks and require thousands of scientists and engineers. Schürer's writing makes clear that this work would necessarily shrink the firm's ability to conduct research and development on other civil projects.⁷³

⁷² Konzeption zur Entwicklung und Profilierung, BArch DY 30/5118, pg. 502-515.

⁷³ Ibid, pg. 511-512.

Investments in research and development for Zeiss's new military products were expected to cost at least 800 million marks, which would be loaned to the firm from the state budget. Between 1984 and 1986, Zeiss would also need to hire and find homes for 1,480 new employees just in research and development, representing a 30 percent increase in the firm's total R&D workforce in 1983. According to the plan's projections, development of *Objekt 016* would itself require 800 full-time R&D employees, compared to 25 and 380 engaged at the time in R&D on for *Objekt 02* and *Objekt 09*, respectively. In addition, Zeiss would have to find at least another 2,000 trustworthy workers to assemble and test the new products once designed. Hiring these employees was expected to cost another 800 million marks between 1986 and 1989. A further 192 million marks would be invested in new production facilities and equipment.⁷⁴ As recently as 1976, Zeiss spent just 83 million marks on investment across the entire firm. From 1980-1982, the entire Zeiss Kombinat invested 853 million marks across all product lines.⁷⁵

However, these investments were expected to pay off. The Politburo projected that new technologies stemming from the research and development required for *Projekt 152* would form the basis for new military and civil products alike that would power exports and domestic production in the 1990s. While Zeiss was placed at the core of the plans to produce *Objekt 016*, it would also necessitate cooperation with other East German high-tech enterprises, most notably *VEB Kombinat Mikroelektronik Erfurt*.⁷⁶ The Politburo regarded the opportunity to create new technological advancements in the GDR through research on *Projekt 152* and collaboration with the Soviet Union as a second key advantage of the Politburo's new plans for Zeiss.⁷⁷

⁷⁴ Konzeption zur Entwicklung und Profilierung, BArch DY 30/5118, pg. 505-508.

⁷⁵ Hellmuth and Mühlfriedel, *Carl Zeiss*, 371 (table 37).

⁷⁶ Konzeption zur Entwicklung und Profilierung, BArch DY 30/5118, pg. 519.

⁷⁷ *Ibid*, pg. 510-511.

On paper, the new strategy still mandated increasing exports to non-socialist markets as a goal for the rest of the decade. The document acknowledged that the firm had consistently failed to meet export plan quotas in the early 1980s, also noting that the firm was again unlikely to meet its target by the end of 1983. Even so, the Politburo called for a doubling of NSW exports to 260 million marks by 1985 and a target of 330 million marks by 1990. Schürer noted specifically that Biermann believed exports of at least 220 million marks by 1985 to be possible. In fact, the East German planners hoped that increased investment in optics and microelectronics needed to fulfil Soviet military demands would benefit their product lines sold to the West and make them more competitive on world markets.⁷⁸ To do so, astronomy, photogrammetry, medical technology, precision instruments, microscopes, and other optical equipment all needed to be improved to be marketable in NSW countries. Zeiss called for an increase in advanced research and development overall, but also noted that some product lines, such as photolithography, absorbed more of the firm's research and development spending than they contributed to sales.⁷⁹

Despite official insistence that Zeiss's military production and Western export program could coexist, officials at Zeiss knew that increasing weapons development and exports to the Soviet Union would necessarily require sacrificing the firm's NSW export program. A remarkably candid internal report found in the Zeiss archives details the firm's failures to increase these Western exports and the lack of resources available to support both aspects of Zeiss's plans for the decade. The report stated clearly that "a stronger concentration of research, development, catenary, and production capacity dedicated to NSW-oriented products cannot be

⁷⁸ Konzeption zur Entwicklung und Profilierung, BArch DY 30/5118, pg 500-501.

⁷⁹ Konzeption zur Entwicklung des Kombinates VEB Carl Zeiss JENA im Zeitraum bis 1990, 12 May 1983, BArch DE 1/59154, fol. 5.

realized due to the overall assignments of the combine and will be restricted based on the growing demands of the [military and microelectronic] complexes. The decisive special military technology components are not exportable to the NSW given their strategic importance and the characteristics of their licenses.”⁸⁰

Instead, the future activities and identity of Zeiss would be defined by research and production of “special” goods for the Soviet Union and Warsaw Pact alliance. The report projected that fulfilling the new agreement with the Soviets to develop and produce *Projekt 152* would actually require 1,200 “high-qualified employees” dedicated to research and development, which was more than Zeiss had in its entire weapons program. Labor shortages were already limiting *Objekt 09* production, and the microelectronics division was struggling to find enough housing for the engineers that it needed. These weapons programs would cannibalize the scientists that Zeiss needed to keep up with advances in Western technology and compete in global markets. Officials at Zeiss knew that further integration with the Soviet defense industry would require the firm to admit defeat in its efforts to increase exports to the West. The report determines that, “Based on the requirements already determined, the weight of the special scientific and production sectors that have arisen in recent years will continue to grow and increasingly define the overall profile of the optical precision machinery manufacturing.”⁸¹

Zeiss was willing to make this trade because it would allow them to focus on making “hard” goods that only they could produce for fellow communist countries. Despite Biermann’s best efforts at compelling, cajoling, and cheating to increase sales of civil machinery to the West, Zeiss proved increasingly unable to compete with capitalist firms. According to Stasi reports, Biermann feared that his failure to increase NSW exports in the early 1980s was likely to cost

⁸⁰ Untitled document GVS GR 412-15183, BACZ VA 2182

⁸¹ Ibid.

him his job. Zeiss's new emphasis on weapons production made him invaluable to both East Germany and the Soviet Union. The Soviets' faith in Zeiss, and Biermann in particular, to execute this new project offered them both a new path forward.⁸²

⁸² Remy, *Zeiss-Generaldirektor Wolfgang Biermann*, 386-387.

IV – Goodbye Yellow Brick Road

The SED Politburo adopted its new strategy for Zeiss in 1983 to ensure sales of very “hard” military goods to the Soviet Union and to assume a larger political role in the Warsaw Pact alliance. However, Zeiss proved incapable of making the scientific advancements necessary to turn its plans into reality. In addition to internal inefficiencies, the firm’s progress was stymied by the high technical specifications required by the Soviets and difficulties navigating the Soviet bureaucracy. Friction between the two sides suggests that the weapons Zeiss was to provide to the USSR were not as important, or as “hard,” in the Soviets’ eyes as GDR planners had hoped.

High-level consultations between East Germany and the Soviet Union regarding *Objekt 016* began in 1984. On the Soviet side, the effort was led by the Ministry for Aviation Industry under its deputy minister Ilyin. In East Germany, the entire project fell under the purview of the MEE and its state secretary Karl Nendel, with Zeiss and Biermann leading the effort to develop the new homing head.

When the East Germans did receive performance requirements for *Objekt 016*, they found the Soviets’ demands to be “extraordinarily high.” The optics and electronics were supposed to be able to sense a temperature difference of just two to four degrees Celsius between the atmosphere and an enemy ship at a distance of 12 to 15 kilometers. Furthermore, the rocket was intended to prioritize one target out of many while resisting enemy countermeasures. Finally, the Soviets wanted the homing head to retain functionality after a nuclear explosion and otherwise have a shelf life of 12 years. These parameters would demand technological advancements across all of East Germany’s electronic-related industries, not just at Zeiss.⁸³ By

⁸³ Information über die Zusammenarbeit des Ministeriums für Elektrotechnik und Elektronik der DDR mit dem Ministerium für Flugzeugindustrie der UdSSR zum Komplex 152, 16 Feb. 1985, BArch, MfS, HA XVIII, Nr. 9521, fol. 26-28.

mid-1985, Nendel convinced the Soviets to loosen some specifications, such as increasing the wavelength required for the homing head from 3-5 micrometers to 8-15 micrometers, which was apparently in line with “international standards.”⁸⁴

Zeiss finally compiled a report in December of 1985 detailing all of the requirements for *Objekt 016*. Only three copies were distributed, including two for the MEE and one for Biermann, Gattnar, and other officials at Zeiss. However, an “informal collaborator” embedded in the project informed the Stasi that East Germany still faced considerable roadblocks to progress. In particular, critical raw materials such as zinc sulfide, zinc selenium, and germanium could not be obtained from West Germany due to the U.S. embargo on exports of these commodities to Europe.⁸⁵

Despite the project’s difficulties, Wolfgang Biermann wrote a relatively upbeat report in the summer of 1986 detailing the progress that Zeiss “special” production programs had made in recent years. Biermann’s report suggests that he and the firm intended to forge ahead with the design and production of *Objekt 016* in fulfillment of East Germany’s agreements with the Soviet Union. Biermann acknowledged that the project would require East Germany’s high-tech industries to make significant progress and reported that cooperation with the Soviet Ministry of Air Industry had not been as productive as promised. Even so, he noted that the Soviets lacked advanced infrared technology necessary to complete the project without Zeiss’s help. While the Soviet Ministry of Defense Industry had been more cooperative, Biermann still estimated that the project would run well into the 1990s. He also projected a total production run of 6,300 units at

⁸⁴ Bericht über die 6. Beratung der staatlichen Arbeitsgruppe zur Profilierung des Kombinates Carl Zeiss Jena, 1 Jun. 1985, BArch, MfS, HA XVIII, Nr. 9521, fol. 30.

⁸⁵ Inoffizielle Einschätzung zum Realisierungsstand Vorhaben 016, 6 Dec. 1985, BArch, MfS, HA VXIII, Nr. 9521, fol. 48-50.

500,000 marks per unit for total sales of over 3 billion marks.⁸⁶ This projection represented a much larger production run than originally planned in terms of units sold, but also a much lower sales price than the Politburo originally approved.

By the end of 1985, “special” production comprised 17.2 percent of Zeiss production by value and 25 percent of its exports to other socialist economies. Most of these exports were sales of the *Objekt 02* air-to-air seeking heads and *Objekt 09* T-72 laser sighting system. By 1985, Zeiss had sold 13,400 and 1,800, respectively, with plans to increase annual sales to 3,600 and 750 in 1986. Furthermore, Zeiss still believed a new license for an updated version of *Objekt 02* to be forthcoming from their Soviet partners. Biermann wrote that he was willing to massively increase spending on human capital. At the time of his writing, nearly 5,000 employees were assigned to weapons production, including 1,800 involved in research and development. Biermann intended to triple investment in this workforce from 440 million marks to a total of 1.3 billion in the coming years to increase Zeiss “special” exports to 35 percent of exports to the socialist camp. At least in this report, it seemed that the East Germans’ difficulties in securing Soviet cooperation on *Objekt 016* had not caused Biermann and Zeiss leadership to reconsider transitioning the firm into a weapons-producing powerhouse for the Warsaw Pact.⁸⁷

Behind the scenes, officials from the MEE and the SPK were aware that Zeiss’s “special production” program was not going as planned. Of the 1,265 employees seen necessary to complete the firm’s demanding R&D ambitions, Zeiss had only managed to hire 827. The firm was also missing a further 270 of the 550 needed for other technical and production processes. This gap was caused by the strict security requirements necessary to work on *Objekt 016*, as well

⁸⁶ Der Beitrag des Kombinates VEB Carl Zeiss JENA zur Stärkung der Verteidigungskraft der DDR und der Warschauer Vertragsstaaten unter Einbeziehung der Aufgaben zur Ausrüstung der Schutz- und Sicherheitsorgane und der Kosmotechnik, 6 Feb. 1986, BArch, MfS, HA XVIII, Nr. 9521, fol. 76-79.

⁸⁷ Ibid, fol. 71-73.

as the simple lack of basic infrastructure needed to house these employees. Perhaps more concerning, planners realized that the project was likely to exceed the already significant 2.3 billion marks budgeted for the project. The original 1983 plans for *Objekt 016* had factored in significant material and technical assistance from the Soviet Union that had not materialized. East Germany projected that a further 750 million marks would be needed to develop the required “base technologies” for the project in the absence of Soviet assistance.⁸⁸

East German officials had been expressing frustration with their Soviet counterparts from the beginning of the project. GDR officials complained that their main partners, the Soviet Ministry of Aviation Industry, failed to simply communicate specific requirements for essential components required for *Objekt 016*.⁸⁹ The East Germans went so far as to send a letter from Prime Minister Willi Stoph, Chairman of the GDR Council of Ministers, to his Soviet counterpart, Premier Nikolai Tikhonov, detailing the project’s poor state of affairs.⁹⁰ Stoph wrote to Tikhonov that while work had begun between the GDR MEE and Soviet Ministry of Air Industry, delays on the Soviet side were putting the project’s timely completion at risk. Stoph asked his counterpart to review the terms of their original 1981 agreement and “if applicable” bring in the Soviet Ministries of Defense Industry and Electronic Industry to cooperate with the East German MEE on the project.⁹¹

In December 1985 an East German delegation travelled to Moscow to meet once again with Minister Ilyin and other Soviet officials from the Ministry of Air Industry. The meeting once again went poorly from the East German perspective as the Soviets continued to prove

⁸⁸ Informationen und Vorschläge zur Durchführung des Beschlusses des Politbüros des Zentralkomitees der SED zur Profilierung des Kombinates VEB Carl Zeiss Jena, undated, BArch, MfS, HA XVIII, Nr. 9521, fol. 133-137.

⁸⁹ Bericht über Leiterberatung zur Umsetzung des PB-Beschlusses vom 24.5.1983 “Profilierung des Kombinates Carl Zeiss Jena,” 11 Sep. 1984, BArch, MfS, HA XVIII, Nr. 9521, fol. 7.

⁹⁰ Bericht über 5. Leiterberatung zur Durchsetzung des PB-Beschlusses vom 24.5.1983 zur Profilierung des Kombinates Carl Zeiss Jena, 11 Jan. 1985, BArch, MfS, HA XVIII, Nr. 9521, fol. 9.

⁹¹ Letter from Willi Stoph to Nikolai Tikhonov, 20 Feb. 1985, BArch, MfS, HA XVIII, Nr. 9505, fol. 19-20.

uncooperative in defiance of their treaty-bound commitments. Karl Nendel's meeting report noted that "extraordinary problems" still existed with the project, but the Soviet Ministry of Air Industry had clearly not been working on solving them, instead preferring to pass the work on to the Ministry of Defense Industry. The Soviets had still declined to provide critical components such as germanium, cadmium, quicksilver-telluride, and gyroscopes, arguing that East Germany needed to establish its own sources. In Nendel's judgement, the Soviet Union had overestimated the industrial and technological prowess of the GDR and itself lacked the optoelectronic technology to assist in developing *Objekt 016*. He concluded that East Germany should seek to obtain as much help from the Soviet Ministry of Defense Industry as possible while ensuring that its research on the project also contributed to civilian technology in the GDR.⁹²

While Zeiss was struggling to gain traction with its stubborn Soviet partners, its civil exports to the West were also stagnating. The firm never reached Biermann's projections as laid out in the 1983 Politburo decision, exporting only 164 million in *Valutamarks* to NSW economies in 1985. Perhaps more worryingly, the firm's critical *Devisenertragskennziffer* metric sunk to 0.388, meaning it cost the firm over 50 percent more in marks to earn a dollar than at the beginning of Biermann's tenure.⁹³ Zeiss's reallocation of investment in R&D away from its traditional export products directly affected its ability to compete in Western markets.⁹⁴ A 1988 analysis of the program given by Biermann to the firm's leaders showed that most of its machines and equipment were three to five years behind the competition. The firm judged that only 16 of the 159 new products introduced between 1981 and 1986 were developed within the

⁹² Informationen über eine Beratung mit dem Ministerium für Flugzeugindustrie der UdSSR am 11.12. und 12.12. 1985 in Moskau, 13 Dec. 1985, BArch, MfS, HA XVIII, Nr. 9521, fol. 54-59.

⁹³ Mütze, *Die Macht Der Optik*, 798 (table 29); Barkleit, "Moderne Waffensysteme," 44-45. (author's calculations).

⁹⁴ Hellmuth and Mühlfriedel, *Carl Zeiss*, 295.

necessary two-year timeframe.⁹⁵ As the decade wore on, supply issues, especially in electronic components, as well as production capacity increasingly hindered the firm's efforts to keep up.⁹⁶

Contrary to the rosy picture painted by Biermann in his October 1986 report, he was well aware of the firm's struggles with *Objekt 016* and NSW exports. Biermann's actual views regarding Zeiss's future, and especially its weapons production program, were reported by an unnamed source to the Stasi's HA XVIII division responsible for economic issues. Biermann's comments suggested that not only he and other officials at Zeiss, but also East German leadership—including Erich Honecker and Günter Mittag—had been reconsidering the program and relationship with the Soviet Union for some time. The Stasi was briefed on a private conversation between Biermann and an unnamed colleague in which he divulged that he viewed the *Objekt 016* project obsolete in the “atomic age.” In any case, Zeiss was spending too much on military production.⁹⁷

Instead, Honecker and Mittag asked Biermann whether Zeiss could help the GDR “accelerate the development of microelectronics” rather than merely acting as the “workshop of the USSR” in the service of Soviet priorities.⁹⁸ The GDR had been attempting to develop a homegrown microelectronics industry with little success since at least the late 1970s. In particular, Gerhard Schürer of the SPK “convinced Honecker that microelectronics could lift the GDR out of its morass.” Hopes for an East German microelectronics industry ranged from merely incorporating more advanced computing into its machine exports to finally creating a functioning communist society.⁹⁹

⁹⁵ Hellmuth and Mühlfriedel, *Carl Zeiss*, 311.

⁹⁶ *Ibid*, 296.

⁹⁷ Information, 27 Jun. 1986, BArch, MfS, HA XVIII, Nr. 9521, fol. 109-110.

⁹⁸ *Ibid*, fol. 109-110.

⁹⁹ Augustine, *Red Prometheus*, 309.

Biermann agreed with SED leadership that the firm should use the resources allocated to *Objekt 016* for civil projects. Reallocating resources from *Objekt 016* would enable the GDR to realize its dreams of establishing a relevant microelectronics industry. Biermann furthermore believed that microelectronics could help East Germany achieve a degree of independence on the international stage.¹⁰⁰ He argued that Zeiss could only focus on essential manufacturing processes such as microlithography by cannibalizing work done on *Objekt 016*. Neither the Soviets or East Germany had been able to produce cutting-edge microelectronics, and their programs were dependent on machine imports from the West. Biermann estimated that Zeiss could reduce the GDR's dependency on Western equipment from 70 percent to 40 percent by 1995.¹⁰¹

To refocus the firm's efforts once again, this time on microelectronics, the GDR would have to abrogate its 1981 treaty with the Soviets and reject the assistance from the Ministry of Defense Industry that Willi Stoph had requested from Soviet Premier Tikhonov only a year earlier.¹⁰² First, the East Germans had to convince themselves that taking such a step would be permissible.

Following Biermann's communications with Mittag about the future of Zeiss, officials from Zeiss, the MEE, and the SPK drew up a further series of reports for the Politburo including more detailed proposals for another round of reorganization. These reports also included significant criticism of their Soviet partners. The authors listed each meeting between GDR officials and their Soviet counterparts and detailed the gaps between what had been promised by

¹⁰⁰ Information, BArch, MfS, HA XVIII, Nr. 9521, fol. 109-110.

¹⁰¹ Auftrag vom. 13.6.1986 zur Erarbeitung eines Profilierungsvorschlages für die beschleunigte Entwicklung und Produktion der Mikroelektronik im Kombinat VEB Carl Zeiss JENA, 26 Jun. 1986, BArch, MfS, HA XVIII, Nr. 9521, fol. 111-118.

¹⁰² Information, BArch, MfS, HA XVIII, Nr. 9521, fol. 109-110.

the Soviets and what had been delivered. They complained that little to no support had materialized from the Soviets despite treaty obligations to do so, leaving the GDR to develop the new technologies needed for the project with its own time, money, and specialists—which were always in short supply. The GDR made these investments despite never receiving contractually binding price or quantity figures from the Soviet Union. Despite their best efforts, the authors judged the project could not be completed in a reasonable amount of time with the funds allocated by the central government and human capital available in the GDR. Further investment was seen as unwise given the apparent lack of Soviet enthusiasm for the project and dim prospects for its completion.¹⁰³

Some members of the East German security services and military leadership opposed the plans to give up on *Objekt 016*. Although the deputy director of the SPK responsible for military production, Wolfgang Neidhardt, had worked alongside Biermann on the new proposals for Zeiss's future, the two struggled to convince Schürer to acquiesce. Schürer ordered that further study of the issue should continue through November 1986 while keeping quiet any indication that the program was in trouble. However, Defense Minister Heinz Kessler had already discovered their plans and had filed a report with Schürer at the SPK with his opinions—unknown to Zeiss—regarding the future of *Objekt 016* with Günter Mittag.¹⁰⁴

The Stasi's HA XVIII department was also concerned about the implications of cancelling the production of *Objekt 016*. Its officers were aware that in Biermann and Nendel had nominally agreed with Neidhardt to consider simply pushing back the project's timeline in July 1986. At the same time, Biermann was sending written reports to Mittag and others arguing

¹⁰³ Informationen und Vorschläge zur Durchführung des Beschlusses des Politburos des Zentralkomitees der SED zur Profilierung des Kombinates VEB Carl Zeiss Jena, undated, BArch, MfS, HA XVIII, Nr. 9521, fol. 130-146.

¹⁰⁴ Durch Genossen Generalmajor GRABOWSKY, Militärberich der Staatlichen Plankommission, wurde bekannt:, 13 Nov. 1986, BArch, MfS, HA XVIII, Nr. 9521, fol. 189-190.

for the project's cancellation. Biermann had also informed key deputies, including Klaus-Dieter Gattnar, that work at Zeiss on the missile would cease. Once Neidhardt discovered that Biermann and Nendel were not actually considering his proposals, he accepted the winding-down of *Objekt 016* "as a decided matter."¹⁰⁵

The Stasi argued that "the cessation of work on *Objekt 016* had military implications that "Comrade Neidhardt [was] not in a situation to precisely evaluate." Reorienting work towards microelectronics exclusively would destroy the progress that the GDR had made through the project for both military and civil applications. Abrogating binding agreements made with the Soviets also risked damaging the two sides' broader relationship. The Stasi were unaware if East Germany's Defense Minister Kessler had already informed the Soviets of the planned cancellation, but they predicted that the issue would be elevated to a political dispute between East Berlin and Moscow if the Soviets were made aware.¹⁰⁶

The East Germans had apparently managed to keep their Soviet partners in the dark through the summer and fall of 1986. As scheduled, the fourth meeting of the combined working group of officials from the East German MEE and the Soviet Ministry of Aviation Industry took place in September 1986. Discussions on other parts of the overall *Projekt 152* program, such as the transport container and the onboard computer, took place without issue. However, officials from Zeiss did admit to the Soviets that they had not made enough progress on their own to deliver *Objekt 016* on time. Instead, the East Germans proposed 1992 as the earliest possible delivery date for a prototype. This information was sensitive enough that Ilyin requested that this portion of the discussion be stricken from the official meeting protocol. He then spoke with Moscow via telephone before reluctantly agreeing to the new timeline and further discussions at

¹⁰⁵ Durch Genossen Generalmajor, BArch, MfS, HA XVIII, Nr. 9521, fol. 192-193.

¹⁰⁶ Durch Genossen Generalmajor, BArch, MfS, HA XVIII, Nr. 9521, fol. 192.

the group's fifth meeting in April 1987. Ilyin also took Nendel aside during the conference and emphasized that the Soviets had no backup plan and were counting on the GDR to deliver *Objekt 016*. Nendel's Stasi minders noted that he neglected to reveal the full extent of the true plans being formed in Berlin and Jena for the future of the program.¹⁰⁷

Following months of debate, Biermann's bureaucratic maneuvering succeeded in January 1987 when the Politburo issued a decision ordering the cessation of work on *Objekt 016* and the reorganization of Zeiss to focus on microelectronics.¹⁰⁸ Nendel and Neidhardt travelled to Moscow the following month to deliver the news of *Objekt 016*'s cancellation in person to Ilyin and other representatives of the Ministry of Aviation Industry and Gosplan. They also hand-delivered a letter from Schürer to the head of Gosplan, Nikolai Talyzin. The Soviets insisted that the GDR would be breaking their original April 1981 agreement to jointly develop *Projekt 151* and *Projekt 152*. In response, Nendel and Neidhardt highlighted that the agreement also required the Soviets to contribute technical assistance to the project, which they had largely failed to do. The East Germans could not guarantee that work would resume once the GDR developed the technical capabilities to make the project a reality on its own but confirmed that other military and technical collaborations between the GDR and USSR would continue as planned. The Soviets concluded by announcing that they would officially react to the GDR's unilateral cancellation of the program in writing.¹⁰⁹

While the two sides had nominally agreed to continue their other avenues of weapons cooperation, Zeiss production of *Objekt 02* soon dissolved and the new license for a more

¹⁰⁷ Bericht über die Beratung zwischen dem Ministerium für Elektrotechnik und Elektronik der DDR und dem Ministerium für Flugzeugindustrie der UdSSR in der Zeit vom 08. bis 11.09.1986, 12 Sept. 1986, BArch, MfS, HA XVIII, Nr. 9521, fol. 166-171.

¹⁰⁸ Anlage Nr 7. zum Protokoll Nr. 3 vom 21.1.1987: Maßnahmen zur Durchführung der Beschlüsse des Politbüros zur Profilierung des Kombinates VEB Carl Zeiss Jena, 20 Jan. 1987, BArch DY 30/J IV 2/22/2202, pg 99-101.

¹⁰⁹ Information über die Erfüllung des Auftrages zur Information der sowjetischen Seite über die Einstellung der Arbeiten am Zielsuchkopf 016 in der DDR, undated, BArch, MfS, HA XVIII, NR. 9521, fol. 213-216.

advanced version would not be forthcoming. Zeiss continued to produce *Objekt 02* units through December 1987 and deliver them to the Soviets until 1988. The program was ended as part of the overall cancellation of the weapons production agreements between East Germany and the Soviet Union after Zeiss proved unable to deliver its promised advanced naval rocket weapons system. The two sides had previously discussed producing an updated version for a more advanced air-to-air system under a new Soviet license at Zeiss, but these negotiations were abandoned amid the broader wind-down of the Zeiss weapons production program.¹¹⁰

Even while the INEJ-70 program was running, it never lived up to the GDR's lofty goals for production or income. Archival documents from 1989, likely written by Gattnar, and his later writings show that the product's price was cut from over 87,000 marks to just 59,415.50 in 1984, less than one year after the Politburo's 1983 reorganization plan was adopted. This price continued to sink to just 42,738 marks in 1988 as the program was being wrapped up and the final contracted units were being delivered. Zeiss did manage to deliver over 3,000 units in 1985 and 1986, but never eclipsed the 195 million marks earned in 1982 or achieved the projected annual incomes for the firm projected in the Politburo's plans.¹¹¹ Production of *Objekt 09* was somewhat more successful, with the firm delivering 6,200 units total between 1979 and 1990.¹¹² These volumes were on the lower end, but still more in line with what the Politburo had hoped for when approving the 1983 strategy.

VEB Carl Zeiss Jena abandoned plans to promote exports to the West in favor of producing advanced weapons for the Soviet Union because the firm saw an opportunity to sell its technology to import-hungry customers in the socialist world instead of trying to compete with

¹¹⁰ Gattnar, "Produktion Militärischer Erzeugnisse," 150; Reisebericht zur Auslandsdienstreise in die UdSSR, 10 Feb. 1987, BACZ VA 02310.

¹¹¹ Abschlussbericht, BACZ GB 1596.

¹¹² Gattnar, "Der Zielfernrohr Entfernungsmesser TPD-K1," 368.

Western firms in capitalist markets. However, Zeiss failed to realize that it would still have to compete within the Soviet Union in a much more opaque bureaucratic market.

The Soviet military represented one of the major internal “interest groups” able to affect the Soviet economy regardless of any decrees or decisions made at the highest levels. High-level officials viewed their ministries as “personal fiefdoms” and used their positions to establish “power bases and patronage networks” of their own. Although economic plans were nominally under the control of Gosplan, in practice enterprises often had to lobby those at the top of ministerial pyramids for access to needed materials.¹¹³ GDR Prime Minister Willi Stoph’s letter to Soviet Premier Tikhonov in early 1985 asking him to pressure his ministries into providing what the government had promised demonstrates this disconnect between policy and action in the Soviet Union. It also suggests that East Germany was either unaware of how the Soviet military-industrial complex worked in practice or unable to influence its actions from the outside. As a result, Zeiss’s products proved economically uncompetitive in the West and politically uncompetitive in the East.

¹¹³ Chris Miller, *The Struggle to Save the Soviet Economy: Mikhail Gorbachev and the Collapse of the USSR* (Chapel Hill, NC: The University of North Carolina Press, 2016), 57-58.

V – Conclusion

Zeiss's exports to capitalist countries continued to decline in the latter half of the 1980s, falling from 176 million *Valutamarks* in 1986 to just 122 million in 1989, the last full year of East Germany's existence.¹¹⁴ Zeiss's experience mirrored that of East Germany's entire industrial sector, which required more and more inputs to produce increasingly obsolete equipment as the decade wore on. These firms were in turn granted increasingly generous subsidies by the central government. By 1988, GDR firms were credited 8.14 marks for each dollar earned abroad, compared to 4.75 at the beginning of the decade.¹¹⁵ After German reunification, Western economists found that most East German firms had been even less efficient than Zeiss in terms of earning foreign exchange, especially its peers in the electronics industry.¹¹⁶

Zeiss prioritized military production to sell weapons that the Soviets needed rather than civil goods that the West barely wanted. It also hoped that its investments in military research and development would benefit its other product lines in the future. Becoming a producer of advanced weaponry would also raise the GDR's political profile within the communist bloc. Unfortunately for Zeiss, its collaboration with the Soviet Union on *Objekt 016* was also a microcosm of the worsening relations between the two sides and their leaders in the late 1980s. The widening gap between Gorbachev's new vision for Europe and Honecker's communist orthodoxy worsened both political and economic relations between their two countries.¹¹⁷

¹¹⁴ Hellmuth and Mühlfriedel, *Carl Zeiss*, 373 (table 41).

¹¹⁵ Charts of Mark conversion rates to foreign currencies, undated, BArch DL 2/16055.

¹¹⁶ Akerlof et al., "East Germany in from the Cold," 17-20.

¹¹⁷ Barkleit, "Moderne Waffensysteme," 41; William Taubman, *Gorbachev: His Life and Times* (New York, NY: W.W. Norton & Company, Inc., 2018), 384.

Gorbachev's withdrawal from Eastern Europe demonstrated to these satellites that they would be responsible for their own economic development going forward.¹¹⁸

While Gorbachev dismissed Honecker, East Germany's leader since 1971, as out of touch, Honecker believed himself to be "not only the most senior communist leader but the wisest."¹¹⁹ As the Soviet Union renounced direct intervention in the GDR, Honecker led a renewed push for modernization through microelectronics the way he knew best—a top-down inward-looking effort directed by the party and supervised by the Stasi at every level. He and other East German leaders like Schürer and Mittag ignored the GDR's decay and insisted that devoting even more resources to microelectronics would solve the country's political and economic problems. In reality, the program was an autarkic "black hole" doomed to failure given its reliance on copying from rather than collaborating with more advanced partners in the West, as other Eastern Bloc countries were beginning to do. Innovation was further stifled by Stasi micromanagement on behalf of state and SED leadership.¹²⁰

Misguided investment decisions throughout the 1980s helped create an East German economy lacking both modern technology and many basic consumer goods. The GDR's poor economic position bolstered the popular movements that eventually tore down the Berlin Wall in November 1989, demanding both political freedoms and improved material conditions. Indebtedness and illegitimacy also prevented the SED regime from taking harsher measures that might have delayed the dissolution of its so-called "workers' and peasants' state."¹²¹

Like the country as a whole, the East German iteration of Zeiss was reunited with its West German counterpart in the early 1990s following a takeover by the *Treuhandanstalt*

¹¹⁸ Vladislav M. Zubok, *Collapse: The Fall of the Soviet Union* (New Haven, CT: Yale University Press, 2021), 90.

¹¹⁹ Taubman, *Gorbachev*, 384.

¹²⁰ Augustine, *Red Prometheus*, 308-310.

¹²¹ *Ibid.*, 328-330.

responsible for administering the former GDR's industries. The assets purchased by Carl Zeiss AG headquartered in Oberkochen became known as Carl Zeiss Jena GmbH, while the rest of the firm was spun off into a new company called Jenoptik. Although modernizing and integrating Carl Zeiss Jena with the Western half proved difficult at first, the Jena operations became profitable by the end of the decade.¹²² Today, Carl Zeiss supplies the lenses that help produce the world's most advanced semiconductors.¹²³ Given the immense strategic importance of microelectronics in the 21st century, Zeiss may again find itself playing a key role in the next Cold War.

¹²² "The Company's History of Zeiss – at a Glance," ZEISS Archiv.

¹²³ "Markets and Partners," Zeiss.com, accessed May 1, 2023, <https://www.zeiss.com/semiconductor-manufacturing-technology/products/markets-and-partners.html>.

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