

WITH A NEW FOREWORD BY ADMIRAL JAMES G. FOGGO III, USN (RET)

OIL & WAR

*How the Deadly Struggle for Fuel in World War II
Meant Victory or Defeat*



ROBERT GORALSKI

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FOREWORD TO THE 2021 EDITION



I share a common view with retired Marine Corps General James N. Mattis in opining that if you want to learn something new, read an old book. In his recent memoir, *Call Sign Chaos: Learning to Lead*, Mattis bluntly asserts that “if you haven’t read hundreds of books, you are functionally illiterate, and you will be incompetent, because your personal experiences alone aren’t broad enough to sustain you.”¹

More specifically, in a note to a colleague, Mattis reflected, “Thanks to my reading, I have never been caught flat-footed by any situation, never at a loss for how any problem has been addressed (successfully or unsuccessfully) before. It doesn’t give me all the answers, but it lights what is often a dark path ahead. . . . Ultimately, a real understanding of history means that we face NOTHING new under the sun.”²

Therefore, my hat is off to Marine Corps University Press for its decision to reprint the book *Oil & War: How the Deadly Struggle for Fuel in World War II Meant Victory or Defeat*, written by Robert Goralski and Russell W. Freeburg.

The late NBC News correspondent Robert Goralski saw service with the U.S. Navy in the Pacific during World War II. He later covered the Korean and Vietnam conflicts as a journalist. He is the author of *World War II Almanac, 1931–1945* and wrote and lectured on military affairs and energy. He died in 1988 in McLean, Virginia.

Russell W. Freeburg served in the European theater of World War II with the U.S. Army. He fought with the 8th Armored Division in the Ardennes,

¹ Jim Mattis and Bing West, *Call Sign Chaos: Learning to Lead* (New York: Random House, 2019), 237.

² Geoffrey Ingersoll, “General James ‘Mad Dog’ Mattis Email about Being ‘Too Busy to Read’ Is a Must-Read,” *Business Insider*, 9 May 2013, emphasis in original.

Rhineland, and Central Europe campaigns. After the war, he became a journalist and was the Washington, DC, bureau chief and managing editor of the *Chicago Tribune*.

This book is extremely well-researched and written in a style that appeals to historians, researchers, and warfighters alike. It begins with interwar Germany's evolutionary recovery from a near-failed state with a disastrous economy and massive inflation to a nation determined to punish the Western powers that exacted significant war reparations and placed severe restrictions on Germany's economic resurgence and remilitarization after World War I. Adolf Hitler and his Nazi regime focused on expanding Germany's span of control in Eastern Europe before moving against France, the United Kingdom, North Africa, and finally the Soviet Union.

Throughout these campaigns, leaders of the German General Staff and the military-industrial complex knew that they could not accomplish all of Hitler's objectives for the rest of Europe without significantly greater reserves of fuel. As the Third Reich rearmed, German innovation was applied to the development of synthetic fuels extracted at first from lignite (coal). This new ability to produce fuel was absolutely necessary, but it remained insufficient to meet all of Germany's energy needs.

In fact, when Hitler engineered the bloodless *Anschluss* (annexation) of Austria, his home state, the renowned German tank commander Heinz Guderian, in an intended show of force to the newly repatriated citizens of the fatherland, ran out of gas on his way to Vienna. In today's Joint parlance, *Anschluss* is what we would call a "permissive" environment, as Hitler and his armies were essentially "invited" into Austria. This made running out of gas on the way there a massive wakeup call to the German General Staff rather than a threat to forces on the ground. As the book proceeds, it becomes increasingly evident that the victor of the war in Europe was going to be the side with the most robust sustainment capability.

Herein lies the true value in reprinting *Oil & War*. To illustrate, let us examine a few real-world examples that have parallels to the situation in Europe during World War II. I had the privilege of commanding the North Atlantic Treaty Organization's (NATO) Exercise Trident Juncture as commander, Allied Joint Forces Command, Naples, Italy, in the fall of 2018. This was the largest

undertaking of the NATO alliance since the end of the Cold War. Planning occurred during the 18 months prior to the exercise. The location for this operation was north of the Arctic Circle in the maritime, air, and land domains of the country of Norway. The timeframe was October–November 2018. This was done with malice aforethought to stress the force. The climate was cold, wet, and icy and presented significant and unique challenges to the maneuver forces involved. NATO's task was to return Norway's sovereignty to status quo after being attacked by a fictitious adversary that everyone understood to be the Russian Federation.

Article 5 of the North Atlantic Treaty of 1949, also known as the Washington Treaty, specifies:

The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all and consequently they agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defence recognised by Article 51 of the Charter of the United Nations, will assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area. Any such armed attack and all measures taken as a result thereof shall immediately be reported to the Security Council. Such measures shall be terminated when the Security Council has taken the measures necessary to restore and maintain international peace and security.³

The only time that Article 5 has been operationalized in the 71-year history of the NATO alliance was after the attack against the United States on 11 September 2001. Our allies came to our collective defense in the Global War on Terrorism and have stood alongside the United States, shoulder-to-shoulder, ever since.

³ North Atlantic Treaty art. 5, 4 April 1949, 63 Stat. 2241, 34 U.N.T.S., 243.

Exercise Trident Juncture was important because it sent a message of deterrence to Russia in the aftermath of its Exercise Vostok in 2018, which boasted some 300,000 participants (it actually amounted to much fewer than that number).⁴

NATO's current military strategy revolves around two themes—deterrence and defense—in the Euro-Atlantic theater. This includes about 90 percent deterrence and 10 percent defense, so it is important to demonstrate that the risk calculus for any violation of a NATO member state's sovereignty is so great that it is not worth the belligerent's return on investment.

In order to meet the challenge presented by Exercise Vostok, NATO had to overmatch the Russians in terms of “capability” during Exercise Trident Juncture. Our numbers were very strong, though not at the inflated 300,000 mark of the Russian Federation, and the mobility of the NATO force was indeed impressive. Exercise Trident Juncture included 50,000 soldiers, sailors, airmen and Marines, as well as 70 large-deck ships including the USS *Harry S. Truman* (CVN 75) carrier strike group and the USS *Iwo Jima* (LHD 7) amphibious readiness group. Approximately 18,500 of the 50,000 personnel were American, and 8,500 of those were U.S. Marines. There were 265 high-performance aircraft of all type-model-series used in the exercise and, even more impressive, 10,000 tracked or rolling vehicles operating on land or from the maritime domain. *Amphibiousity* was the watchword! In order to get this force to Norway to fight, NATO had to move seven equivalent brigades in just 30 days.

Consequently, mobility and logistics were the key to success. Based on what I learned as commander of Trident Juncture, I coined the phrase, “Logistics is the sixth domain of warfare.”⁵ This has proven to be a matter of some debate in terms of Joint vernacular, and there are those who would disagree with me. That ongoing debate emphasizes why Goralski and Freeburg's work is so important as we examine our priorities in new domains of warfare. Consider that during the period of history covered in *Oil & War*, there were three basic

⁴ Dmitry Gorenburg, “5 Things to Know about Russia's Vostok-2018 Military Exercises,” *Washington Post*, 13 September 2018.

⁵ Adm James G. Foggo III, USN, *On the Horizon: Navigating the European and African Theaters* (podcast), episode 5, 17 December 2018.

domains of warfare: *land, maritime, and air*. Today, in the twenty-first century, there are two additional domains that have been embraced during the last 10 years: *cyber* and *space*. Neither of these new domains are fully developed, and we are just now in the fledgling stages of developing the U.S. Space Force in the Department of Defense.

As I experienced the challenges of moving personnel, fuel, beans, and bullets by air, land, and sea into and all around the country of Norway in the middle of winter, it became clear to me that we as a Joint Force, or NATO as an alliance, have short-changed the importance of logistics and logisticians in warfare—hence the need for a declaration of a sixth domain.

Throughout *Oil & War*, Goralski and Freeburg consistently prove my argument that logistics is the Achilles’s heel of any maneuver force, particularly in the sustainment of petroleum, oil, and lubricants (POL). I would add that the authors’ historical research reveals that logistics is also a domain in which battles can be won or lost. Such examples from this book include Germany’s blitzkrieg in Poland, Hitler’s debacle of Operation Barbarossa in Russia, German field marshal Erwin Rommel’s defeat in North Africa, and Japan’s demise in the Pacific.

All of the above examples are covered in exquisite detail in this book, and the lessons learned retain relevance in modern warfare. Logistics is not the be-all, end-all domain, for even perfect logistics will not win battles. It does, however, enable well-trained warfighters to achieve victory and requires seamless integration across all other domains of warfare. For example, Goralski and Freeburg portray how Rommel, the “Desert Fox” and one of Hitler’s greatest generals, was constantly frustrated by the German High Command’s failure to sustain his *Afrika Korps* in North Africa:

If success depended, as in times gone by, on the strength and will of my men and their officers, then we would have overrun Alamein. . . . But our sources of supply had dried up—thanks to the idleness and muddle of the supply authorities on the mainland.⁶

⁶ *Congressional Record: Proceedings and Debates of the 83rd Congress, 1st Session*, vol. 99, pt. 11 (Washington, DC: Government Printing Office, 1953), A3429.

As I traveled around my vast area of responsibility during Trident Juncture, I would often discuss success and failure in the campaigns of Alexander the Great with my leadership team. While I can find no primary source for the following quote (and historians argue whether it really came from Alexander himself), it conveys the importance of logistics and logisticians quite clearly, and it makes for good motivational rhetoric during campaign planning speeches by a commander: “My logisticians are a humorless lot . . . they know if my campaign fails, they are the first ones I will slay.”

One could conclude from Alexander’s sentiment that the contribution of logisticians is an essential enabling element of warfare. As I stated earlier, not everyone shares this view, both today or in the historical timeframe of *Oil & War*. Goralski and Freeburg document the lightning runs of General George S. Patton Jr.’s II Corps and later Third Army through North Africa and Europe to defeat the German war machine (and attempt to beat British Field Marshal Bernard L. Montgomery to every strategic objective). Patton’s tanks and mechanized infantry burned a *lot* of fuel, but he seemed to take lines of supply and communication for granted and the sustainment of his forces as a divine right. Moreover, he believed that theater logisticians were “cowardly slackers,” and worse, he was convinced there was a deliberate attempt at the highest Allied command levels to withhold fuel from him for political purposes (undoubtedly stemming from his competition with Montgomery).

Over time, as I have built my argument for logistics to be its own domain of warfare, I have examined the definitions of an *operational domain*. NATO’s definition is as follows: “A domain is the sphere of interest and influence in which activities, functions, and operations are undertaken to accomplish missions and exercise control over an opponent in order to achieve desired effects.”⁷

Goralski and Freeburg provide numerous examples in their book that illustrate this point. Whereas the German High Command could have used blitzkrieg tactics to destroy POL facilities in its early campaigns in Eastern Europe to bring its adversaries to their knees sooner, Hitler knew that he

⁷ NATO Military Committee Memorandum (MCM) 0255-2015 (2015).

needed the oil fields to continue the fight. In other words, you break it, you buy it . . . in one way, shape, or form.

Accordingly, the German High Command created a cadre of *oil commandos* to secure and cultivate an opponent's oil reserves and infrastructure by conducting early and coordinated lightning strikes on those facilities to ensure that they remained intact and operational for follow-on friendly forces to use. German forces did this time and again in Poland, the Caucasus, and the Soviet Union, the former campaigns seeing much more success than the latter. Despite the fact that Germany significantly increased its supply of oil and gas for use by the *Wehrmacht* (armed forces) by subsuming the reserves or productive capability of vanquished territories, the benefits were short-term and did not lead to long-term victory. As the authors point out, Soviet leader Joseph Stalin's "scorched earth" policy in the Caucasian oil fields was exactly that—destroying existing infrastructure or supplies, but more importantly, denying the enemy of essential enablement.

Similar decisions happen in campaign planning today. Having served as the operations officer for Joint Task Force (JTF) Operation Odyssey Dawn in Libya in 2011, I can attest to the fact that this lesson from *Oil & War* is relevant today and will remain so in future warfare.⁸ While determining how to carry out UN Security Council Resolution (UNSCR) 1973, which mandated a no-fly zone and a unique civilian protection mission in Muammar al-Qaddafi's Libya, my campaign planners went to work with very little advanced notice.

Our Joint Operation Planning and Execution System (JOPES) allows for deliberate or crisis action planning. Based on the rapid escalation of violence on the ground in Libya by regime forces against their own citizens, there was little time for development of a deliberate plan. I would characterize the situation as one requiring instead a crisis action plan.

Regardless of the acute timing of the operation in support of UNSCR 1973, when sending U.S. forces into harm's way, the JOPES system requires a robust design in crisis action planning that mandates a six-phased develop-

⁸ James G. Foggo III and Michael Beer "The New Operational Paradigm: Operation Odyssey Dawn and the Maritime Operations Center," *Joint Forces Quarterly*, no. 7 (2013): 91–93.

ment process: 1) situation development; 2) crisis assessment; 3) course of action development; 4) course of action selection; 5) execution planning; and 6) execution.⁹ A crisis action plan does not allow for time phased force deployment data (TPFDD), where resources are allocated in advance to support the campaign, so we had to use the existing forces located in the theater's land, air, and maritime domains. Accordingly, there were many gaps and seams in the planning process.¹⁰

When developing courses of action, it is necessary to assess the enemy's end strength and centers of gravity. The al-Qaddafi regime had several centers of gravity with which to focus on: its extensive network of integrated air defenses, including operationally effective SA-5 Gammon missile batteries along the coast; the Libyan Air Force; al-Qaddafi's extended network of family members, loyalists, and tribal affiliations; the combat power of the regime's most effective and well-resourced unit, the *32d Brigade*, commanded by al-Qaddafi's son Khamis; and its oil reserves and infrastructure, which in turn generated revenue and gold reserves to finance the regime.

When developing a plan to neutralize or weaken the regime's centers of gravity, many courses of action were developed. Integrated air defenses and the Libyan Air Force had to be rendered ineffective in order to assert a no-fly zone in support of the civilian protection mission—there was no question about that. However, to prevent the regime's air and land forces from conducting combat operations against friendly forces or their own citizens, there was serious debate given to the subject of crippling the POL infrastructure in Libya to slow down the *32d Brigade* and speed up the pace of the campaign. As you read *Oil & War*, you will find that both the German High Command and Stalin's generals went through a similar decision-making process. Again, you break it, you buy it.

⁹ *User's Guide for JOPES (Joint Operation Planning and Execution System)* (Washington, DC: Joint Chiefs of Staff, 1995).

¹⁰ *Time Phased Force and Deployment Data (TPFDD) Primer*, CJCS Guide 3122, 15 December 2011; and *Joint Operation Planning and Execution System (JOPES)*, vol. 3, *Time-Phased Force and Deployment Data Development and Deployment Execution*, CJCSM 3122.02, 4 June 2014.

Our decision in Libya came down to the question of end states and exit strategy. There were many foreign investors in the Libyan oil infrastructure. Some economies, like that of Italy, a host nation for U.S. forces involved in Operation Odyssey Dawn, were inextricably tied to the import of Libyan oil. For those nations who subscribed to UNSCR 1973, there was no desire to make recovery and reset any more difficult than it had to be. Therefore, we decided to leave Libyan POL intact. This decision may have slowed down the campaign, but it was intended to speed up the recovery of a new and more independent Libya.

Attacks on POL aside, it became intuitively obvious to me during Operation Odyssey Dawn that unfettered allied access to fuel and oil was critical to the pace of campaign. During the first night of the air campaign to neutralize the Libyan Air Force and integrated air defenses, the Seventeenth Air Force under U.S. Air Forces Africa established an air bridge that refueled strike fighters and airborne intelligence, surveillance, and reconnaissance aircraft with about 2 million pounds of fuel per day. When the campaign gained full swing, that number exceeded 3 million pounds of fuel per day. Between Operation Odyssey Dawn and NATO's follow-on JTF Operation Unified Protector (2011), there were about 19,000 sorties flown in six months. As an alliance, NATO was fortunate to call on the U.S. Air Force to supplement its six airborne refueling tankers with a force totaling 140 Boeing KC-135 Stratotankers or similar refueling aircraft. No other nation on Earth could have mustered such a capability in so short a period of time as the United States. As Goralski and Freeburg observe, in addition to attrition during the Battle of Britain, one of the German *Luftwaffe's* (air force) most significant shortfalls was keeping gas in its tanks. Again, logistics asserts itself then and now as its own domain of warfare.

During Operation Odyssey Dawn, I learned the importance of just-in-time sustainment operations for fuel and ordnance replenishment, primarily Tomahawk cruise missiles but also 500-pound bomb kits and mine countermeasure platforms that were mustered in response to al-Qaddafi's mining of the approaches to Misrata, a key humanitarian relief corridor. None of these lessons are new and have been previously articulated in the campaigns of the Second World War. Many times, however, we continue to reinvent the wheel in times of crisis.

If you fast forward from Operation Odyssey Dawn in 2011 to Exercise Trident Juncture in 2018, in preparation for the latter, I instructed my Allied Joint Force Command (JFC Naples) logistics officer and his logisticians to read *Moving Mountains: Lessons in Leadership and Logistics from the Gulf War* by Lieutenant General William G. Pagonis with Jeffrey L. Cruikshank. Like *Oil & War*, it is a great book that articulates the need for logistics. As Pagonis points out, and I summarize here, armies eat; armies drive; armies need well-trained, mobile, and flexible fighting forces—their teeth; and armies also need extensive support services—their tails.¹¹

Pagonis also has a refreshing perspective on Murphy's Law —“if it can go wrong, it *will* go wrong” —but he feels that a good logistician “acknowledges the real-world wisdom of that law” and responds by keeping all options open. Similarly, he recommends building redundancy into the plan so one mishap will not doom the entire campaign. Finally, he concludes that the good logistician does not deny that Murphy's Law exists, but rather “tries to quarantine its potential impacts.”¹² Murphy's Law is alive and well in *Oil & War* with a plethora of historical examples of logistical challenges that were either overcome by commanding generals such as Patton and Dwight D. Eisenhower or contributed to the downfall of equally talented field commanders such as Guderian and Rommel.

Goralski and Freeburg also include an interesting analysis of the shortcomings of the Imperial Japanese Navy (IJN) and the German *Kriegsmarine* (war navy), particularly the German submarine force. Although the IJN planned and led the bold and brazen attack on Pearl Harbor in December 1941, it was deprived of the necessary resources to sustain the fight against the U.S. Navy in the Pacific. The Japanese General Staff prioritized the interests of its army over its navy throughout the entire war, thereby squandering the IJN's strategic and tactical advantage after the surprise attack on Pearl Harbor.

¹¹ LtGen William G. Pagonis, USA, with Jeffrey L. Cruikshank, *Moving Mountains: Lessons in Leadership and Logistics from the Gulf War* (Cambridge, MA: Harvard Business School Press, 1992), 1–2.

¹² Pagonis and Cruikshank, *Moving Mountains*, 202.

Similarly, German fleet admiral Karl Dönitz's early successes during the Battle of the Atlantic were undervalued by both the German High Command and even Hitler. With only 37 operational submarines and just 12 on station at any one time in 1942, Dönitz and his submarine skippers wreaked havoc on shipping along the East Coast of the United States and, more importantly, Allied resupply convoys crossing the Atlantic to the United Kingdom. During Operation *Paukenschlag* (drumbeat), Dönitz claimed that his U-boats had sunk as much Allied shipping as would have required 80,000 aircraft sorties flown by the German *Luftwaffe*. Accordingly, Dönitz asked Hitler to produce twice the number of submarines currently at sea. Luckily for the Allies, his request was denied.

The skill of the German U-boat skippers in the Atlantic rivaled that of their American counterparts operating against Japanese convoys on the opposite side of the world in the Pacific. American submariners concentrated their relentless attacks against Japanese oil tankers and transport ships, thereby crippling Japanese supply lines to the outer islands. Japan realized this too late, and the U.S. Navy won the battle of the *Marus* (Japanese supply vessels).

The Allies clearly understood the threat posed by German U-boats and poured resources into the Battle of the Atlantic. Outnumbered and outgunned by American destroyer escorts and aircraft, disadvantaged by utilization of superior radar systems at sea and in the air, and vulnerable to exploitation of Ultra radio transmissions, the significant attrition of German submarine forces ended in defeat by the end of 1942.¹³

History repeated itself in the "Third Battle of the Atlantic" during the Cold War, whereby the Soviet Navy was defeated by a cost-imposing strategy in which not one shot was fired. It would be wise to acknowledge the lessons in undersea warfare, articulated by Goralski and Freeburg in both the

¹³ Ultra was an Allied intelligence project that tapped the very highest level of encrypted communications of the German armed forces, as well as those of the Italian and Japanese armed forces. This group of code breakers developed techniques for decrypting intercepted messages using electrical cipher machines, such as the Enigma and, later in the war, the Tunny machine. The flood of military intelligence produced by the project was code named Ultra from "Top Secret Ultra."

Atlantic and the Pacific during World War II, as we embark today on what I have called the “Fourth Battle of the Atlantic.”¹⁴

We now face an emerging threat in the Atlantic from a resurgent Russian submarine force. Realizing the asymmetric advantage of stealthy and capable undersea vessels, over time, the Russian Federation has continued to fund research and development and produce new generations of lethal nuclear-powered submarines and associated weapons systems. This represents a direct challenge to Allied transatlantic sea lines of communication and critical infrastructure. Writers such as Magnus F. Nordenman, author of *The New Battle for the Atlantic: Emerging Naval Competition with Russia in the Far North*, have embraced the seriousness of the Russian threat and written extensively about it.¹⁵

While in command of Allied Joint Forces Command, Naples, I had a commander’s recommended reading list known as “Foggo’s Forty.” Books such as Pagonis’ *Moving Mountains* and Nordenman’s *The New Battle for the Atlantic* are on it, as they represent landmark examples of the importance of what General Mattis referred to in my opening paragraph of this foreword: to “never be caught flat-footed by any situation, never at a loss for how any problem has been addressed (successfully or unsuccessfully) before.”¹⁶

As I think about *Oil & War* and how the lessons of the past pertain to our future, I am convinced that our nation must stay on course toward energy independence. We need more innovation and diversification in our energy resources and infrastructure. Hydrocarbons and fracking are not the only answer. Research, development, and investment must continue in nontraditional means of renewable energy production, including wind, solar, hydroelectric, and, yes, nuclear power! Other nations have done this safely, and so can we. The U.S. Navy’s safety record in 60 years of operating nuclear propul-

¹⁴ VAdm James G. Foggo III, USN, and Alarik Fritz, “The Fourth Battle of the Atlantic,” U.S. Naval Institute *Proceedings* 142, no. 6 (June 2016). According to the authors, the “First Battle of the Atlantic” took place during World War I; the “Second Battle of the Atlantic,” during World War II; and the “Third Battle of the Atlantic,” during the Cold War. The “Fourth Battle of the Atlantic” is occurring today.

¹⁵ Magnus Nordenman, *The New Battle for the Atlantic: Emerging Naval Competition with Russia in the Far North* (Annapolis, MD: Naval Institute Press, 2019).

¹⁶ Ingersoll, “General James ‘Mad Dog’ Mattis Email about Being ‘Too Busy to Read’ Is a Must-Read.”

sion plants is unmatched. Civilian industry can do the same. We must ensure that oil is never used as a weapon against the United States. It is time to think outside of the box.

Accordingly, after reading *Oil & War*, I can understand why Marine Corps University Press chose to republish this work, for it remains as relevant a piece of research in 2021 as it did in 1987. I regret *not* having been able to include it as one of “Foggo’s Forty!”

Read this book and recommend it to others—you will not be disappointed.

James G. Foggo III
Admiral, U.S. Navy (Ret)

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Robert Goralski and Russell W. Freeburg, 1987

GLOSSARY AND ABBREVIATIONS

Afrika Korps—A German expeditionary force that fought in North Africa between 1941 and 1943

Alaska Highway—A 2,414-kilometer highway built between British Columbia and the U.S. Territory of Alaska

Anschluss—The annexation of Austria into Nazi Germany in March 1938

autobahn—Germany’s innovative highway system

blitzkrieg—The German word for “lightning war,” in which a mechanized force employs fast, concentrated attacks against an enemy to quickly break through the latter’s defenses

Canol—An oil pipeline built to carry oil from Norman Wells, Northwest Territories, to the U.S. Territory of Alaska

Caucasus—Energy resource-rich region in Eastern Europe, located between the Black and Caspian Seas

D-Day—The day on which a military operation or invasion is set to begin; most commonly associated with the Allied invasion of Normandy, France, on 6 June 1944

Eaker Plan—A U.S. air strategy for prioritizing the bombing of Germany’s oil industry to weaken the enemy’s ability to make war

GI—U.S. “government issue”

Hilfswillige—The German word for “volunteer laborers”

I. G. Farben—A German chemical conglomerate that had a leading role in the production of synthetic fuel during World War II

IJA—Imperial Japanese Army

IJN—Imperial Japanese Navy

jerry can—A container for storing gasoline, first introduced during World War II by Germany and so nicknamed by British forces in North Africa based on the derogatory term for Germans

kampfgruppe—A German combined-arms battle group

kaibokans—Japanese frigates designed to escort merchant shipping convoys

Leunabenzine—A German synthetic fuel known for its exorbitant cost that was marketed to civilians in the 1930s

Luftwaffe—The Nazi German air force, 1933–45

NATO—North Atlantic Treaty Organization

OPEC—Organization of the Petroleum Exporting Countries

Operation Orient—An envisioned Axis military operation in which German forces in Eastern Europe would link up with those in North Africa, securing the Middle East region’s vast oil fields; the operation was planned but never conducted

Operation Overlord—The Allied invasion of Normandy, France, which began on 6 June 1944

Operation Paukenschlag—A series of German U-boat attacks on U.S. merchant shipping along the Atlantic coast throughout 1942

Operation Pedestal—A British operation to resupply the island of Malta in August 1942

OWI—U.S. Office of War Information

panzer—The German word for “armor” or “tank”

PLUTO—A cross-English Channel “pipeline under the ocean” spanning between Britain and France

RAAF—Royal Australian Air Force

RAF—Royal Air Force (United Kingdom)

RN—Royal Navy (United Kingdom)

Schutzstaffel (SS) —A German military organization directly affiliated with and subordinate to the Nazi Party

Stuka—A German dive-bomber used to devastating effect during the early years of World War II

synfuel—Synthetic fuel manufactured throughout the German Reich

Third Reich—The Nazi German regime, which existed between 1933 and 1945

U-boat—German submarine

Ultra—An Allied intelligence program in which Axis transmissions were intercepted and deciphered by Allied codebreakers

UN—United Nations

USA—United States Army

USAAF—United States Army Air Forces, predecessor to the United States Air Force

USMC—United States Marine Corps

USN—United States Navy

U.S. Strategic Bombing Survey—A report compiled by chiefly civilian Allied experts that assessed the effects of strategic bombing of Nazi Germany and Imperial Japan during World War II; more than 300 volumes were published between 1944 and 1947

USSR—Union of Soviet Socialist Republics

Vichy France—The Axis-aligned French state that existed between 1940 and 1944

Wehrmacht—The unified military organization of Nazi Germany, 1935–45

A NOTE ON CONVERSIONS



Oil production and consumption today are measured almost exclusively in barrels per day. Difficulties arose in dealing with World War II and prewar petroleum figures, which were generally expressed in metric tons or kiloliters on a daily, monthly, or yearly basis. In order to standardize figures and make them more easily understandable, all figures have been converted into U.S. barrels per day wherever practical. Some inconsistencies have arisen, in great part because of rounding out in original reports and oftentimes because of conflicting figures covering specific totals. In no way, however, are the differences sufficiently large to distort the broader and evident conclusions.

Since crude-oil weights (in converting from metric tons or kiloliters) are not the same as product weights, the following volume conversions as set by the American Petroleum Institute were adopted:

- Crude oil: metric ton equals 7.33 barrels
- Gasoline: metric ton equals 8.51 barrels
- Residual fuels: metric ton equals 6.66 barrels
- Distillate fuels: metric ton equals 7.25 barrels
- Synthetics: metric ton equals 8.30 barrels

On synthetics, however, that portion of the synthetic barrel that yielded aviation gasoline or motor gasoline was converted as the gasoline equivalent from crude oil. A thousand kiloliters was computed to be the equivalent of 264 U.S. barrels.

For currency conversions, the official exchange rates for specific periods as given in the *Foreign Commerce Yearbook* for the appropriate year were used.¹

¹ The *Foreign Commerce Yearbook* was published for almost two decades, first by the Bureau of Foreign and Domestic Commerce from 1933 to 1939 and then by the bureau's Office of International Trade from 1948 to 1951.

German and Japanese currencies were converted into U.S. cents at the following rates:

- German reichsmark (RM) = 24 cents (prior to 1 April 1934)
- German RM = 40 cents (after 1 April 1934)
- Japanese yen (¥) = 29 cents

The British pound sterling (£) was converted to the U.S. dollar rate of \$4.87 to the pound.

**OIL &
WAR**

CHAPTER 1

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THE EVE OF WAR

He who owns the oil will own the world, for he will rule the sea by means of the heavy oils, the air by means of the ultra-refined oils, and the land by means of gasoline and the illuminating oils.

~ Henri Bérenger, French diplomat, 1921

*Today all Germany is ours;
Tomorrow the whole world.*

~ Nazi Party song

Adolf Hitler stood triumphant before a mass of exultant followers that filled every inch of space in Nürnberg's (also known as Nuremberg) vast Zeppelin Field. From his stone pedestal, the unsmiling German leader accepted the deafening ovation in studied grim satisfaction. A giant, oak-wreathed swastika of gold glowed above him. Around the colonnaded and bannered arena, 130 antiaircraft searchlights, spaced 40 feet apart, sent a pillared cathedral of light 4 miles into the cloudless September night sky.

The pagan-like setting on the Franconian plains for the 1938 Nazi Party rally had been inspired by the Great Altar of Zeus at Pergamon, erected two centuries before Christ by Emperor Eumenes II to commemorate his victory over the Gauls.¹ Austria had just been absorbed into Hitler's Third Reich, and

¹ The Bible (Rev. 2:13) makes reference to the Great Altar as "Satan's seat."

imperial expansionism was vibrant in the air. The spectacle was political theater on a grand scale.

Columns of goose-stepping, jackbooted troops of the ever-expanding *Wehrmacht* marched with their new weapons, and waves of modern bombers flew overhead.²

The ceremonial transfer from Vienna to Nürnberg of the imperial symbols of the First Reich—the crown, scepter, sword, and orb of empire—was consummated. Hitler and the Nazis were the inheritors of Germanic rule, the successors to Frederick the Great, and they thought it particularly appropriate to bring the historic treasures to Nürnberg as part of the “First Party Rally of Greater Germany.”

As he did each year, Hitler solemnly consecrated new black-and-red Nazi colors. With one hand he touched the fresh flags while clasping with the other the Nazi *Blutfahne*, the bullet-torn “blood banner” reputedly soaked in the blood of party martyrs, 18 of whom were killed in the failed Munich Beer Hall Putsch of 1923. As sacred ritual, it never failed to bring the party faithful to hysterical fervor. The *Westdeutscher Beobachter* (West German Observer) newspaper would comment on Hitler’s act of consecration:

Yesterday witnessed the profession of the religion of the Blood in all its imposing reality. Yesterday saw the triumphant and decisive beginning of our fight to make National Socialism the only racial religion of the German people. Whoever has sworn his oath of allegiance to Hitler has pledged himself unto death to this sublime idea. There is no more room for the doubts and uncertainties, no room for retreat.³

The words spun a web of political entrapment, but Germans forgave them because of rising economic expectations. From the depths of World War I had come the dogma that only through self-sufficiency could Germany prosper in peace or battle. The 1938 rally was above all a celebration of that econom-

² The *Wehrmacht* was the unified military organization of Nazi Germany, comprising the *Heer* (army), *Kriegsmarine* (navy), and *Luftwaffe* (air force).

³ J. S. Conway, *The Nazi Persecution of the Churches, 1933–1945* (London: Weidenfeld and Nicholson, 1968), 147.

ic independence. When Hitler issued a proclamation at the rally that the fixed goal of autarky, or economic self-sufficiency, had been achieved, it was the fulfillment of a national dream. The humiliation of surrender in 1918, caused not by defeat on the battlefield but because Germany had neither fuel nor food to continue, was ingrained in the minds of all Germans, whatever their political leanings.

World War I was the first military conflict with tanks and aircraft. Though the mechanized forces were small (the U.S. Army had three times as many horses and mules as trucks), they required quantities of fuel that at the time pinched availability. Germany lacked fuel. Britain, France, and the United States did not. The Allies, as British war cabinet minister Lord Curzon observed, “floated to victory on a wave of oil.”

Germany and the Central Powers were effectively blockaded, and by 1918 their leaders were confronted by mutinous soldiers and civilians. As one writer observed, “Germany had never forgotten that its failure in the First World War was due as much to a lack of oil as to any other single commodity.”⁴

Now, five years after taking power, Hitler proclaimed that he had brought Germany to a point of economic self-sufficiency. He declared:

[The] German economy is being so constructed that at any time it can be completely independent from other countries and stand on its own feet. And this is succeeding. The idea of blockading Germany can even now be buried as an entirely ineffective weapon. The National Socialist State, with energy that is peculiar to it, has drawn conclusions from the lessons of the World War. And now, as before, we hold to the fundamental principle that we would rather limit ourselves in this or that field should it become necessary in order to make ourselves independent from foreign countries. Above all, the following decision always will stand at the top of our economic actions: security of the nation goes ahead of everything else. Its economic existence is, therefore, to be secured materially in its fullest measure with our

⁴ A. E. Gunther, “The German War for Crude Oil in Europe, 1935–1945,” *Petroleum Times (London)*, 8 November 1947.

own standard of life and our own living space. For only then can the German army be in a position at all times to take the freedom and interests of the Reich under its strong protection.

The task of self-sufficiency had been given to Hermann Göring, second only to Hitler in the Nazi hierarchy. In addition to commanding the Luftwaffe, Göring became Germany's master economic planner to implement the ambitious Four Year Plan of self-sufficiency, which began in 1936. In only half the allotted time, Göring could boast at Nürnberg that the plan was already a fact of military, political, and economic reality:

we shall never be forced to sacrifice our honor. Never will it be possible to starve our nation and then demoralize it by propaganda. Those times are definitely over. We are provisioned both with food and with raw materials . . . we are well supplied and excellently armed. We have a powerful army and a great navy and our air force is the world's most modern, most technically advanced and most numerous.

Hitler and Göring misspoke. They could truthfully boast of considerable achievement in moving to break Germany's dependence on imports, but fuel self-sufficiency remained an unattained objective. Most of the ingredients were in place for developing and stockpiling sufficient supplies, and in a few more years Germany conceivably could attain autarky. That position was still years distant, however.

In 1938, Germany was unquestionably less vulnerable than it had ever been. More had been done to bring about resource development for self-sufficiency in fuels than anyone could have imagined when Hitler first came to power. This was done at a time of virulent economic depression, making the gains even more remarkable. Hitler had been able to do this by building on what had been German government policy for decades.

Only a few nations are blessed with oil. Germany is blessed with coal. Coal was thus the essential ingredient for any plan aimed at becoming energy independent. Vast coal deposits (75 percent of them in the Ruhr) could provide virtually unlimited quantities of substitute substances literally capable of driving Germany as well as supplying direct combustion for its industries. It

Figure 1.1. Adolf Hitler at Reichstag



Adolf Hitler received high praise from many members of the German Reichstag after Austria was absorbed into the Third Reich in March 1938. That same year, he also announced that Germany had at last achieved economic independence due to its new-found self-sufficiency.

National Archives and Records Administration

was the synthetic field, the hydrogenation of coal, that was the most critical. Germany had the technology and skills to convert coal into liquid fuels and end its reliance on imports of crude oil and petroleum products.

A German plant was producing synthetic ammonia from coal as far back as 1913. During World War I, a shortage of nitrates, essential in the manufacture of gunpowder, arose when Chilean imports of saltpeter were denied by the British blockade. Germany overcame its imperative need for a substitute by modifying the ammonia-producing process to turn out artificial nitrates as

well. All its expanded wartime needs for the material were met. *Ersatz*, or artificial, was no longer a term of opprobrium in Germany when applied to the miracle of chemistry that transformed coal into forms of desperately required ingredients of war. German chemist Fritz Haber won a Nobel Prize in 1918 for his work in coal synthesis.

Production of synthetic oil remained an insoluble problem during World War I, even though the Germans had demonstrated how coal could be synthesized into liquid fuels years before. Indeed, a French chemist, Pierre-Eugène-Marcellin Berthelot, performed the first such successful experiment in 1869, and the Germans had been the most assiduous of all in perfecting the process.

It was not until after World War I, however, that the first synthetic-fuel plant was constructed in Germany. The facility at Mannheim-Rheinau (now Rheinau) was producing 250 barrels of ersatz oil daily in 1921. Though the output was small, the plant demonstrated that the process was feasible and that simple, expanded replication was possible. The primary products flowing out of Mannheim-Rheinau were an automotive gasoline with a 72-octane rating and, with additives, a fuel of aviation quality.

Commercial development lagged nonetheless. Two competing coal liquefaction processes, named for their developers, Friedrich Bergius and Frans Fischer-Hans Tropsch, vied for markets, but few buyers existed, within or outside Germany.

In 1925, the government of the Weimar Republic evinced an interest in commercial-scale synthetic fuel production. There was a clear need by a burgeoning industry for domestic fuels of any kind. Germany's few crude oil fields were producing a paltry 600 barrels a day, an almost negligible percentage of national needs. In contrast, primarily agricultural Poland was producing 10 times as much oil that year. Costly imports and the resulting negative trade balance (a staggering figure of nearly \$1 billion in 1925) were damaging the nation's already crippled economy.

The synthetic-fuel program was bolstered appreciably when the German Defense Ministry declared its support for such developmental projects, particularly those that would produce liquid fuels. In the name of national defense, the military argued that industrial production employing coal liquefaction was "of utmost importance." What was not known then was that the German

officer corps was already secretly planning to rearm, preparing for the day when the imposed peace treaty prohibitions would be lifted—or even if they were not.

The civilians heading the government were not privy to the hatching of the closely guarded remilitarization plans. A 63-division army and all requisite naval and air support elements were envisioned for the time when the new German military force could be unveiled. In early 1925, the supply system staff of the German Army's ordnance office completed the task of outlining what the industrial, munitions, and fuel requirements would be for a military force that large. It concluded that Germany lacked the requisite base for so ambitious a plan, and the more realistic concept of a 16-division army was adopted instead. A paucity of fuel was at the heart of the scaled-down force, hence the military's unqualified support and interest in synthetics.⁵

Private companies were not eager to enter the field. Synthetic technologies were expensive to implement and considered too great a financial risk. Capital was scarce. Beset by uncontrolled inflation, Germany was struggling to meet its reparations obligations. Petroleum companies, which might have been thought to be more interested, quickly determined that crude oil prices were only a small fraction of synthetic-production costs and were likely to remain so into the distant future.

Only one group displayed a serious interest in synthetics. That was I. G. Farben, an amalgam of major chemical companies brought together as a war-time expedient in 1916 to produce ersatz nitrates. I. G. Farben was restructured in 1925 and systematically acquired exclusive rights to the Bergius hydrogenation process. Eventually, it would possess 3,000 patents in liquefaction, giving it the greatest concentration of knowledge in the processing of synthetics worldwide.⁶

I. G. Farben took the plunge. On 1 September 1926, it announced that it would build a plant capable of producing 2,300 barrels of fuel daily. The

⁵ Edward L. Homze, *Arming the Luftwaffe: The Reich Air Ministry and the German Aircraft Industry, 1919–39* (Lincoln: University of Nebraska Press, 1976), 22.

⁶ W. R. K. Wu and H. H. Storch, *Hydrogenation of Coal and Tar*, Bulletin No. 633 (Washington, DC: U.S. Bureau of Mines, U.S. Department of the Interior, 1968), 3.

site selected was Leuna, a small town 24 km west of Leipzig where synthetic nitrates had been produced during World War I. Leuna was to become the showplace of the synthetic fuel effort through the end of World War II.

Coal-based oil began flowing from Leuna in 1927, barely a year from decision to production. Lignite from central Germany was used as feedstock, while molybdenum oxide was the catalyst.

Other plants were planned, and I. G. Farben established itself as the clear leader of Germany's industrial rebirth. Other companies enjoyed the I. G. Farben-sparked expansion. It was little wonder that the government began to believe that what was good for I. G. Farben was good for the country. Chancellor Gustav Stresemann stated the sentiment succinctly in 1927, when he said, "What have I as a trump card in my hands aside from I. G. Farben and the coal people?"⁷

The German military, meanwhile, kept urging rapid development of synthetic fuels. An economic staff report stated that when "substitutes for foreign raw materials can be developed only through very expensive processes, these must be supported by army ordnance." Money, in other words, was no object when it came to remilitarization.

In 1930, the *Reichswehr*, Germany's 100,000-man army permitted under the Treaty of Versailles, outlined a program for constructing several large facilities to produce not only synthetic fuels but rubber and fibers as well. The plants were to be located in central Germany, where they would be removed from possible land and air attacks from the east and west.

External factors then almost killed the synthetic program. An international oil glut had been induced by the worldwide economic depression and new discoveries in Texas. Prices plunged. Germany's oil came primarily from Romania and Russia, each of which was competing aggressively for markets by lowering prices to less than \$1 a barrel. U.S. Gulf Coast prices in 1932 and early 1933 actually plummeted to 26 cents. Shipping costs were the prime differential, and determinant, to buyers.

⁷ Victor Lefebure, *The Riddle of the Rhine: Chemical Strategy in Peace and War* (New York: E. P. Dutton, 1923), 206.

As prices collapsed, synthetic fuels became less attractive. The ersatz fuel (which was being marketed in Germany under the brand name *Leunabenzine*) was expensive at \$13.62 a barrel, or about 32 cents a gallon at the wholesale level. That meant the German motorist was paying what they considered to be an exorbitant price. American motorists in 1931, in comparison, paid an average price of 17 cents a gallon at the pump. Generally, synfuel production costs at that time ran six or seven times more than the price of gasoline refined from natural crude. Only government subsidies or tax concessions kept prices for synthetic fuels within reasonable levels at retail.⁸

As a further means of cutting back oil imports, the German government required that alcohol, produced from potatoes, be added progressively to all commercially sold gasoline. The gasohol program helped reduce imports slightly, but it served to aid distressed farmers more. When gasohol was mandated in 1930, potatoes were by far the largest cash crop in the country but lacked a profitable market. Farmers increased their potato yields 20 percent in the two years after the alcohol additive program was introduced.

Coal-made synthetic fuels were losing the fight because of their cost and such measures as gasohol. Ironically, the developer of the most promising process of coal liquefaction, Friedrich Bergius, and the head of I. G. Farben, Carl Bosch, were awarded the Nobel Prize for their work in chemical synthesis in 1931, the year German ersatz fuel plans fell to their nadir. By then, I. G. Farben had invested more than the equivalent of \$120 million and was considering dropping all hydrogenation work.

Funds for further development by I. G. Farben and other firms were no longer available as the full fury of the depression hit Germany. Private investment in synthetics by 1932 amounted to only \$3 million, down from the 1929 high of \$23 million. The German government tried to help the industry by imposing import fees on gasoline, and in 1932 the duty was raised to an equivalent of about \$6.50 a barrel.

⁸ Terry Hunt Tooley, "The German Plan for Synthetic Fuel Self-Sufficiency, 1932–1943" (unpublished thesis, Texas A&M University, 1978).

I. G. Farben said it needed more direct assistance from the government to sustain its synfuels work. Officials argued that foreign exchange was being saved by substituting the country's products for foreign oil, even if the final cost of the finished product was higher. They sought direct price supports and capital assistance from the German Economics Ministry. Tentative negotiations were being conducted in January 1933 when Hitler came to power.

Hitler wanted a Germany on wheels. He was committed to the "motorization" of Germany, and after only a few months in office he ordered plans for mass production of the Volkswagen (unveiled in February 1939 to sell for the equivalent of \$395). He also promoted the autobahns, limited-access superhighways without speed limits. More than 3,000 km of these roads, from the Baltic to the Alps, were serving the German people by 1938. These ambitious programs only increased the demand for oil products.

For I. G. Farben, full-scale development of synthetic fuels seemed truly propitious at last. The first formal meeting between Hitler and I. G. Farben officials took place in 1932 while Hitler was still seeking the chancellorship. Farben's representatives received a sympathetic hearing, unlike their treatment from the Nazi Party press, which railed against the company because of the number of Jews serving in leadership positions within the conglomerate. Hitler began his meeting with the I. G. Farben officials forthrightly: "Today an economy without oil is inconceivable in a Germany which wishes to remain politically independent. Therefore, German motor fuel must become a reality even if this entails sacrifices. Therefore, it is urgently necessary that the hydrogenation of oil be continued."⁹

At the end of the two-and-a-half-hour session, which was mostly a Hitlerian monologue, I. G. Farben pledged to kick in to the Nazi Party's campaign chest. A contribution of \$96,000 was duly made. I. G. Farben, it should be noted, hedged its bets by giving to most of the other contending parties as well.

⁹ Joseph Borkin, *The Crime and Punishment of I. G. Farben: The Startling Account of the Unholy Alliance of Adolf Hitler and Germany's Great Chemical Combine* (New York: Free Press, 1978), 78.

Once in power, the Nazis backed up their interest in I. G. Farben's syn-fuels by embracing the company. The party asked the company how it could help promote the development of synthetics. Like Stresemann, Hitler saw the company as a valuable national asset. I. G. Farben's real backer and supporter, however, was the German military.

In September 1933, I. G. Farben invited the German Air Ministry to invest \$96 million as synfuel seed money. In return, the company would boost its synthetic-fuel production from 11,400 barrels a day to 41,000 by 1936. The military had to guarantee a profitable price and a market for the product for 10 years.

Farben was guaranteed a price of \$7.20 a barrel, an amount substantially higher than the world crude price. The average price per barrel for U.S. crude oil at the well in 1933 was only 67 cents. Even with added transportation costs, American crude oil would have been cheaper, but Germany was still willing to provide a generous subsidy to get industry into high gear.

In 1934, the government undertook a program for storing and distributing synthetic fuels. The Economic Research Association was created as the first step in the centralization and control of the synthetics industry. The association was in fact "merely a facade to mask the war preparations of the Wehrmacht and Luftwaffe."¹⁰ Strategically placed storage facilities were constructed, and a transportation network for supplying the military was designed.

Germany's foreign exchange problem, once a factor favoring synthetics, now mitigated against the fledgling industry. Hjalmar Schacht, head of the Reichsbank and acting minister of economics, sought to cut back all but essential domestic spending. He thought the capital-intensive synthetics program would make it difficult to achieve a favorable trade balance and believed other projects could be developed that would produce positive results faster. This flew in the face of the military's proposals.

¹⁰ Arnold Krammer, "Fueling the Third Reich," *Technology and Culture* 9, no. 3 (July 1978): 394–422, <https://doi.org/10.2307/3103372>.

Luftwaffe officers led the fight against Schacht. The enormous growth of the fledgling air arm under Hitler and Göring only added urgency to plans for stepping up production of aviation fuel. Hydrogenation, the air officers pointed out, yielded far more octane (87 to 89) than conventional crude-based fuel, and the process bypassed complicated refining methods.

The German War Ministry's economic staff urged an accelerated synfuels program in January 1935, but Schacht objected. He could not prevail and in the end lost control over the industry when it was decided to appoint a fuel commissioner. The post went to Göring, head of the Luftwaffe, forever ending the military's concern about priorities in gaining funds for their planes and tanks. When Göring took over, the basis for a synthetics industry was well established. Plants that would yield 31,000 barrels daily were operating or under construction. Still, that was only three-quarters of what I. G. Farben had set as a national goal. German petroleum consumption in 1936 was about 90,000 barrels a day. That amount would have been even higher without stretching gasoline supplies by adding alcohol. Ethanol and methanol as fuel additives had grown to 4,500 barrels a day. Motor gasoline consumed more than one-half of Germany's total fuel consumption.

If further impetus was needed at this time, however, it came from abroad. As the world began to recover from the depression, oil demand grew, and the international oil glut came to an end. Russia and Romania, instead of fighting to sell oil, now hoarded it. Then Germany, already concerned about making up the difference between its fuel demands and production from synfuels and its meager crude-oil output, was struck another blow. On 7 March 1936, German troops occupied the demilitarized west bank of the Rhine in violation of the Locarno Pact.¹¹ Russia responded by cutting off all oil shipments, and Romania increased the price of its shipments. At the time, the two countries were providing 12 and 37 percent, respectively, of Germany's total oil needs.

At almost the same time, another event was reaching a climactic stage, one that had a profound effect on Hitler. Italy invaded defenseless Ethiopia,

¹¹ The 1925 Pact of Locarno was a series of agreements between Germany, France, Belgium, Great Britain, and Italy that mutually guaranteed peace in western Europe.

and the League of Nations revealed itself as impotent. Although branded an aggressor, Italy received little more than a slap on the wrist from the organization. A total arms embargo was declared by most powers (which only deprived Ethiopia of weapons to defend itself), and limited economic sanctions were imposed on Italy.

More than anything else, Italy feared an oil embargo, since it was as dependent on foreign oil as was Germany. But the league specifically exempted oil from its list of restricted items. As Benito Mussolini was to tell Hitler later: "If the League of Nations had followed [British foreign secretary Anthony] Eden's advice in the Abyssinian [Ethiopian] dispute and had extended economic sanctions to oil, I would have had to withdraw from Abyssinia within a week. That would have been an incalculable disaster for me."

Italy's vulnerability to a cutoff of foreign fuel supplies matched Germany's in 1936, and Hitler fully appreciated the consequences of sanctions resulting from remilitarization of the Rhineland. But no coordinated effort by the league or the Western democracies followed.

What Hitler had, and Mussolini did not, was the prospect of sufficient domestic production of substitute fuels to replace imports. That was still in the future, however, and buying petroleum in large quantities remained a necessity.

Germany turned to more distant sources, primarily the United States, Venezuela, and the Dutch West Indies (a.k.a. the Dutch Caribbean), for imported oil. Purchases from those areas jumped 250 percent between 1936 and 1937. Deals were also made to barter industrial goods and newsprint for Mexican oil.

I. G. Farben was sanguine about the future despite the miniature crisis that was swirling through Germany. Company officials assured the government without qualification that all of Germany's fuel supplies could be met through the liquefaction of coal. Apart from the promise of greater government support, I. G. Farben's sense of synfuels as liquids of destiny was encouraged by narrowing costs. In August 1936, the largest of the liquefaction plants was turning out fuel at \$8.93 a barrel. Romanian crude products could be bought for \$6. U.S. landed costs were \$4.75, but the long logistical line from the Gulf of Mexico to Hamburg was of concern to German planners.

New urgency for supplies was prompted by Germany's vast arms build-up. The Treaty of Versailles was renounced, and Berlin proclaimed its inten-

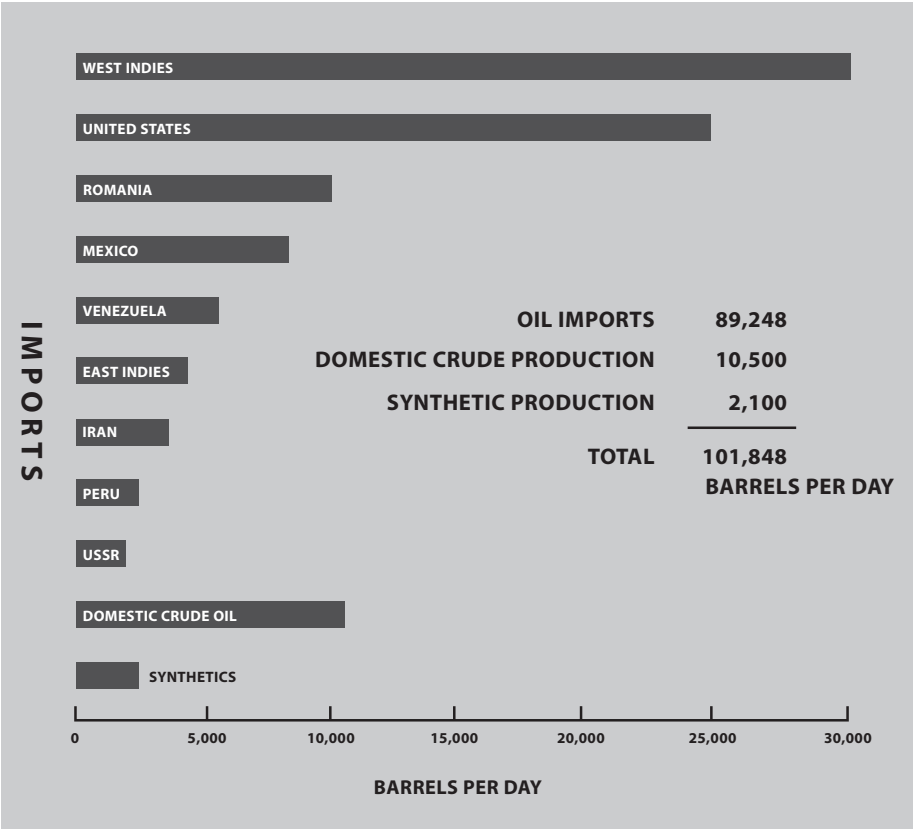
Figure 1.2. Adolf Hitler and Benito Mussolini



Adolf Hitler (right) and Benito Mussolini in Munich, Germany, June 1940. Both Germany and Italy were heavily dependent on foreign oil in the years leading up to World War II. *National Archives and Records Administration*

tion to create a 36-division army of 550,000 troops and 3,200 tanks. Luftwaffe plans called for the construction of 4,500 combat aircraft. While other nations were meeting to limit their navies, the Nazis ordered the creation of a fleet unrivaled in firepower. The most dramatic evidence of the scope of Germany's military modernization program was the development of jet aircraft. Aviation history was written by German scientists and engineers when the world's first flight with a jet engine was made by a Luftwaffe pilot in a Heinkel He 178 before

Figure 1.3. Germany's oil, 1938



Courtesy of William Morrow, adapted by MCUP

the outbreak of World War II. It was no coincidence that the specialists knew that coal-made liquids were ideally suited as jet fuel and easily manufactured.

By September 1936, Hitler was able to put together his master project for self-sufficiency. Ten new hydrogenation plants were to be constructed at a cost of half a billion dollars. Total synfuels production would be 86,000 barrels a day by 1938, or nearly triple what was produced in 1936. “The question of production costs of these raw materials,” said Hitler, “is of no importance.”

As a further incentive to spur synfuels, the government increased the duty on imported oil in December 1936 to the equivalent of \$13.05 a barrel. The action instantly discouraged imports and made synfuels truly competitive. There was also a much smaller tax on domestically produced motor fuels, but this was abandoned a few months later, apparently because it ran counter to Hitler's motorization program. In fact, Germans were extremely Spartan in their use of petroleum products. On an annual per capita basis, each German accounted for only five gallons of oil materials. Britons, by the same computation, were using 3 times as much and Americans 11 times more.¹²

Synfuel expansion was rapid. By April 1938, construction was underway at five more plants, which would assure a daily production rate of 66,000 more barrels.

Domestic crude oil was not neglected or abandoned during this period despite I. G. Farben's claim that synthetics would fulfill the Reich's total needs. The fields of Germany yielded twice as much crude in 1938 as they had five years earlier. A modest but intense exploration period, which was tripled after Hitler gained power, was paying dividends.

While these were solid measures of improvement, some Germans felt they were swimming upstream. The more oil, crude or synthetic, being produced, the more that was being used. By 1938, German consumption had climbed to 150,000 barrels a day, with the armed forces alone using nearly half the total amount.

"Germany," as one study concluded, "could now obtain gasoline out of a coal mine, but more important politically, it could now operate a mechanized army of tanks, bombers and fighter planes with a minimum of natural petroleum."¹³

Historian J. F. C. Fuller was even more succinct when he said that without synthetic fuel the Germans "could not have declared war, let alone waged it."

¹² These figures are for 1938 and are contained in table 2 of U.S. Strategic Bombing Survey, *The German Oil Industry*, Ministerial Report Team 78 (Washington, DC: Government Printing Office, 1947).

¹³ Krammer, "Fueling the Third Reich."

CHAPTER 2



BLITZKRIEG AND OIL

If there were oil fields or refineries to be secured, it was the aim [of Nazi Germany] to bring them into immediate operation.

*~ A. E. Gunthur, **Petroleum Times**, 20 December 1947*

The handful of men assembled at Spandau Barracks outside of Berlin in August 1939 was sworn to secrecy. The reason became apparent when they were told that they would be part of the Galician Crude Oil Commission. Although the operation's name seemed innocent enough to the uninitiated, insiders were busy completing plans for Hitler's invasion of Poland.

The men listened as Major Erich Will explained their mission. Under his command, they would become "oil commandos," advancing with the tanks and troops that would dash southeastward across Poland to capture the coveted oil fields and refineries of Galicia (Eastern Europe). Their task: the technical occupation of the 6,600-square-mile production area. The flow of Polish oil for the Reich was imperative.

A sense of the commandos' importance was evinced in the group's position directly under the German Army High Command (*Oberkommando der Wehrmacht* or OKW). Major Will reported to the OKW's economic section. Each commando had been handpicked from private oil companies and government bureaus. All were specialists in petroleum exploration and production. They would hold no ranks and wear no uniforms but still be integral

parts of the forthcoming invasion. They were told their service would be brief, for Poland would be overrun in a few days in a *blitzkrieg*, or “lightning war.”¹

As a concept, *blitzkrieg* was not new to Germans. Prussian generals in the nineteenth century developed troop mobility as a strategy to fight a multifront war with limited resources. Marshal Helmuth von Moltke the Elder in 1869 and the plan of Alfred von Schlieffen in 1914 embraced and extended the doctrine. With Hitler’s ascendancy to power, the doctrine was refined and adapted to modern weaponry. What made *blitzkrieg* essential to the Nazis was that their resources were even more limited than those of their Prussian forebearers, who had only to find feed for horses. In 1939, Germany’s *blitzkrieg* was based on swift-moving tanks and far-ranging aircraft, both of which demanded quantities of fuel that Germany did not possess. In essence, *blitzkrieg* meant quick victories to be fueled by limited stockpiled materials. A long war had to be avoided at all costs.

Poland was overrun in three weeks. While the world added new words to its vocabulary—*blitzkrieg*, *panzer*, *Stuka*, and *Luftwaffe*—German propaganda led to a distorted and exaggerated picture of what actually took place. Although Germany’s nine armored divisions spearheaded the attacks, most of the German divisions were purely infantry, and the burden of each division’s supplies was carried by the 5,375 horses assigned to them. Many of the horses had been purchased from the British when they began mechanizing in the mid-1930s. In Poland, a constant difficulty arose from the supply of horse-shoes, which were made to fit each division’s garrisoned animals but were too small for the splayed hooves of the horses commandeered by the army during mobilization.

Germany committed 2,700 tanks piecemeal against Poland. Only the XVI and XIX Corps operated as integrated armored units. When tanks entered cities, they were rendered immobile. As a U.S. Army postwar study states: “Full advantage was not taken of the Panzer divisions in the campaign in Poland.”²

¹ The term *blitzkrieg* is said to have been coined by Hitler in 1936. However, some historians dispute this, and there is no consensus on the term’s origin.

² Robert M. Kennedy, *The German Campaign in Poland (1939)* (Washington, DC: Department of the Army, 1956), 131.

Figure 2. German troops in Poland



German troops march through Warsaw after overrunning Poland in three weeks, September 1939. While the rapid victory was largely attributed to Germany's mechanized forces and blitzkrieg tactics, most of the German soldiers who fought in Poland were infantrymen who depended chiefly on horses for transportation.

National Archives and Records Administration

Part of the reason was a German inability to solve logistical problems. Fuel was not readily available, and panzer units in combat suffered from a lack of spare parts for even simple repairs. Each tank was supposed to advance 724 km on its normal fuel load and supplemental containers. Traveling

across difficult terrain on circuitous routes reduced the range significantly.³ Regimental and divisional supply trucks and trains could not be ideally positioned, and the panzers could not get fuel when needed most. There was an overall shortage of trucks to carry fuel, and the 500,000 gallons transported to a storage center near Breslau (now Wrocław) in German Silesia were not available to dry panzers only a short distance away. A panzer division of the XIX Corps ran out of fuel on the second day of the war.

The situation was both ominous and prophetic. Fuel problems would haunt the Nazis to the bitter end. The situation had first surfaced in March 1938 during the occupation of Austria. While no resistance to *Anschluss* (annexation of Austria) was anticipated, Germany felt it prudent to display its might with a show of panzer force.

Lieutenant General Heinz Guderian, principal advocate of a German panzer force, took command of the armored units that would lead the advance to Vienna. Two divisions—the 2d Panzer from Würzburg and the SS *Liebstandarte Adolf Hitler* from Berlin—were ordered to Passau, where Austrian officials had stopped Hitler from crossing the Danube River into his homeland in the 1920s when the German government had ordered him deported.

Immediately, there were problems. After their journeys, tanks of both divisions ran out of gas with 274 km still to go to the Austrian capital, and the officer in charge of the army fuel depot in Passau refused to refill them because he had no orders. Secondly, the panzers would again be short of fuel along the way unless they had extra supplies. Guderian roused the sleeping mayor of Passau to requisition trucks to haul additional gasoline and telephoned service stations in Austria to open up for his armor. Finally, the commanding officer of the 2d Panzer had no maps of the area, and Guderian had to get him an ordinary Karl Baedeker's travel guide to Austria so the tanks could find their way.⁴

Once on the road, even more serious problems developed. At least 30 percent of the tanks broke down because of mechanical failures. Without the

³ A panzer division used 1,000 gallons per mile, twice that in open country.

⁴ Heinz Guderian, *Panzer Leader*, trans. Constantine FitzGibbon (New York: E. P. Dutton, 1952), 33–34.

availability of repair units or spare parts, helpless armored vehicles soon lined the road. Fuel siphoning for refills and communications lapses made a mockery of organization. Fortunately, this all happened along main trunk highways where the population greeted the Germans warmly instead of shooting at them.

The march into Austria was supposed to be an exercise in panzer mobility, but as Guderian wrote later, “Fuel supply had been shown to be a fundamental problem.”⁵

Anschluss with Austria helped fill part of the energy gap. Existing crude oil production and subsequent development of the Prinzdorf field added another 18,000 barrels a day to the greater Reich’s domestic oil production. That output was a far cry from what might have been produced, and the Germans committed an error that was to come back to haunt them. With their faith in synthetics unshaken, German officials were unwilling to devote money and material to boost the Austrian oil output. Hitler said later, “There is no limit to what we could have extracted from the sources in the vicinity of Vienna if the state had undertaken the necessary exploitation in time.”

It was less because of German panzers and aircraft than overwhelming German and then Russian numerical superiority and inadequate Polish equipment that Poland was conquered. Poland’s strategy rested on defending its frontiers, and the surprise attack and subsequent breakthrough fully discredited an already anachronistic military philosophy. Cities and large military centers were bypassed in giant encirclements.

On the surface, it all seemed easy. On 17 September, immense German pincers closed near Brest-Litovsk, ensnaring virtually all that was left of a decimated Polish fighting force. Early that morning, however, Russian forces crossed into eastern Poland. When told that the Russians were in the fight, the German Army chief of operations, General Alfred Jodl, inquired fearfully, “Against whom?” Hitler had not advised his top commanders of the secret agreement he had negotiated with the Russians to partition Poland.

⁵ Guderian, *Panzer Leader*, 35.

Even more surprised were the German panzer and motorized units of the XXII Corps, which had been fighting their way to the Galician oil fields with the oil commandos to the immediate rear. The armored groups were ordered to secure the facilities intact, if possible. When they arrived at Jasło on 15 September, they made their first penetration to those targets. The retreating Poles had attempted to sabotage as much as they could, but most of the structures were intact. The oil commandos quickly assessed the damage, established a field center, and determined what would be needed to bring the wells back into production.

The tanks paused in Jasło only briefly. They moved on that same day to the greater concentration of oil fields farther east. At Winniki, another oil center, they found Russian tanks blocking their path. Soviet armored forces had obviously sped to the Galician production areas in a rush to beat the Germans. They had had to travel only 160 unimpeded kilometers from early morning to win the race. The Germans had fought for 17 days over hundreds of kilometers to reach Galicia—and they lost most of it.

Russia thus held the more productive areas around Drohobych and Stanisławów (now Ivano-Frankivsk), with the San River in that area marking the dividing line between Soviet and German occupied territory. Germany had been counting on the entire production of Polish oil. It ended up controlling only 1,646 producing wells, while Russia held 2,273. And the latter were far more productive, yielding 70 percent of Poland's total production.

Before the war, Poland had produced 10,500 barrels of oil daily. Germany could reap only 3,000 barrels a day from the wells under its control. Full Polish production nearly equaled Germany's own output of crude. If the Germans had taken possession of all Polish oil in 1939, that amount would have supplied about 7 percent of Germany's total military and civilian needs, and the Nazis could have systematically exploited Poland's known reserves. Such exploitation was the function of the oil commandos, but they were limited to west Galicia.

Their work was more than satisfactory from a German point of view. New wells were drilled after existing production facilities had been repaired. By 1940, when the oil commandos had returned home to their civilian jobs and turned the west Galician fields over to a consortium of four German oil

companies, the fields were producing more oil than in the immediate prewar period.⁶ Authorities in Berlin were so pleased that the OKW planned the formation of another group of oil commandos for the invasion of France and the Low Countries (Belgium, the Netherlands, and Luxembourg).

There was special significance in German preparations to capture the French oil fields. In their minds, they would be taking back only what rightfully belonged to them. All the oil produced in France at the time came from Pechelbronn (now Merckwiller-Pechelbronn) in Alsace, a region lost to France in border adjustments after World War I. Pechelbronn, and Alsace, had been under German control from 1870 until 1919.

As plans advanced in Berlin for the invasion of France, a survey was conducted for specialists on French oil fields. Without difficulty, seven men working for DEA Deutsche Erdöl A.G., one of Germany's "Big Four" oil companies, were tracked down and earmarked for a return to Alsace, where they had worked in Pechelbronn when it was German. DEA Deutsche Erdöl, in fact, had been the major operator in the Pechelbronn fields before 1919, and it was not difficult for the Nazis to win the company's agreement for a temporary assignment. Not only were these engineers and production specialists experts, but their expertise extended right to particular fields and facilities they would be working.

These seven veterans of the French fields became the core of the large professional force that was constituted as the Pechelbronn Crude Oil Commission. As in Poland, they would be under direct military control but would not wear uniforms. They were poised to move in behind the troops and "to get the Pechelbronn oil fields and refinery working at the first opportunity."⁷

⁶ Details of the oil commando operations are available in German World War II documents held by the National Archives and Records Administration, Washington, DC, and in a 16-part series by A. E. Gunther, "The German War for Crude Oil in Europe, 1934–1945," which appeared in the *Petroleum Times* of London between 8 November 1947 and 8 May 1948. Production figures were also drawn from postwar statistical data published in various publications of the U.S. Department of the Interior and the American Petroleum Institute.

⁷ A. E. Gunther, "The German War for Crude Oil in Europe," *Petroleum Times* (London), 13 March 1948.

France and the Low Countries were invaded in May 1940. This time, it was blitzkrieg to near perfection. One of the ironies of that lightning strike was the employment of panzer warfare to its fullest potential against the French. France was the first nation to embrace armor as a major military entity, equipping a cavalry division with tanks in 1935. An obscure colonel, Charles de Gaulle, promoted the creation of such units, and his views were at last gaining currency. But French military habits were not changed easily. No more armor divisions were created until 1939. The tradition-minded French Military Command seemed content with only the token gesture toward modernization and even failed to take into account the means to combat the armored forces that other countries began developing. The French never bothered to produce antitank mines, and while they ordered the manufacture of antitank guns, a shortage existed in 1940 because the bulk of these weapons had been exported. Above all, though, was the French insistence that it would fight at the Maginot Line, a fixed-defense mentality. The fortification had no place in modern warfare, but the French would not believe it.

Germany massed 94 divisions along the western front for its attack. Only 19 of them faced the Maginot Line. The rest were arrayed along the borders with Luxembourg, Belgium, and the Netherlands to sweep around the archaic fortress that confronted them along the length of the French boundary. The Germans struck on 10 May, led by 10 panzer divisions—all that the Wehrmacht could assemble. For this campaign, Germany used its armor in brilliant fashion. The panzers broke through thin defense lines manned by numerically inferior Allied forces and enveloped them with breathtaking speed and surprise. In the original plans, the German tanks were to reach the Meuse River in five days; they arrived in three. French Army general Maurice Gamelin, commander in chief of all Allied forces, vainly issued orders to halt the advance: “The torrent of German tanks must finally be stopped.”

They were not, and on 20 May, panzers reached Noyelles (now Noyelles-sur-Mer), France, on the English Channel coast. In less than a month, the Germans consolidated their victory.

A total of 2,574 tanks were used to gain control of France and the Low Countries. More than 4,000 fighter planes and 2,000 bombers of the Luftwaffe joined in the blitzkrieg. Fuel was expended at a rate greater than at any previ-

ous time in military history but, for once, German tanks and aircraft never ran short. Only the commander of the *2d Panzer Division* complained about shortages and sought to halt his advance. He was ordered to press on. It was his division that reached the English Channel first.

General Guderian, who commanded a panzer corps in the campaign, wrote later: "There was no lack of fuel . . . it was only a question of transport and easy to solve."⁸ The planning for fuel replenishment was more comprehensive and realistic than it had been in the Polish campaign. However, a great deal of improvisation and good fortune made adequate fuel distribution possible. Seven million barrels of oil stockpiled by the French, and lesser amounts by the Belgians and Dutch, were captured by the Germans. The windfall, located along invasion routes, permitted convenient refueling by Nazi panzers. The bulk of the stock remained in storage until drawn down by the Luftwaffe to fight the Battle of Britain.

Germany had also stockpiled vast quantities of fuel for its tanks and planes just within the frontier area before the invasion began. Belgium, as soon as its transportation centers were overrun, served as the main fuel distribution center for the swift German advance. By 22 May, a system operated to bring fuel and other supplies, primarily by rail, from Germany to Antwerp and by barge from Duisburg, the port city at the confluence of the Rhine and Ruhr Rivers, to Brussels. The material was then hauled to unit supply points by truck. The great weakness was finding enough vehicles to complete the distribution process.

Horse-drawn wagons continued to serve as the cornerstone for infantry division support. The animals in each division required a total of 53 tons of oats and hay daily. That feed had to be transported or appropriated along the way. Even the infantry divisions needed gasoline for their motorized vehicles, about 7,000 gallons per division each day. In pure tonnage, a German infantry division required three times as much horse fodder as motor fuel. In the invasion of France, the horse-drawn wagons threatened to disrupt the transportation system. They clogged roads, slowing motorized supply columns.

⁸ Guderian, *Panzer Leader*, 90.

By the end of May, it was apparent that more trucks were needed. The Wehrmacht commandeered civilian vehicles, along with their drivers, and ordered them to assemble at Aix-la-Chapelle (also known as Aachen) to carry supplies to panzer and other mechanized units that had driven well beyond planned resupply points.

Even if the problems worked themselves out through emergency measures and luck, the need for much better logistics soon became obvious. Hitler, with a penchant for detail not common with top military commanders, recognized the faults within the German supply system before his staff and field generals. He ordered a complete overhaul while the war in France was still being fought. Even so, as one writer later observed, “No amount of jugglery was able to make up for Germany’s basic weaknesses such as an insufficiently developed motor industry and an insecure supply of fuel.”⁹

It was the task of the oil commandos of the Pechelbronn Crude Oil Commission to help remedy the problem, but they were delayed in moving to their objective. The fields of Alsace were just beyond the Maginot Line, and the Wehrmacht, flush from its victorious sweep around the static defense line, was in no hurry to penetrate it by frontal assault. The fruits of victory would fall when ripe. Pechelbronn could wait until the once vaunted French defenses eroded to the point where they could be attacked more easily from the rear.

On 20 June, the oil commandos gathered at Landau to accompany the troops who would pierce the Maginot Line. The following day, they drove to the southwest through a 5-km breach in the defense line and arrived early that evening at Pechelbronn. A handful of collaborators greeted them.

The OKW ordered an immediate assault on the oil fields. The area was occupied without a shot fired. Sixty soldiers on motorcycles, two tanks, two artillery pieces, and seven oil commandos riding in two cars took the fields unopposed.

Fighting continued nearby, however, and Pechelbronn’s fields remained under sporadic fire for more than a week because several thousand French

⁹ Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge, UK: Cambridge University Press, 1977), 147.

soldiers to the immediate north held out in some fortresses of the Maginot Line. The oil commandos had ample opportunity, even with the occasional artillery barrages, to assess the extent to which the fields had been damaged by the retreating French.

Demolition squads of the French Army had been assigned responsibility for blowing up the fields and facilities if the Germans threatened to capture them. They botched the job. About 1.5 million gallons of gasoline and other petroleum products were discovered in storage at Pechelbronn. Some wells were untouched. Other facilities were only slightly damaged and could be repaired without difficulty. Well heads were mostly undamaged, and a great portion of production was resumed within a few weeks. Where structures were toppled, new steel derricks were installed within five to eight months. The refinery was at first thought to have been rendered useless, but there, too, the actual damage was minimal. Limited refining operations began within three months, and full capacity was reached in eight months.¹⁰

When Axis forces threatened to seize oil fields, defenders desperately tried to destroy the wells before retreating. It turned out to be a difficult task. Setting the wells aflame or destroying drilling machinery were the least effective methods. Fires could be easily extinguished and aboveground equipment replaced. Other techniques were used with varying degrees of success, though none halted production for more than a few months. The simplest and most common method was filling the well holes with metal junk, but in time the scrap could be retrieved. The best plug was reinforced concrete poured through piping driven through the length of the shaft. Repair crews, however, drilled out the concrete. Flooding with mud and water under pressure was generally effective, though crews—oftentimes under fire—rarely had time to clog the underground oil channels. If done properly, dynamiting ripped holes in the steel casing sunk deep in the earth, permitting water and sand to block and even force back the oil flow. Inexpertly placed dynamite resulted in its full force being wasted in upward and downward blast pressure without the desired sideward force that produced the ruptures. Whatever method used,

¹⁰ Gunther, "The German War for Crude Oil in Europe."

the new operators could resume production just by boring another shaft next to the one sabotaged.

The French made a feeble effort to move some key equipment out of Pechelbronn before the Germans arrived, only to run into the encircling Wehrmacht at Épinal, a few kilometers away. It was a simple matter to truck the material back to the production area.

One final task remained for the oil commandos after the fall of France, but they were too busy at Pechelbronn. When Paris was occupied, other oil experts had to be brought in from Berlin. These men, knowledgeable in various facets of petroleum production and exploration, were dispatched to the offices of private oil companies, foreign as well as French, and oil service contracting firms. There, the Germans scoured files for technical data and other information kept on oil operations and geological surveys in other countries in Europe. Particularly important was material on the Soviet Union. All such papers and documents were collected and rushed to Berlin. Germany was already beginning to look to the east again.

Russia, inevitably, had to become the major source of fuel for the Third Reich. Nazi Europe in 1940 was incapable of producing petroleum in sufficient quantities to sustain itself. Pechelbronn yielded only about one-third as much oil as the Polish wells in western Galicia. As *Fortune* magazine reported during that period, “Of all the liabilities that Hitler acquired when he swallowed Europe at a gulp, by far the most serious was the problem of oil.”¹¹

Germany had already suffered an energy crisis in the bitterly cold winter of 1939–40 before conquering Denmark, Norway, the Netherlands, Belgium, Luxembourg, and France. Conservation measures were mandatory, and civilian consumption was sharply curtailed. Even if Hitler had been able to deliver his low-cost Volkswagens to every German family, there would not have been enough fuel to power them.

The German victories of 1940 were won because the German military turned “scavenger.” By the summer of that year, half of the Wehrmacht’s infantry divisions were equipped with captured trucks fueled with gasoline

¹¹ “The Paradox of Oil and War,” *Fortune*, September 1941, 69.

taken as spoils of war. The Luftwaffe was bombing Britain with French fuel conveniently stockpiled when captured. Europe's transportation network under German control made it simple to move fuel when and where it was needed.

The Reich, it seemed, almost luxuriated in oil. But it was all illusion. Combined consumption by German armed forces from the invasion of Poland to the fall of France amounted to 12 million barrels of gasoline, diesel fuel, and lubricants. That was only 40,000 barrels a day, but it still imposed a drain on Germany alleviated only by newly captured stocks.¹²

Also, Britain was still in the war. Hitler had miscalculated the English determination to go to Poland's aid. From all accounts, he did not believe the British would join in the conflict but would permit him a free hand. Now, even standing by herself, Britain was able to impose a naval blockade that exacerbated Germany's fuel problem. All oil shipments from the Americas, the Middle East, and Asia were denied to the European mainland.

German leaders were faced with a major dilemma. They fully appreciated the longer-term difficulties. As a contemporary report noted, "For upwards of twenty years the military and economic geniuses of the Reich had studied the history of the First World War in minute detail and in planning for victory in World War II they had absorbed one fundamental lesson—that under no circumstances should Germany be forced into a long war."¹³

¹² Van Creveld, *Supplying War*, 145.

¹³ "The Paradox of Oil and War," 69.

CHAPTER 3



OCTANE AND THE BATTLE OF BRITAIN

I think we wouldn't have won the Battle of Britain without 100-octane . . . but we did have 100-octane.

~ **Geoffrey Lloyd, M. P., British Secretary of Petroleum, 1942**

The Luftwaffe entered the war using fuels that were not of the quality of those of their western opponents.

~ **Edward L. Homze, *Arming the Luftwaffe* (1976)**

With the Battle of Britain set to begin, the two sides found themselves in opposite military fuel positions. An ominous supply crisis loomed for the British, while the Germans enjoyed a surplus.

By the summer of 1940, Britain and Germany faced each other with fuel supplies coincidentally reflecting the overall military situation. Germany was triumphant and seemingly invincible. Britain, staggering and facing a cross-channel invasion, mustered its meager resources for a decisive battle.

Britain's prospects were bleak. Its survival depended on oil imports, and the amount of petroleum products and crude oil reaching its shores was dwindling. Stocks would be cut in half by fall when only two-thirds of the requisite imports to maintain minimum levels were expected to arrive. Despite civilian rationing, which began within days of the declaration of war, and other stringent conservation measures, the British viewed the situation with understandable alarm.

Fuel stocks fell sharply in the winter of 1939–40. Tanker losses were staggering. In the first year of the war, 573 British-controlled tankers were sunk,

mostly by magnetic mines strewn by German bombers along approaches to British ports. German attack planes and a growing number of U-boats also menaced oil imports. The relatively safer west coast ports were congested with tankers that had made it through but had to unload at overstrained facilities.

For the first and last time in the war, Germany enjoyed an abundance of fuel. Seven million barrels were captured in France and other countries overrun in the lightning campaign. This booty included about 2 million barrels of aviation fuel, a prize that doubled Germany's stockpile of high-performance gasoline. Synthetic fuel produced for the Luftwaffe approached 17,000 barrels a day, and new plants would shortly triple that output. Germany also enjoyed the benefit of vast quantities of Russian oil obligingly provided by Stalin. About 4.5 million barrels of Russian production had been shipped to Germany by the end of 1940. Long after the Russians joined the Allies and were demanding British and American aid, Winston Churchill is said to have recalled bitterly how the Soviets helped fuel the Luftwaffe during the Battle of Britain and the Blitz.

Britain scurried to improve its position and eventually did. But in one important area—100-octane fuel—the situation remained tenuous throughout the Battle of Britain. The Royal Air Force (RAF), which was destined to be the spearhead of the nation's defense, was threatened with a shortage of the proper fuel to power new planes coming off assembly lines. The genesis of the problem was prewar shortsightedness and miscalculation during which the Luftwaffe won its one and only strategic battle, a single grand victory achieved without a plane in flight or a weapon fired. The Luftwaffe won the infamous Munich Agreement of 1938 for Hitler by its mere existence.¹

In September of that year, after the Nazi Party rally, Hitler declared that he would send his troops into Czechoslovakia unless it ceded territory with German-speaking majorities to the Reich. If Czechoslovakia refused and was

¹ The Munich Agreement was between Germany, Great Britain, France, and Italy, permitting German annexation of the Sudetenland, in western Czechoslovakia.

attacked, France was treaty-bound to come to its aid. Britain and Russia, in turn, under existing treaties, would be obligated to join the French.

Leaders of Germany, Italy, France, and Britain assembled in Munich to see if war could be averted. A document prepared by the German Foreign Ministry but presented by Italy's Benito Mussolini was offered as a "compromise," although it gave Hitler everything he wanted.

British prime minister Neville Chamberlain and French premier Édouard Daladier carefully weighed their decisions. Both knew rejection meant war. They also knew that nations do not accept conflict without reasonable chances of survival. It was known that Germany had only 13 first-line divisions, with another 44 available under full mobilization. The combined strength of Czechoslovakia (which alone had 35 divisions in the field), France, Britain, and Russia was about 300 divisions. Britain and France possessed navies vastly superior to Germany's.

The Achilles' heel of Britain and France was airpower. At the time of Munich, Germany had 1,200 modern operational bombers. Britain could muster only 93 modern fighters and several obsolete squadrons of interceptors for its defense. France was hopelessly ill-equipped to fend off German air attacks with its impotent Armée de l'Air.

No one seemed to doubt the new and mighty Luftwaffe would wreak havoc on London and Paris or any other city it chose to bomb. The "fear of carnage and panic in those cities, more than any other factor . . . caused the French and British air staffs to advise that war should be avoided at any cost."²

Although Britain and France had watched the rapid buildup of Germany's air force, they ignored the threat. By complacency and political neglect, and with minds set on World War I strategies, they permitted the Nazis to gain air supremacy. From 1934 through 1938, Germany produced 21,104 aircraft. Comparably, British output was 8,737 and the French 3,800. Not only did the Germans have a quantitative advantage, but their fighters and bombers were also demonstrably superior.

² Telford Taylor, *Munich: The Price of Peace* (Garden City, NY: Doubleday, 1979), xv.

Chamberlain and Daladier capitulated. Documents and records later showed that the Germans at that time did not intend to attack either Britain or France and probably lacked the wherewithal for such actions.

Both Britain and France, however, were galvanized into massive air modernization programs. Navies and armies were not neglected, but priorities went to air arms. In London, plans focused on the RAF, for as one historian wrote, "Britain possessed not so much an air force as an unformed embryo."³

A vast construction program called "Scheme M" was initiated, made notable by authorizing the RAF Air Staff to order as many aircraft as British frame and engine industries were capable of producing. Foreign purchases were authorized if domestic output fell short of total need. Emphasis was placed on production of Supermarine Spitfire and Hawker Hurricane fighters. Sir Kingsley Wood, then secretary of state for air, said, "I propose to give highest priority to the strengthening of our fighter force, that force which is designed to meet the invading bomber force in the air."⁴

Final plans called for deliveries of 2,529 combat aircraft. It was also decided the planes would be equipped with engines requiring 100-octane fuel. Eight hundred improved Spitfires and Hurricanes were to be operational by 1941 under Scheme M. It was estimated that the RAF would use 15,000 barrels of aviation fuel a day by then, more than twice the amount previously projected. As an official British historian stated: "The prospect of securing sufficient supplies of 100-octane fuel in addition to the 87-octane petrol designed for nonoperational flying looked doubtful when the Air Ministry decided to make a change."⁵ Testing 100-octane in engines had been conducted since 1937, but the work lagged because there were no facilities in Britain to produce octane-boosting additives. Still, opting for 100-octane fuel made sense. The Air Ministry found the new engines, particularly the Rolls-Royce

³ John Terraine, *A Time for Courage: The Royal Air Force in the European War, 1939–1945* (New York: Macmillan, 1985), 70.

⁴ House of Commons and House of Lords Parliamentary Debates (Hansard's), 10 November 1938, vol. 341, 327–443.

⁵ D. J. Payton-Smith, *Oil: A Study of War-time Policy and Administration* (London: Her Majesty's Stationary Office, 1971), 55–56.

Merlins, pushed aircraft to higher performance levels. Fighters using 87-octane had a combat rating of 1,030 horsepower but achieved 1,310 with 100-octane. The extra boost and thrust could be the margin of survival.

Acquiring 100-octane fuel was another matter. Normal refining of crude oil by thermal cracking in Britain employed heat and pressure, but the method did not yield a knock-free aviation fuel. A catalyst was required to boost the octane level. A pure hydrocarbon isooctane blended with high quality crude and tetraethyl was proposed.

For its air modernization program, Britain was determined to be self-sufficient in aviation fuel production while relying on crude supplies from abroad. A special committee from government and industry drew up plans for British production of 16,000 barrels of 100-octane daily to meet RAF requirements. Even planes with fuel requirements of lesser octane were found to perform better with the higher grade. With 100-octane and a simple carburetor adjustment the older Hurricanes, for example, were given an extra boost and performed appreciably better.

By January 1939, the British Committee of Imperial Defence approved construction of a refinery to produce isooctane and 100-octane gasoline in Billingham. By cutting red tape and making priority allotments, production reached 650 barrels of 100-octane daily by the end of the year, demonstrating the feasibility of the refining method.

Billingham was also built to produce high-quality fuel through hydrogenation identical to the German oil-from-coal process. While the British initially rejected this process as economically impractical and strategically undesirable, the Billingham project was a hedge against import uncertainties. In the end, Billingham produced no synthetic fuel.

As large-scale production of synthetic fuel appeared increasingly unrealistic, the British government approved the construction of other 100-octane refineries, selecting Heysham, Stanlow, and Thornton as dispersed sites on opposite coasts to reduce the possibility of total destruction by enemy air attacks.

At that point, what appeared to be an orderly and well-coordinated plan fell victim to vacillation and indecision. No sooner was Billingham in operation than it was converted to produce automobile fuel instead of 100-

octane. The reason was economic. Dollars could be saved by cutting gasoline imports from the Americas. Stringent cost-saving policies also cut into the other 100-octane projects. The Thornton plant was half completed and then abandoned. Work was delayed on the Heysham facility until it was realized that completion would have to be postponed indefinitely because of a lack of materials. Only Stanlow would be ready, but its yield was a paltry 720 barrels a day.

By arbitrary revisions in priorities and budgeting, the British came close to scuttling their entire air modernization program. There had been strenuous efforts to mesh aircraft production with fuel needs, but according to the official British historian, “After the outbreak of war the problem had fallen out of sight.”⁶

Fortunately, the British found they could turn to foreign sources for finished 100-octane fuel. High-quality aviation fuel, conforming to RAF standards, was available in the United States, Iran, and the Dutch East Indies.⁷ All were prepared to provide 100-octane, but each posed levels of transport risk and uncertain assurances of future supplies. The United States was belatedly building up its own air force and would itself need large quantities of 100-octane. Its neutral status and moves toward an embargo on oil exports gave the British pause. Iran had a pro-German government that periodically vowed to end concessions granted the oil consortium controlled by the Western democracies. Japan was threatening Southeast Asia and could easily disrupt supplies from the Dutch East Indies.

In the end, it was the shortest supply line on which the British depended most—the United States, which supplied 53 percent (4,380 barrels daily) of the aviation fuel consumed by the British military in 1940. U.S. oil exports to Britain in 1940 were 325 percent greater than the previous year.⁸

⁶ Payton-Smith, *Oil*, 260.

⁷ The Anglo-Iranian Oil Company had just developed an improved process, which was shared by Allied refiners using similar crude oil. Butylenes and isobutane were combined, producing alkylates rich in isooctanes.

⁸ H. Duncan Hall, *North American Supply* (London: Her Majesty's Stationary Office, 1955), 89.

Figure 3.1. Allied convoy in North Atlantic waters



A North Atlantic convoy sails to the United Kingdom, 1941. The previous year, the United States supplied 53 percent of all aviation fuel consumed by the British military. *National Archives and Records Administration*

British officials, already absorbed with the fuel problem, were unexpectedly confronted with a new set of difficulties. After the outbreak of hostilities, a frenzy of industrial mobilization resulted in mismanagement and waste. The political leadership tried to manage a war for which Britain's industry was ill-prepared. Aircraft production was a major bottleneck. As indicated earlier, Hurricane and Spitfire production was accelerated, and the target date for completion of the Scheme M fighter program was 1941. It seemed a hopeless goal, but the government pushed manufacturers to their limits. The Gloster Aircraft Company factory turned out a Hurricane every four hours by



keeping the assembly line running day and night. The wood and frame structure of the Hurricane made production relatively simple. With the superior Spitfire, however, all-metal construction created production problems and delayed deliveries.

Early Spitfire components were manufactured at scattered plants. When brought together for final assembly, the parts did not fit. Schedules fell behind by a full year. A fully integrated production facility at Birmingham operated by William Richard Morris, Lord Nuffield, apparently was mismanaged, and the government installed the Supermarine Aircraft Company, the original designers and builders, to run it.

When it was realized that Britain did not have the means to build enough Merlin engines, which were standard in all new model RAF fighters, a contract was signed with the Packard Motor Car Company in the United States after isolationist Henry Ford refused to support the British war effort.

Only weeks before Hitler issued his directive opening the Battle of Britain, the first Mark II Spitfires and new Hurricanes were in the hands of the RAF. Original plans called for a total of 292 new fighters to be added by June 1940. In fact, 446 were built, and production rose dramatically during the summer months.

With a combination of good fortune and improvisation, the giant difficulties of fueling the burgeoning fighter force kept pace. Reserve stocks were drawn down without regard for long-term needs, although “long term” then meant the following month. By October, the stockpile was at its lowest level of the war without assurances of future supplies. Still, when new fighters were added to squadrons as replacements for downed aircraft and new squadrons were formed, 100-octane was always available.

Reserve supplies alone did not fuel the fighters. The margin of difference was supplied from abroad. Even though oil imports dropped 30 percent during the Battle of Britain, the safer west coast ports were rapidly being unclogged.⁹ By August, 83 percent of all British petroleum imports were being funneled through them. In normal times, they received only 38 percent.

Ironically, German plans for the invasion of England also worked as an advantage. Diversion of Nazi resources in preassault maneuvering resulted in a small but significant drop in British tanker losses when the German air force and navy dissipated some of its blockading strength.

At the same time, an increasing number of tankers were added to the worldwide runs to Britain. When Norway and Denmark fell to the Germans in April 1940, most of their tankers escaped to British ports. The Royal Navy seized as prize any others it could locate. Nearly 900 tankers were thus added to the British-controlled merchant fleet during the spring and early summer. The windfall could not have been more opportune.

Geoffrey Lloyd’s assertion that without 100-octane the RAF could not have won the Battle of Britain may appear overstated. Facts show it was a realistic assessment of the role played by fuel. Lloyd was British secretary of

⁹ From June through November 1940, an average of 340,000 barrels of oil were brought into UK ports daily. U.S. supplies represented 54 percent of the total; Caribbean, 42 percent; and Iranian, 4 percent.

state for petroleum and chairman of the Oil Control Board and was the one official who saw the unfolding problems and solutions in their full dimensions. His conclusion is supported by Germans and Americans alike.¹⁰

The first German air attack in the Battle of Britain came on 15 August 1940, in Operation Adler (“Eagle”). The Germans flew 1,786 sorties against RAF bases in an attempt to draw British fighters into combat and destroy them. As the RAF scrambled, supply officers and pilots knew they did not lack fuel and that it would be delivered as a matter of course. Few line personnel were aware of how close they came to not getting gasoline as needed. At no time did they experience the frustration and futility of German and Japanese pilots later in the war, who were often grounded by a lack of fuel. Consider what might have happened if the bewildering array of obstacles in the spring of 1940 had remained beyond solution and deliveries of 100-octane had not been made.

About 1,000 RAF fighter planes were lost during the Battle of Britain. Their replacements and the additions to Fighter Command that began arriving by June all had to be fueled by 100-octane. Even the older models were in many cases fueled by 100-octane.

In performance, the 100-octane-fueled aircraft of the British gave the RAF parity, or even superiority, over the 87-octane-powered Luftwaffe fighters. The margin of difference was not fuel alone, but we need only compare earlier Hurricane fighters, built before the Air Ministry decided on 100-octane, and the Messerschmitt 109. The Hurricane fighter was no match. The later Spitfire was.

Adolf Galland, the German fighter ace and general, conceded that the Spitfire was more maneuverable and could climb faster than the Messerschmitt Bf 109 (Me-109). Forty years after the war, Galland vividly recalled a meeting with Hermann Göring during the Battle of Britain:

I remember this very well because it was on the occasion when Göring bawled us out, [Colonel Werner] Molders and myself, for not

¹⁰ John W. Frey and H. Chandler Ide, eds., *A History of the Petroleum Administration for War, 1941–1945* (Washington, DC: Government Printing Office, 1946), 3.

Figure 3.2. British aircraft spotter in London



An aircraft spotter watches the skies over London for German aircraft during the Battle of Britain, 1940. The British Royal Air Force was fortunate to avoid the kind of frustrating fuel shortages experienced by the German Luftwaffe during the campaign.
National Archives and Records Administration

performing in the fighter escort. He said we had to slow down, he was arguing terribly, and I told him that if we slow down to bomber speed we are lost, we are only additional targets for the Spitfires and Hurricanes and Göring said, "That's okay with me. Even better that you fighters are shot down than instead of my expensive bomber pi-

lots with crews." This made me angry and Göring finally finished by asking, "Fellas, what can I do to improve the capability of your fighters to escort?" Molders answered, "I want to have those more powerful 605 engines with 100-octane." Göring took notes. He will get it. Then he asked me, "What do you want, colonel, for your wing?" and I answered, "Please, Herr Reichmarshal, equip my wing with Spitfires."¹¹

Galland blamed the inability of the Germans to use 100-octane gasoline on inferior steel in their fighter-plane engines.

"We had first 80-octane," he said. "We could have gone to 100-octane fuel but this needed specific characteristics in the engine compression and our problem had been all the time the overheating of the engines because we didn't have the exact steel, the proper steel, and we had to use fuel to cool our engines. This means we did inject more fuel than was needed, than was the proper dimension."¹²

In a letter to the authors on 26 August 1985, retired Air Force lieutenant general James H. Doolittle wrote that the availability of 100-octane fuel gave the British an additional advantage over German aircraft.

"I was in England on an inspection trip before we entered the war," Doolittle wrote. "Then, I commanded the Eighth Air Force in England from early January 1944 until the end of the war in Europe. I, therefore, know firsthand that our superior fuel was an important factor in the air war."

In the years between World Wars I and II, Doolittle was a key figure in the development of 100-octane aviation gasoline. He had been an ace in World War I, flying an airplane that used 40-octane gasoline to develop 400 horsepower. While he was manager of aviation for the Shell Oil Company in the 1930s, the industry was breaking through the 100-octane barrier with engines capable of 1,600 horsepower. Doolittle was the key figure in getting Shell, and the industry, committed to 100-octane. It was estimated that about one-half

¹¹ Statement by Gen Adolf Galland, LW (Ret), at the Virginia Bader Aviation Symposium, Alexandria, VA, 2 November 1985, hereafter Galland statement.

¹² Galland statement.

the power boost was directly attributable to higher octane fuel. The spiraling thrust created by engineers, designers, and refiners in those years ushered in a new era of aviation.

By objective consensus, the Spitfire was superior in top speed and in the altitude at which it reached top speed, but the Messerschmitt performed better at all altitudes and at speeds above critical altitude. The reasons for Messerschmitt advantages, however, were not because of fuel. To the contrary, it was 100-octane that made the Spitfire competitive. Messerschmitt built a much lighter fighter. The model used during the Battle of Britain weighed 5,520 pounds at takeoff. The Spitfire's takeoff weight was 6,300. Hurricanes weighed between 6,730 and 6,970 pounds during the fall of 1940. The lighter Messerschmitt resulted from a Daimler-Benz DB 601A engine that had a 25-percent greater displacement than the Rolls-Royce Merlin, even though the engines were of comparable weight.

Rolls-Royce was forced to equalize performance at lower altitudes by increasing manifold pressure. Experiments in 1940 showed this could be done only with a fuel that would tolerate more boost without detonation. The answer was 100-octane. As a Harvard University study concluded, "Fortunately, 100-octane fuel was made standard for service use by the RAF just [in time] in September 1940."¹³ The newer model Spitfires that were going into combat, of course, were required to use the high-grade fuel, and the older Spitfires were put on 100-octane even before September as fast as the fuel was available. Only a minor carburetor adjustment was required.

The advantage of 100-octane was obvious. Until mid-1940, the Spitfire's authorized intake manifold pressure was 42.6 column inches of mercury on 87-octane. With 100-octane, manifold pressure increased to 54.3. The combat rating, as noted earlier, was thus increased by 27 percent to 1,310 horsepower.

¹³ Robert Schlaifer, *Development of Aircraft Engines* (Cambridge, MA: Division of Research, Graduate School of Business Administration, Harvard University, 1950), 221–23.

Unquestionably, German fighter pilots were handicapped during most of the Battle of Britain by their 87-octane gasoline.¹⁴ It carried a B-4 designation. If one examines the few remaining planes on display or photographs of Messerschmitts, an “octane triangle,” about eight inches long on each side, can be seen on the upper portion of the left side of the fuselage directly behind the cockpit. Inside the yellow or red triangles, “87” is painted in black. Fixed directly below the main filler cap, the marker gave ground crewmen extra pause against refueling the fighters with a lesser grade.

A few Me-109 models introduced during the Battle of Britain bore a “C-3” in the octane triangle, designating a 95- to 97-octane requirement. This fuel was available only in extremely limited amounts in 1940. A hurried program to increase octane was started. Not until 1941, however, when the German Focke-Wulf FW 190 *Würger* fighters were made operational, was C-3 produced in quantity. Even then, pilots found they could have used increased octane. C-3 was deficient in its lean range, consuming uneconomical amounts of fuel and consequently reducing range.

In light of Galland’s remark faulting the quality of steel in the engines of German fighter planes, it is interesting that German engineers in postwar interviews complained that engine development was retarded because “fuel quality had always been decided by the Air Ministry and the engines were required to use that fuel.”¹⁵ Limitations on octane set by Berlin were a consequence of Germany’s restricted access to high-grade crude oil and near-total dependence on synthetics for aviation fuel. If Germany had been assured of whatever quality fuels it wanted, more powerful engines using higher octanes would have resulted in planes of even higher performance. Luftwaffe pilots never enjoyed the benefits of extra octane.

¹⁴ This “utility fuel” of the Luftwaffe consisted mainly of naphtha from normal crude oil, mostly Romanian; synthetic “hydropetrol” hydrogenated from coal; and tetraethyl (4.6 cubic centimeters per gallon). It showed 15–18 percent aromatics, chiefly from synthetic material.

¹⁵ U.S. Strategic Air Forces in Europe, *Complete Survey of Aviation Fuel Utilization Research in Germany during the War*, Technical Intelligence Report No. A-480 (U.S. Army Air Forces, 1945).

When the Germans did push for higher octane, it was a direct result of observing the performance of the Spitfires during the Battle of Britain, and they sought to provide equalizing fuel for their own fighters. Nazi officials admitted that air-to-air competition with the Spitfires “undoubtedly contributed greatly to the adoption of ‘C-3’ for combat even at substantial volume sacrifice over the ‘B-4’ [87-octane].”¹⁶

Germany had little flexibility built into its fuel supply system. In the manufacture of fuels, there is a direct relationship between volume and quality. An improvement in one results in a sacrifice of the other unless new manufacturing methods are developed. That, in turn, requires continuing fundamental research, which the Germans did not have the time or resources to pursue. Consequently, when the Germans did decide to bring new, higher octane into use, the established processes and facilities began turning out lesser volume. While no shortage of aviation fuel developed in the first three years of the war, Germany began to feel the pinch in 1942 and never went to 100-octane fuel for its aircraft. An Me-109 flown by Galland when he commanded a unit in France after the Battle of Britain carried an octane triangle of “100,” but it was the exception.

Fuel was also deeply involved in another Luftwaffe failure to achieve air superiority in the Battle of Britain. Because of restricted fuel capacity, the penetration range of the Me-109 into British airspace was extremely limited. With additional fuel tanks, the Me-109’s range could have been extended by 201 km to 322 km.

During one day’s action at the height of the Battle of Britain, a Luftwaffe wing lost 12 fighters because its pilots flew too close to the fuel margin and ran their tanks dry before reaching home bases. Five crash-landed on the coast of France. Seven ended up in the English Channel. One day’s action thus resulted in a loss of more than 10 percent of the unit’s total aircraft. It was an attrition rate the Luftwaffe could not afford and was made more frustrating because the losses did not come as a result of combat. On this particular day,

¹⁶ U.S. Strategic Air Forces in Europe, *Complete Survey of Aviation Fuel Utilization Research in Germany during the War*.

more planes and pilots were lost by running out of fuel than at the hands of the RAF.

Luftwaffe fighters were stationed at 13 airfields in the Pas-de-Calais and several smaller advance fields on the Cotentin Peninsula around Cherbourg. Each Messerschmitt carried an 88-gallon fuel tank. It was sufficient for an action radius of 201 km, or barely enough to reach London from the Calais bases, or slightly beyond Portsmouth for the planes operating from Cherbourg (now Cherbourg-Octeville). Allowing 30 minutes for each leg of the flight to and from target, the Messerschmitts were left with only 20 to a maximum of 30 minutes of actual combat time.

For the Messerschmitts, this time was spent protecting the slower bombers against intercepting Hurricanes and the antifighter tactics of the Spitfires. The Me-109 was the only German fighter then capable of protecting Luftwaffe bombers, which were sitting ducks unescorted.

The problem of range was ignored and, as Martin Caidin observed, "It was one of the major factors in the disastrous defeat suffered by the Luftwaffe."¹⁷

Field Marshal Erhard Milch of the Luftwaffe High Command claimed he urged the use of external fuel tanks months before the Battle of Britain, but he told Hermann Göring that the pilots "were refusing to use the drop tanks unless they were armor plated."¹⁸

Milch's explanation does not ring true. Me-109 pilots could have used the external tanks to reach their targets, jettisoned them on encountering a combat situation, and switched to the internal tank for the rest of the flight. Armor plating would have added weight, but that appears to be an extraneous consideration since the pilots need not have feared using external tanks at all on the relatively safe inbound legs of their sorties.

Galland insists the external tanks were simply not available. Belly shackles for mounting the tanks, which could be jettisoned, and connecting fuel

¹⁷ Martin Caidin, *Me 109: Willy Messerschmitt's Peerless Fighter* (New York: Ballantine, 1968), 77.

¹⁸ Len Deighton, *Fighter: The True Story of the Battle of Britain* (New York: Knopf, 1978), 240.

lines were produced for German aircraft as early as 1935, and their benefits were proven by the Luftwaffe in Spain.

“We had external tanks already in Spain for the Heinkels, Heinkel [He] 51s, but we didn’t have external tanks for the Battle of Britain,” Galland said in 1985. “We didn’t have them in supply. Everything was installed for them.”

The inescapable fact that the Me-109s did not have external tanks, as well as 100-octane fuel, during the Battle of Britain obviously leads to second-guessing. Without the tanks, their time to defend the bombers was disastrously limited. The auxiliary 60-gallon tanks that were finally added to the “G-4” model Messerschmitts in 1943 could have kept each plane in the air from 30 minutes to an hour longer even if jettisoned while approaching target areas. It is tempting to speculate how the battle would have progressed had the German fighters over Britain had both the tanks and higher-octane fuel.

CHAPTER 4

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RUSSIAN OIL

The German Key

To fight, we must have oil for our machine.

~ Adolf Hitler

German general Georg Thomas is remembered best for his role in the abortive plot to kill Hitler in 1944. But his place in history is that he, almost alone, tried to stop Hitler from committing his greatest blunder—the invasion of Russia. Thomas, who directed the Army High Command’s Office of War Economy and Armaments, insistently warned that Hitler courted disaster because Germany lacked the resources to win.

Hitler, who could not accept views that clashed with his own, read Thomas’s reports with rage. The general always bore bad tidings. The situation reached a point where Field Marshal Wilhelm Keitel, chief of the German Army High Command, was forbidden by Hitler “to circulate General Thomas’ ‘defeatist’ reports any longer; they were pure fantasy.”¹

Only once did Thomas even meet Hitler. This single meeting led to the general’s being banished forever from the führer’s presence. Finally, in January 1943, when the folly of the invasion was inescapable to all but sycophants, Thomas was dismissed from his post. Keitel’s parting words to Thomas were, “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 Führer and the Party by expressing those views

¹ Wilhelm Keitel, *In the Service of the Reich* (New York: Stein and Day, 1979), 183.

loud and often. Hitler has made clear he has no use for men who seek continually to instruct him.”²

Thomas seemed an unlikely thorn in anyone’s side. He was almost a caricature of the aging staff officer, somber and cerebral. Thomas was a protégé of General Ludwig Beck, one of Germany’s most respected military leaders who eventually committed suicide to escape execution after joining in the plot to kill Hitler. Thomas served under Beck in the dark days of the skeleton German Army of the 1920s. When Beck briefly became chief of the High Command, Thomas won promotion on the economic planning staff. Thomas still enjoyed his superiors’ confidence even after Beck resigned in protest against the growing role of the Nazi *Schutzstaffel* (SS) in military matters. In November 1939, Thomas was promoted to major general and placed in charge of the army’s economics and armaments division.

His elevation to the influential position surprised many. Thomas was a doubter before the invasion of Poland and had issued cautionary warnings. He feared that shortages in fuel and other supplies would endanger the operation. When his views were presented to Keitel, the chief of the High Command dismissed Thomas’s concerns by assuring him that Hitler could solve any problem.

Thomas again voiced concern about shortages that might develop in the invasion of France and the Low Countries. By now, Thomas was regarded as unduly pessimistic. His Cassandra-like judgments were ignored further when his superiors in the Wehrmacht began appreciating that Hitler’s military strategy was paying dividends. After all, most of Western Europe was in German hands by the middle of 1940.

In July of that year, Hitler decided that Germany would have to capture the Russian oil fields. He began doubting that economic self-sufficiency was possible. On the eve of the invasion of Russia, Hitler was to rationalize and justify his action by saying, “The course of the war shows that we have gone

² Berenice Carroll, *Design for Total War: Arms and Economics in the Third Reich* (The Hague: Mouton, 1968), 2.

too far in our efforts to achieve autarky. It is impossible to produce all that we lack by synthetic processes.”³

So Hitler, who needed oil, chose to get it in Russia. But to get that oil, he required fuel that he did not have. Thomas fully understood Germany’s precarious oil position, but he could convince no one of the reality of the situation.

When Hermann Göring asked Thomas in November 1940 to study what economic problems might arise in a protracted war, the general turned to the task with his characteristic thoroughness. He reported that Germany did not have the necessary resources, and “oil and rubber were the weakest points.”

Thomas was not providing the right answers. He was instructed to reconsider his conclusions and come back with more optimistic ones. The best Thomas could do in his amended report was to say that a short war against Russia was possible, but its success would depend on “preventing destruction of enemy stores, seizing the oil producing areas of the Caucasus without demolitions and solving the transportation problem.”⁴

German troops along the Russian border were then about 1,500 air miles from the Caucasian oil fields, and the notion of scoring quick victories at that distance seemed highly remote. Thomas discussed with Göring the possibility of dropping paratroopers to seize the Russian oil fields as part of the “short war strategy.” The issue became academic when the German airborne force was decimated in the invasion of Crete in May 1941.

In a final warning only days before the Russian invasion, Thomas presented General Franz Halder, chief of the German General Staff, a grim assessment of the fuel situation: “Fuel reserves will be exhausted in autumn, aviation fuel will be down to one-half, regular fuel to one-quarter and fuel oil to one-half requirements.”⁵ Would Germany gamble, given these facts? It did

³ Georg Thomas, “Foundations for a History of the German Armed Forces War Economy,” Microcopy No. T-77, National Archives and Records Administration, Washington, DC.

⁴ Robert Cecil, *Hitler’s Decision to Invade Russia, 1941* (New York: David McKay, 1976), 149.

⁵ Matthew Cooper, *The German Army, 1933–1945: Its Political and Military Failure* (New York: Stein and Day, 1978), 277.

because its leaders, incredibly, believed Russia could be conquered in weeks; Hitler thought the campaign would last no longer than three weeks. Even Field Marshal Walther von Brauchitsch, commander of the German Army, predicted a quick victory: “Massive frontier battles to be expected; duration up to four weeks. But, in further development, only minor resistance is then still to be reckoned with.”⁶ No one argued otherwise, except Thomas.⁷

How did not only Hitler but his top generals as well accept as gospel that Russia could be conquered in another blitzkrieg? Joseph Goebbels wrote that the invasion of Russia “would probably pass into history as the decisive act of this war.” He was right, but for the wrong reasons.

It was an inescapable fact that Germany needed Russian oil. Hitler lost the lion’s share of Poland’s Galician oil when Russia’s army occupied most of the production fields. To get that lost oil, Germany proposed its purchase. German foreign minister Joachim von Ribbentrop flew to Moscow within days of Poland’s collapse to tidy up its partition, with oil high on his agenda. On 29 September 1939, von Ribbentrop and his Soviet counterpart, Vyacheslav Molotov, signed three secret protocols carving up Poland and establishing administrative procedures over newly conquered territories. They also reached an agreement on the sale of Polish oil to the Nazis.⁸

Russia promised to provide 7,500 barrels daily, exactly the production from the eastern Galician fields in Russian hands. Germany would get all of Poland’s production as though it had actually occupied all of Galicia.

By Russian standards, this was a small quantity, for Russia was by then the second largest oil producer in the world behind the United States. Still, Russia was a net importer. Its petroleum consumption was large, stemming from great industrial and agricultural usage, the latter growing out of mech-

⁶ International Military Tribunal, *Trial of the Major War Criminals before the International Military Tribunal, Nuremberg, 14 November 1945–1 October 1946*, vol. 26, *Documents and Other Material as Evidence* (Nuremberg, Germany, 1947), 873-PS.

⁷ Thomas was arrested for his part in the attempt on Hitler’s life but escaped execution. He was detained by U.S. forces after the war as a possible war criminal. He was cleared eventually of any war crimes and released.

⁸ The Moscow trade agreement is covered in James W. McSherry, *Stalin, Hitler and Europe*, vol. 2, *The Imbalance of Power, 1939–1941* (Cleveland, OH: World Publishing, 1970), hereafter *The Imbalance of Power*.

Figure 4. Signing the German-Soviet nonaggression pact



Soviet foreign commissar Vyacheslav Molotov signs the German-Soviet nonaggression pact, August 1939. Within two years, Germany would invade the Soviet Union to conquer its vast oil fields.

National Archives and Records Administration

anization from the 1920s when kulaks killed their horses to protest enforced collectivization and turned to tractors. In 1940, the Russians were forced to impose rationing even though they imported a million barrels of oil from the United States. Exports, even those relatively small quantities involved in the German agreement, did not make sense from a rational planning point of view. Still, for political reasons, Stalin agreed to help the Germans.

As buyers, the Germans regarded the initial agreement as a modest beginning. They were bent on getting more oil from the Soviet Union as well as using the Communists to facilitate the flow of oil to Germany from other sources.

Under the agreement, Russia would provide rail facilities for large volumes of oil from Romania through southeastern Poland in order to eliminate slower and longer sea and river routes to Germany's industrial centers.

Encouraged by Iran's pro-German leanings, Berlin made long-range plans that included imports from Iran's gushing wells, in addition to shipments from unspecified Asian areas, to be carried over Russian railways.

Berlin's petroleum problems in the winter of 1939–40 were acute. Apart from an upsurge in military demand, Hitler was cut off from American oil by the British naval blockade. No petroleum from either the United States or Latin America reached the Reich. Anyone with a world map and the slightest knowledge of existing reserves fully appreciated that Germany had to focus on known Russian supplies.

Any flow of oil from the Soviet Union was a matter of deep concern to France and Britain. Economic warfare experts were truly alarmed when the Russians and Germans announced a greatly expanded trade agreement. Under terms of this pact on 11 February 1940, Russia promised Germany 7 million barrels of oil, plus increased shipments of grain and war-essential metals. Germany, in return, would send manufactured goods, machinery, and military equipment to Moscow. Included in the last category was the pocket battleship *Lützow*, then undergoing extensive modernization and overhaul.⁹

For the Allies, the oil fat was in the fire. A Soviet Union friendly to Germany and providing fuel for use against Britain and France was unacceptable, and the latter two countries were willing to risk war with Russia to stop the flow of that oil. After all military possibilities were examined, the most practical seemed to be air strikes against the Russian oil center of Baku, the Caspian Sea terminal at the heart of the Soviet petroleum industry. French general Maurice Gamelin reasoned that knocking out Baku "could bring the U.S.S.R. to the verge of collapse in a few months."¹⁰

Eventually, planning was extended to include bombing Batumi on the western side of the Caucasian peninsula, and Allied photographic reconnais-

⁹ Originally launched as the KMS *Deutschland* in 1931, the *Lützow* served throughout the war and was scuttled by its crew in 1945.

¹⁰ McSherry, *The Imbalance of Power*, 67.

sance flights were flown in late March and early April. Syria was prepared to handle the bombers while diplomatic negotiations went forward to secure air base rights in Turkey.

Incredible as it now seems, World War II might have been fought with Germany and Russia allied against Britain and France. That certainly would have been the case had the projected bombings of Russian oil fields actually taken place. Hitler was aware of the British and French plans generally and was not upset by the Allies engaging in war with Russia. General Franz Halder, chief of staff of the German Army, wrote at the time that Allied efforts “to allow . . . a break with Russia suit him [Hitler] perfectly.”¹¹

Stalin thought otherwise. He did not want war with Britain and France. Or Germany. Even war with Finland was not acceptable any more. His forces had just been bloodied in the invasion of Finland and withdrawn. Further war with a major military power was unthinkable. A military partnership of Britain and France was too formidable a force for Stalin in early 1940, and he moved to assuage the Allies. He minimized Russia’s trade with Germany and noted that Moscow’s oil and grain exports to Hitler’s Reich were smaller in percentages than Romania’s. Molotov kept declaring Russia’s intention to remain neutral.

The issue became moot with the German invasions of Denmark and Norway. British officials determined that long-range bombers could no longer be spared for duty in the Middle East. The planes, few in number, would be needed in Scandinavia. Still, the planned air strikes against the Caucasus were kept alive by the British, perhaps “in the autumn when the German oil position would be more critical and the Allies—and Turkey—would be stronger.”¹²

Events overtook further consideration. The fall of France left Britain fighting Germany alone and preoccupied elsewhere. Germany and the Soviet

¹¹ Franz Halder, *The Halder Diaries: The Private War Journals of Colonel General Franz Halder, Chief of Staff of the General Staff, Supreme Command of the German Army (OKH)*, vol. 1 (Boulder, CO: Westview Press, 1976), 236.

¹² Ernest Llewellyn Woodward, *British Foreign Policy in the Second World War*, vol. 1 (London: Her Majesty’s Stationary Office, 1962), 31.

Union were thus able to carry out terms of their economic agreement without external difficulties. Those terms were vast in scope. The Russians were to receive the equivalent of \$600 million (1.5 billion reichsmarks or RM) in German industrial production during 27 months. In exchange, the Russians would provide a similar worth in oil and other raw materials for 18 months. In a secret protocol, the Russians also promised to serve as a purchaser of goods from other countries with Germany as the final destination.

Actual implementation of the agreement was beset with problems. Russia was the more ardent of the economic suitors. It was anxious to get on with the trade and eager to receive Germany's arms and machines to begin modernization of its armed forces. At one point, in April 1940, after Russia delivered 812,000 barrels of oil, Moscow said no further shipments would be made until the Germans fulfilled promised deliveries. Germany was dragging its feet. The action made Berlin realize how easily the Kremlin could turn off the spigot.

It was hurting the Germans to send material to Russia. At a time when military planners like General Thomas were pointing out the need to build up armaments and transportation, industrial output was being exported. Oil was considered more important, so Germany resumed deliveries and in return received 427,000 barrels in May and another 714,000 barrels the following month. All was well from either side's point of view.

Again, the question arises of Stalin's willingness to part with his oil. Hitler's military successes of 1940 commanded Stalin's respect. If the German juggernaut rolled through Western Europe, Stalin did not mind. He still believed that Hitler was not anxious to move to the east and that giving the German dictator oil might keep him at bay. Then, too, Stalin wanted to practice a little land-grabbing of his own.

On 14 June 1940, the day German troops entered Paris, Russian forces occupied Lithuania. Within a week, the other Baltic buffer states of Estonia and Latvia fell under Soviet domination. Later that month, Stalin moved to regain possession of Bessarabia and Bukovina from Romania.

The Russian ruler went too far. Romania was comfortably pro-German and providing Hitler with nearly a million barrels of oil a month (about 30,000 barrels a day, or one-quarter of Germany's total needs, military and civilian).

A displeased Germany was concerned with what might happen to those supplies if Romania resisted Russia's claims on the disputed territories.¹³

Germany's dilemma was real. It had secretly agreed to Soviet acquisition of Bessarabia—not Bukovina—but it neither liked Soviet truculence in reclaiming Romanian-held land nor appreciated potential Soviet ambitions to carve out a greater slice of central Europe for itself. Hitler did not want the issue to upset Romania's role as a provider of the Axis. Italy was now in the fold, and the Italians were truly energy poor and mightily dependent on Romanian oil for their armed forces. The Germans also did not relish the thought of Russian troops in Bessarabia, a mere 160 km from the rich Ploesti oil fields and refineries.

Squeezed by its two giant neighbors, Romania had to choose between a rock and a hard place. It did not want to yield territory to anyone and was walking a straight line to remain nominally neutral. Like Poland, however, it was a victim of geographic circumstance. Its resources were coveted.

German diplomats in Bucharest warned Berlin that "a continuous supply of petroleum to Germany from [Romania] is only assured if [Romania] keeps out of any war-like complication." If the Russians attacked, or even hinted at approaching the oil fields, Berlin was advised to expect "destruction of the entire petroleum industry by the [Romanians] and the English."

The mention of the English refers to one of the curiosities of the period. Much of the Romanian oil industry was still under British control. In the spring of 1940, Britons were still operating the Romanian oil fields, in effect producing and refining oil for Germany to be used against their own country.

Officials in Budapest applied pressure on the Germans to help Romania against the Russians. In late April, the head of the Romanian national police force told the Germans, "If the Russians approach our oil we shall destroy it . . . also, if Germany attacks us we shall destroy the oil."¹⁴ Such unambiguous statements bordered on blackmail: Help us, but do not do anything precipi-

¹³ "Oil as a Factor in the German War Effort," in *Report of the C.O.S. Technical Subcommittee on Axis Oil* (London: Offices of the Cabinet and Minister of Defence, 1946).

¹⁴ *Documents on German Foreign Policy, 1918–1945*, ser. D, vol. 9, *The War Years, March 18–June 22, 1940* (Washington, DC: Department of State, 1956), 469.

tate yourselves. Romania was clinging to a bare chance of controlling its own destiny.

In the end, Germany told Romania it would be best to yield to the Russians and do so without further recrimination, certainly without military resistance. For the sake of oil, Romania was reduced to a rump state, chopped in size to 88,000 square miles from 114,000 and in population to 13 million from 20 million.

Italy was just as eager to keep Romania's oil flowing. Its foreign minister, Count Galeazzo Ciano, visited Hitler at Berchtesgaden in late June to discuss the carving up of Romania and their concerns centered on oil. As Ciano recorded in his diary, "A general conflagration [would mean] the oil wells would not only be shut down for some months but would be destroyed forever."¹⁵

Even though the storm passed, Hitler, for one, was not comforted by what he considered Russian "adventurism." He underscored his fears about losing Romanian oil fields on 28 August when he ordered six armored and motorized divisions to stand by for possible occupation. Hitler felt responsible for preserving the fields and declared that Germany "will not be frightened off by anything from protecting German interests there."¹⁶

It is no coincidence that within weeks after Germany reluctantly acquiesced in Russia's demands on Romania, Hitler irreversibly turned to his invasion of the Soviet Union. Stalin's machinations rekindled every hatred and prejudice that Hitler harbored for the Russian leader and the Russians in general. In July, Hitler ordered his generals to plan a massive assault on the Soviet Union. By mid-September, he had abandoned his plans to invade England and was directing his full attention and resources to the Russian conquest. Moving east was more alluring than crossing the English Channel:

The gigantic territory of Russia conceals immeasurable riches. Germany will dominate it economically and politically although not annex it.

¹⁵ Galeazzo Ciano, *The Ciano Diaries, 1939–43: The Complete, Unabridged Diaries of Count Galeazzo Ciano, Italian Minister of Foreign Affairs, 1936–1943*, ed. Hugh Gibson (Garden City, NY: Doubleday, 1946), 287–88.

¹⁶ McSherry, *The Imbalance of Power*, 138.

Thereby, Germany will have all the means possible for waging war against continents at some future date. Nobody will then be able to defeat her anymore.¹⁷

Plans for invading the Soviet Union conflicted with fulfillment of Germany's trade agreement with Moscow. How could one hand grip a knife while the other proffered arms to the intended victim? In August, Germany was already seriously behind promised deliveries. That month the Russians supplied Germany with the equivalent of \$26 million (65 million RM) in oil and grain, while the Germans were shipping goods equal to only one-third of that amount. Overall, since the treaty was signed in February, Russian deliveries amounted to \$120 million (300 million RM), but the Germans delivered only half that amount.

It was not until October that Germany seriously resumed large-scale shipments, and then only after Göring went to Hitler and warned that Moscow would cut off oil and other goods unless the situation were corrected. Hitler ordered prompt action on all outstanding items scheduled for delivery. By meeting export quotas, the Nazis would assure themselves monthly deliveries of 700,000 barrels of oil, with an emphasis on stockpiling.

German concerns about losing Russia as an oil source, albeit temporarily, were very real. Hitler placed the need for fuel and other vital materials over the thoroughly repugnant export of arms and war material to a soon-to-be-faced enemy. His choice can only be seen in the context of the nightmarish task confronting German military planners. It was General Thomas who provided the Nazi leader with the grim facts.

It was calculated that a total of 150 divisions would be needed to advance into the Soviet Union (144 were actually employed). Fuel requirements were initially estimated to be 65,000 barrels a day, or 45 percent more than had been consumed by the entire German military since September 1939. As the invasion drew closer, the anticipated fuel usage was increased to a more realistic figure of 110,000 barrels a day for the army alone. The Luftwaffe would need another

¹⁷ McSherry, *The Imbalance of Power*, 183.

50,000 barrels daily. It was a rule of thumb that a Messerschmitt Bf 109 fighter plane required 100 gallons of fuel to remain aloft for one hour; other aircraft requirements were similarly measured.

Panzer forces were being increased as fast as possible. A German tank consumed two gallons of fuel to advance 1.6 km; however, that consumption ratio did not take into account the fact that only 3 percent of the roads in the Soviet Union were then hard-surfaced. Such realities prompted a surge in stockpiling. The German planners believed that, even under the most optimistic conditions, the Russian campaign could be launched with only enough fuel for 60 days of sustained attack. Simply put, the blitzkrieg—a short campaign—had to work, or victory would be impossible.¹⁸

When detailed planning began in August 1940, Germany had only nine armored divisions and 3,420 tanks. The number of divisions was to be increased to 19 before the operation, and another 13 divisions of motorized infantry were to be assembled. Each armored division was to be equipped with 160–200 tanks. Production had to be increased rapidly to meet the quotas.

There was no room for optimism of the kind expressed at the highest levels of the Nazi hierarchy. It seemed unlikely there would be enough fuel for the mechanized forces or for transporting goods by truck. Further, Russian roads were notoriously bad, and wide-gauge Russian railroads would be useful only when the entire system was adapted to handle standard-gauge German tankers and freight cars.

With prospects for oil bleak, German officials imposed stiff conservation measures at home, and draconian steps were inflicted on the occupied countries. For example, France, Belgium, Luxembourg, and the Netherlands together consumed 200,000 barrels a day in peacetime. Under Nazi rule, their ration

¹⁸ Comprehensive figures on the strategic and tactical oil considerations are contained in the various publications of the U.S. Strategic Bombing Survey, which were published in the immediate postwar years. The specific sources for much of the material in this section were drawn primarily from U.S. Strategic Bombing Survey, *Effects of Strategic Bombing on the German War Economy* (Washington, DC: Government Printing Office, 1945); and U.S. Strategic Bombing Survey, *Oil Division Final Report* (Washington, DC: Government Printing Office, 1947).

was slashed to 60,000, barely enough to keep farms and factories functioning even though the output was earmarked for Germany.

Efforts were extended to draw more petroleum from fields under German control and from Axis partners. Hungary was producing 4,100 barrels daily in 1940, up from 100 in 1936. Romania in November 1940 was sending Germany 60,000 barrels a day, or 54 percent of its total production. Germany was getting 23,500 barrels of Russian oil each day that month.

The arithmetic of oil at the end of 1940 did not add up to self-sufficiency. By then, Germany had the production of 234,550 barrels of oil under its control each day. It needed, by the standards of the last year of peace, a total of 575,000. That was the consumption in 1938 of the Axis nations and those lands that were to fall under Hitler's domination in the first year of the war. The Axis empire now stretched from Arctic Norway to the Mediterranean, from the English Channel to the Bug and San rivers in Poland. That vast area had not been energy sufficient in normal times. Its needs had been filled by importing about 60 percent of oil consumption, mostly from the United States and Latin America.¹⁹

Even the need for 575,000 barrels a day in Hitler's Europe was a bare minimum figure, sufficient only for maintaining an economy of peace. A nation at war, according to the experts, would require a doubling or tripling of oil requirements, estimates that proved to be remarkably accurate.

To help ease the situation and prepare for the future, the Germans began a gigantic fuel-saving campaign. Construction of the autobahns—built, ironically, because of the breakdown in Germany's rail system in World War I—was abandoned. Freight normally carried by trucks was diverted to rail and inland waterways.

German cars and trucks were converted to use "gasogenes," wood- or charcoal-burning units that generated combustible gases. Alcohol and benzine were added to gasoline to stretch oil supplies for unconverted vehicles. Castor and olive oil substituted for oil-based lubricants. Such actions, it was felt, might drop total Axis civilian oil use to 315,000 barrels a day, 87 percent of what the Axis could produce in natural oil. Synthetic production could bring

¹⁹ "The Paradox of Oil and War," *Fortune*, September 1941, 69.

total supply and demand into a precarious balance, but there was no margin for disruptions or unexpected cutoffs of any kind.

The situation was complicated further by Hitler's decision to go to Mussolini's aid when the latter's armies were routed in North Africa and the Balkans. German troops landed in Tripoli on 13 February 1941, and they invaded Yugoslavia and Greece on 6 April, all moves that required oil.

Meanwhile, rumors of a German invasion of Russia flooded the world. Stalin, for one, refused to place credence in them, and though there were difficulties in carrying out the terms of the German-Russian trade agreement, Moscow kept delivering. April 1941 oil deliveries to Germany were set at 637,000 barrels, and Stalin lavishly promised greater quantities in the future. He seemed convinced that Germany would not attack the Soviet Union because of the economic dependence he wished to foster. He was mistaken.

The Germans, as the invasion approached, reneged on an obvious scale in promised deliveries. Work on refitting the pocket battleship *Lützow* was halted. Shipments of machinery slowed to a trickle.

Nazi leaders filled themselves with hopes beyond expectations. Hitler had not deluded himself alone. He had, as General Heinz Guderian would recall later, "succeeded in infecting his immediate military entourage with his baseless optimism . . . the Supreme Command was sunk in its dream of defeating the Russian army in eight or ten weeks . . . it all seemed to be so well thought out and delightfully simple."²⁰

All available data pointed to a bleak if not hopeless outlook completely contrary to the confidence exuded by Hitler and his top commanders. Fuel, as General Thomas had demonstrated, would be a serious problem. Hans Kolbe, who spied for the United States throughout much of the war from his post in the Foreign Ministry in Berlin, said, in a postwar interrogation in Wiesbaden on 23–24 September 1945, that he believed Göring and Martin Bormann exercised the strongest influence on Hitler to invade Russia.

²⁰ Heinz Guderian, *Panzer Leader*, trans. Constantine FitzGibbon (New York: E. P. Dutton, 1952), 150–51.

"The German need to obtain Soviet oil was deemed the primary reason for the attack," the transcript of the interrogation said in summarizing Kolbe's remarks. "Since the Soviet deliveries were insufficient to satisfy German demands for bringing the war [in the west] to a conclusion, the only recourse appeared to be the seizure and exploitation by the Germans of oil resources in the Soviet Union."²¹

Kolbe said the attack was made despite advice against it by officials in the German embassy in Moscow, including the ambassador, Count Friedrich Werner von der Schulenburg; the military attaché, General Ernst Köestring; and an economic expert on the Soviet Union.

Such pessimism was countered with prideful predictions of what was more likely to happen in the campaign. Large amounts of Russian fuel would be captured, said generals standing before large battle charts. But it was known that even if stockpiles were seized, Russian fuel was extremely low in octane and would require a benzol additive before use by German vehicles. Benzol was stockpiled but would not be available to units on a regular basis. Plans were made to transport Romanian oil directly to the front, but trucks were not available to do so in sufficient quantities despite a flurry of truck buying in Switzerland in the spring of 1941. Civilian trucks were commandeered in Germany; captured French trucks were given to their owners in exchange. Tires were in such short supply that steel rims were used as substitutes. Production of rubber soles for shoes and boots was stopped. Seventy-five German infantry divisions were each given 200 peasant carts, called *panjes*, to carry their loads.²²

Germany's gamble was for a quick victory. Unless it could win in blitzkrieg fashion, it could not win at all. Russia's resources had to be captured within months, or they would not be taken at all.

It was shortly after midnight on 22 June when a long freight train halted at Russian and German checkpoints outside Brest-Litovsk. Border guards let the train pass after checking papers that showed the cars contained 21,000 tons

²¹ Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, 1945–1947, Record Group 238, National Archives and Records Administration, Washington, DC.

²² Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge, UK: Cambridge University Press, 1977), 142–45.

Map 4. Axis fuel sources prior to the German invasion of the Soviet Union



Courtesy of William Morrow, adapted by MCUP



of raw rubber destined for the Reich. The rubber had been purchased by the Japanese in Malaya, shipped to Vladivostok, and then hauled over the Trans-Siberian Railroad under terms of the agreement signed by Ribbentrop and Molotov 21 months earlier. The German train crew knew it was hauling rubber but was probably unaware of how desperately German factories needed the raw material. No natural rubber reserves were left in Germany, and the industry was falling far short in producing synthetics to meet the large military and civilian need. Even so, the train sped west after leaving Brest-Litovsk as if the crew fully appreciated the urgent need for its cargo.

The tracks were clear for westbound traffic. Eastbound lines, however, were clogged with military traffic on a scale never seen before. Troops in their summer gear were headed east and would cross into Russian-occupied territory at 0415. The biggest military operation in world history was about to begin.

CHAPTER 5

THE RUSSIAN CAMPAIGN

The war was decided by engines and octane.

~ Joseph Stalin

All evidence to the contrary, the myth persists that Nazi Germany's army was a mechanized marvel. Postwar literature depicts an indomitable force overwhelming its enemies in lightning strikes. Tactical successes were achieved by German panzers, but their exploits have been magnified and misrepresent the reality of battle. After 1940, the panzers were constantly short of fuel and constituted a small—though feared—part of the Wehrmacht. Blitzkrieg was a fizzle after 1940.

When Hitler invaded Russia, the German Army was equipped with a total of 600,000 motorized vehicles. That same army's mobility, however, was severely circumscribed by its dependence on 650,000 horses attached to its 134 field divisions. Only 17 divisions were armored, and 13 more were motorized infantry. The bulk of the force that invaded Russia was little changed from the kaiser's army that fought in World War I.

Most German soldiers had to walk, with their supplies carried on horse-drawn carriages. Some studies conclude that 70 percent of the Wehrmacht's movement was horse-pulled, not horse-powered.

Horses had been an integral part of warfare thousands of years before Christ when the Mesopotamians and Egyptians used them to draw chariots as attack vehicles. By World War I, the Germans alone used nearly 1.5 million of the animals. That figure almost doubled by World War II, when 2.7 million horses were employed on all fronts by the Wehrmacht. On the aver-

age, 1,000 horses died each day of the four-year-long campaign in Russia, most of them killed by artillery and air attacks.

The typical German division in 1941 was supposed to be equipped with 1,400 motor vehicles and 820 to 1,200 horses. The horses' chores were divided almost equally between pulling artillery and hauling supplies. Battalions were equipped with five field kitchens, each pulled by a team of four horses. A battalion had only six light trucks as standard equipment for all other functions. It was not uncommon for infantry to be pressed into service alongside horses to pull supply wagons and artillery pieces across soft sand and dirt roads in Russia.

In operations, the usual practice was for horse-drawn vehicles daily to supply food, fuel, and ammunition needs, with motorized transport commanded by the division bringing up supplies from the rear for the next day's action.

Cavalry regiments, which were still common in the German Army of 1941, were allotted 302 horses each. A normal infantry regiment required about 150. As cavalry troops were mechanized, they found only a diminished need for horses.

Shortages of the pack animals persisted throughout the Russian campaign. During the deadly winters, horses were particularly susceptible to cold, and their death rate when exposed to subfreezing temperatures was far greater than that of humans.

Germany's large horse force required extensive veterinary care. Six officer-doctors and 228 enlisted troops from the veterinary corps were attached to each German infantry and nonarmored division. While a portion of their work was tending messenger dogs (although these were being phased out of service in 1941 with the arrival of radiotelephones) and pigeons (100–200 were assigned to each division's signal section and carried in special mobile lofts), their main activity was horse tending.¹

¹ *Handbook on German Military Forces*, U.S. Army Technical Manual 30-450 (Washington, DC: U.S. War Department, 1941).

Divisional animal hospitals were charged with caring for all sick and wounded animals and receiving captured horses. Horses taken in combat or seized as booty were examined and if deemed fit for service were reshod and inoculated. Russian farm horses, acclimatized and exceptionally durable, were prized. Each hospital could handle 500 horses at a time. Special rail trains were established to move horses, each capable of hauling 360 of the animals to or from a railhead. Heart and respiratory problems were common among horses that were pushed to uncommon exertion levels. Mange and lice infestations required constant treatment.

Dependence on horses multiplied the logistical supply problem. Every horse required about 20 pounds of oats and hay a day. The normal division thus needed at least 33 tons to feed the animals, or 21 tons more than total food rations for the troops. Fuel requirements for that same division's motorized vehicles came to 20 tons. Horse feed required 275 percent more tonnage than human food supplies and 165 percent more than a division's fuel needs.

A ton is a ton, of course, whether it be meat, hay, gasoline, or oats, but a ton of human food or fuel took less shipping space than horse feed. Volumes were important. A ton of gasoline was 335 gallons and in bulk was less than five cubic feet in volume. A ton of mixed hay and oats, on a nine-to-one ratio, was 500 cubic feet, which commanded a disproportionate amount of shipping space. Germany's supply difficulties were compounded enormously by having to provide 3,000 tons of horse feed daily to its dispersed divisions. In turn, scarce fuel was expended bringing animal food forward. It exceeded the amount used for hauling both troop rations and fuel needed for battle operations.

Supply officers and planners would have preferred a higher level of mechanized support for fighting a modern war, but that was beyond Germany's industrial reach and resources. Inadequate supplies of fuel and incompetent meshing of vehicle production with demonstrated needs forced the army to restrict its mobility. Panzer units in combat were capable of advancing up to 97 km daily before refueling. Ordinary infantry groups could go only half that far. As had been demonstrated in France, armored forces regularly had to wait for the infantry to catch up in order to not risk encirclement. Investing a town or village meant the tanks had to sit dan-

gerously exposed until the infantry came in to clear out all resistance. The Molotov cocktail came into being under those conditions when Stalin invaded Finland.²

Shortcomings were pointed out to higher commands, right up to Hitler, but they were ignored. There was a blind faith that somehow everything would fall into place in the Russian campaign. Generals who once questioned Hitler's military acumen and strategic concepts were by the summer of 1941 awed by Germany's achievements and unwilling to confront him with hard facts that undercut his grand design for a quick victory over Russia. Hitler remained contemptuous of those military planners who presented numbers that pointed to dire consequences. At one point he remarked, "General staff officers do too much thinking for me. They make everything too complicated."

As the invasion began, oil was in short supply, and the gamble of reaching the Caucasian oil fields in time to replenish the Wehrmacht and Luftwaffe was risky at best. Even if fuel had been available in quantity, there were not enough vehicles to go around. Trucks and other forms of transport were not being manufactured fast enough to meet the military's basic requirements. They were low on the production priority list, competing with other war needs from Germany's resource-poor and manpower-short fabricating plants.

Trucks, such as the basic Krupp heavy-duty military model, remained scarce and unavailable to combat units requesting them. In early 1940, the Wehrmacht resorted to a "demotorization" program. Dispersal of available vehicles to meet the minimum mobilization needs at battalion and regimental levels meant fewer trucks and cars than had been originally authorized on a unit basis.

The following year, a further reduction in motor vehicle allotments was ordered. More than 2,000 trucks were lost to the army between the French and Russian campaigns through normal wear and tear, but only 1,000 replacement vehicles had been built. Only large numbers of captured French, Dutch, and Belgian vehicles and civilian vehicles commandeered in Germany per-

² The term *Molotov cocktail* refers to a crude incendiary device, such as a bottle filled with flammable liquid and wick, and was named for Vyacheslav Molotov.

mitted the army to maintain a minimum level of motorization. Shortly before the Russian invasion, about 40 percent of the vehicles operated by Germany's 88 infantry divisions were confiscated or captured civilian cars and trucks.

Germany, always sensitive to its military fuel needs, built its forces on the assumption of limited supplies. Material combat needs were stringently reviewed with the knowledge that fuel might be limited. As time passed, Germany's highest commanders came to believe implicitly that victories could be won on the cheap before the limited fuel supplies and the hardware of war were depleted. The theory worked until the invasion of Russia. It was inevitable that their luck would run out, but events clouded their judgment. Inherent weaknesses and the inability to solve the many problems of building and supplying a modern force would lead to Germany's downfall.

Hitler's orders for the planned invasion of the Soviet Union were clear: The German Armed Forces must be prepared, even before the conclusion of the war against England, *to crush Soviet Russia in a rapid campaign*. . . . The final objective of the operation is to erect a barrier against Asiatic Russia on the general line Volga-Archangel. The last surviving industrial area of Russia in the Urals can then, if necessary, be eliminated by the Air Force.³

On its side, Germany also had to consider its own industrial base, less on how to defend it than how to use its production. Hitler had once declared Germany economically self-sufficient, but concerns about Germany's ability to supply the invasion force began to surface long before the campaign.

Hitler was blind to warnings of shortages. When briefed on the problems in early 1941, he snapped, "I am happy that our war production is equal to any demand. We have such an abundance of material that we had to recon-

³ Adolf Hitler, Directive No. 21, Case Barbarossa, 18 December 1940, Führer Headquarters, Germany. Emphasis in original.

vert some of our war plants [to the production of civilian goods]. . . . Our economy is in excellent condition.”⁴

Hitler was at his persuasive, if not informed, best. The generals, with the facts presented by their staffs before them, still came to share Hitler’s delusions of sufficiency. More than 3 million troops were to invade Russia, spear-headed by 3,580 tanks; 7,184 artillery pieces; and 2,800 aircraft. Logistical details were not important to Hitler. He chose to ignore warnings of impending fuel shortages.⁵

By late spring, the glimmer of reality crossed Hitler’s mind. Synthetic-fuel production was reviewed as a way to step up supplies. It was possible in the long term, but at a price. Hitler finally acknowledged: “We have gone too far in our efforts to achieve autarky. It is impossible to produce all that we lack by synthetic processes. . . . These strivings for autarky make great demands on manpower, which just cannot be met.”⁶ Caucasian oil as the primary target of a Russian offensive crystallized in Hitler’s plans.

Tank production was also downgraded by Hitler. He agreed originally to an output of between 800 and 1,000 tanks per month, but scaled that down because of the expense and the drain such a production level would have on Germany’s limited skilled work force. As a result, only 212 tanks were produced in each of the six months before the invasion of Russia. Panzer divisions went into battle with an average of 160 tanks. Since armored units had a higher priority for supporting mechanized transport, trucks were further diverted from the more numerous infantry units. The *18th Panzer Division* was one of the few to have its full quota of supporting trucks, but all of them had been commandeered in France and driven to the staging area only days before the invasion.

It appears the army was short by about 2,700 trucks and small vehicles from its already scaled-down allotments imposed in the 12 months before the

⁴ Franz Halder, *The Halder Diaries: The Private War Journals of Colonel General Franz Halder, Chief of the General Staff, Supreme Command of the German Army (OKH)*, vol. 1 (Boulder, CO: Westview Press, 1976), 142.

⁵ Halder, *The Halder Diaries*, vol. 1.

⁶ Robert Cecil, *Hitler’s Decision to Invade Russia, 1941* (New York: David McKay, 1976), 140–41.

invasion. Those in operation were of different models, and replacing parts was a monumental problem. Drivers learned that a piece of damaged equipment was unlikely to be replaced from available stores.

The Wehrmacht attempted to make up for the vehicle deficit by hurriedly supplying infantry divisions with 15,000 *panjes*, or peasant carts. As one German supply officer noted, “The *panje* was the only standardized transport we had and that was not even an official issue.”

This logistical base was supposed to provide 60,000 tons daily to an invasion force advancing along a thousand-km front, soon to be doubled in width, over nonexistent or at best primitive roads. There were not enough trucks or fuel, and the supporting rail network was incompatible with German equipment.

When German forces crossed the Russian frontier on the morning of 22 June 1941, the Red Army offered little or no resistance. Only in the south, between the Pripet Marshes and the Carpathians, did the Russians initially seem capable of slowing down the advancing invaders. *Army Group South* was spearheaded by General Karl-Heinrich von Stülpnagel’s *Seventeenth Army*, whose immediate objective was Lwów (now Lviv). Progress was slow in the face of tough resistance and rearguard actions. At the height of the breakthrough battle, Stülpnagel received an urgent message from the German Army High Command with explicit instructions to veer southeast and take the east Galician oil fields south of Lwów, “at all costs before the arrival of the Hungarians.”⁷

Hungarian divisions were advancing on Stülpnagel’s right flank in a more direct route to Galicia. The revised orders to the *Seventeenth Army* were to ensure unimpeded German seizure of the east Galician oil, in Russian hands since the partition of Poland in 1939. Getting the German Army into Galicia before the Hungarians meant not having to cope with unpredictable and sometimes intractable Axis partners.

⁷ International Military Tribunal, *Trial of the Major War Criminals before the International Military Tribunal, Nuremberg, 14 November 1945–1 October 1946*, vol. 7, *Proceedings*, 5 February 1946–19 February 1946 (Nuremberg, Germany, 1947), 258.

Figure 5. German soldiers in Russia



German soldiers fight on the eastern front, 1941. As the campaign in the Soviet Union wore on, the invading German troops suffered greatly due to long supply lines and fuel shortages.

National Archives and Records Administration

As in previous operations where oil was to be a prize of conquest, oil commandos were attached to the German Army to ensure immediate exploitation of captured facilities. *Kommando "S"* (*Sud*) was charged with determining the condition of the Galician fields and refineries and putting them back into service for the Reich. *Kommando "S"* was relatively small, including only 50 or so troops, all experts in petroleum operations. The oil commandos reached Drohobycz, the refining site and center of the east Galician fields, two days after the invasion began.

They found the Russians had been proficient in their scorched-earth policy. Producing wells and the refinery were heavily damaged, and restoration of the facilities was clearly beyond the scope of the commandos. It was a simple matter, however, to bring in civilian employees of Germany's private oil companies, and the operation was turned over to Beskiden GmbH. The firm had run the west Galician fields since they were occupied in 1939.

By August, *Kommando "S"* personnel were integrated into another group, *Kommando "R"* (*Romny*), which was being rushed to the Romny oil fields deep

in the Ukraine, 240 km beyond Kiev. Romny was occupied on 9 September as the German Army moved eastward at 48–64 km a day.

In Berlin, the joy of reaching Romny and the prospect of receiving its first oil production sparked planning for the activation of the full oil commando force. The mightiest prize, the Caucasus, was within reach. Major Erich Will's unit of 500 experts was constituted as *Kommando "K" (Kaukasus)*. Uniformed but entirely civilian, Will's commandos were attached to the economic staff of the army. Hermann Göring, in his role as industrial and oil chief, concluded that the assembled oil commando force was far too small and ordered mobilization of a technical oil brigade to take over the Caucasian fields. In the fall of 1941, when the early victories of the Russian campaign pointed to total triumph within months, the expanded force began to form. Major Will remained, but a Luftwaffe major general, Erich Homburg, was placed in command, befitting its new status and size. Homburg, a friend of Göring's, was chief supply officer of *Luftflotte 4 (Fourth Air Fleet)*, whose strategic task was to support the ground operations of *Army Group South*.

Since the German oil industry could not provide enough personnel and still keep its own modest production going, a program was begun to train 8,000 Germans to handle the chores of producing Caucasian oil. Soldiers and officers with related technical and mechanical skills were assigned to the new technical oil brigade. Some were sent to Romania for on-the-job training in field and refining operations, maintenance, and repair. Others went to a school for drillers that had been established at Celle in Lower Saxony. All were trained to fight oil-field fires. Captured Russians with oil-production experience were returned to the Galician fields and organized as teams. With selected war prisoners and forced Russian laborers, the technical oil brigade grew to a force of more than 15,000 troops.

Replacement equipment was assembled in Germany for shipment to the Caucasus, and 140 trains were earmarked to haul the material at a time when rail transport was at a premium. Barges were built in Bulgaria to augment the rail allotments for hauling equipment to the Caucasus and to bring out the oil.

Because the Russians were so methodical in destroying virtually everything they abandoned in retreat, the Germans felt it necessary to drill new wells rather than salvage old, damaged ones. Allocations of steel for new rigs

required special approval from the Ministry of Armament Production and the Central Planning Department. Hitler's personal intervention removed such bureaucratic obstacles. When he was told about the *Kommando "K"* request for hundreds of drilling rigs, Hitler declared that Germany's needs could only be met by thousands.⁸ The Nazi leader already realized that synthetic fuels could not be produced in sufficient quantities to meet German needs.

A total of \$80 million (200 million RM) was set aside for materials required by the Caucasian oil expedition, a remarkably large authorization when funding was being requested by hundreds of administrators, each of whom claimed an urgent need for essential war requirements.

By September, an advance party of *Kommando "K"* personnel was following the German Army pressing toward Rostov, the gateway to the Caucasus. When panzer units occupied Berdyansk on 6 October, the oil commandos decided the uncluttered and intact port city on the Sea of Azov would be an ideal base for future operations, and they prepared to receive the main body for its further advance to the oil fields themselves.

Rostov fell on 20 November, and the newly formed Reich Ministry for the Occupied Eastern Territories completed its plan for the "Organization of the Caucasus":

Germany is interested in creating a stable position in the entire Caucasus in order to secure the safety of continental Europe, that is, to safeguard for herself the link with the Near East. It is only this link with the oil fields that can make Germany and the rest of Europe independent, in the future, of any coalition of maritime powers. The aim of German policy is to control the Caucasus and the adjoining lands to the south, both politically and militarily. . . . Economically, the German Reich must take all oil into its hands.⁹

In North Africa that fall, German general Erwin Rommel had pushed into Egypt, and the linking up of the *Afrika Korps* with German forces from the

⁸ A. E. Gunther, "The German Wars for Crude Oil in Europe, 1934–1945," *Petroleum Times (London)*, 31 January 1948.

⁹ International Military Tribunal, *Proceedings*, 5 February 1946–19 February 1946, 326.

Caucasus into the Middle East was expected. The dream of German mastery of oil supplies from the Suez Canal to the Caspian Sea seemed attainable.

Everything was falling into place for Germany, and another Hitler miracle seemed probable. At the end of September, 40 infantry divisions were demobilized and the troops sent back to their civilian jobs. On 3 October, Hitler addressed the German people: "I declare today, and I declare it without reservation, the enemy in the east has been struck down and will never rise again."¹⁰

But slowly the tide of battle turned. Stalin brought up reserves and stiffened the backs of the Red Army leadership, executing five generals in the process. Small battles were won and holding lines solidified.

Predictably, shortages on a broad level began slowing down the Germans. The warnings of such occurrences made by staff officers before the invasion were being fulfilled. General Thomas sounded the first alarm on 29 September when he reported that frontline supplies were running short. On 9 October, the quartermaster general of the Wehrmacht outlined the distressing fuel situation. Army vehicles were estimated to be 24,000 barrels short of minimum fill-up levels. While 720,000 barrels were to be delivered during the month, the amount was inadequate for new offensive operations or major redeployments. Problems surfaced in other areas. Tires were being depleted at a rate that would leave none left by March. Motor transport was in a perilous state. *Army Group Center* alone had lost one-third of its vehicles in the first month of the campaign. Even if enough replacement trucks could be brought to the front, there would not be enough fuel to keep them moving.

Shipments of oil directly from Romanian refineries to the front helped ease the fuel problem somewhat, but the Germans found that captured Russian stocks, as predicted, could not be used without a further refining and treatment process involving benzol. Further, virtually all Russian tanks, including the mainstay T-34s (medium tank) and the Kliment Voroshilovs (KV

¹⁰ William L. Shirer, *The Rise and Fall of the Third Reich: A History of Nazi Germany* (New York: Simon and Schuster, 1959), 141.

heavy tank), operated on diesel fuel, and those captured supplies were useless to the gasoline-driven German panzer units.

Adding mightily to the Wehrmacht's fuel problems were the helter-skelter movements ordered by Hitler as he changed objectives. His vacillating views on priorities resulted in fuel-wasting, time-consuming major troop and panzer movements along the front. Many studies have covered the events that ended in Germany's failure to capture Moscow, thus missing the opportunity to win victory in the short time required. It is sufficient here merely to review Hitler's orders and their relationship to the drive for Caucasian oil.

It was never assumed the German Army would reach the Caucasus in the first months of the invasion. The original plan was to crush the Red Army and then occupy the oil fields sometime in early 1942. On 18 August, Hitler declared that the capture of Moscow was of the highest priority. He rescinded that order three days later and told his commanders the chief objective "is NOT the capture of Moscow, but the capture of the Crimea and of the industrial and coal-mining area of the Donets, and the cutting off of Russian oil supplies from the Caucasus; and to the north the investment of Leningrad and the linking up with the Finns."¹¹

The generals argued that Moscow should remain the main objective, that its capture would leave the Russian body headless and the rest of the Soviet Union would collapse. Hitler would not listen and told them they knew "nothing about the economic aspects of the war." He also noted that his emphasis on the occupation of the Crimea was defensive, regarding it as "that Soviet aircraft carrier" that could be used to attack the Romanian oil facilities. He said the Crimea had to be "neutralized," pointing out that Ploesti (now Ploiești) was only 400 air miles from the Soviet Crimean air bases.¹²

Concerns about losing Romanian oil by bombing were more than fanciful. While Hitler was weighing his strategic moves, Romania was already under attack. American air strikes against Ploesti later in the war are widely

¹¹ Shirer, *The Rise and Fall of the Third Reich*, 857. Emphasis in original.

¹² Shirer, *The Rise and Fall of the Third Reich*, 858.

recalled, but few people are aware of Russian strategic bombing of the Ploesti area in June 1941.

Only three days after the invasion started, on 25 June, Red Air Force bombers staged four separate attacks on Ploesti oil wells and refineries and storage and shipping installations at nearby Constanța. The heaviest air strike was a dawn raid on Ploesti by 30 Soviet bombers. German after action reports claimed 17 of the aircraft downed and damage to the oil facilities “slight.” Further raids were experienced almost daily, though few aircraft were involved. Little actual damage resulted, but operations were impaired.

On 13 July, six Soviet bombers struck three refineries on the southern edge of Ploesti, attacking from 6,500 feet and causing widespread damage. A distillation plant was knocked out of operation for an extended period, and 11 storage tanks and a dozen loaded rail tank cars were destroyed.

In August, Red Air Force planes concentrated on the Danube River bridge at Cernavodă, a particularly vulnerable point over which a pipeline passed on its way to Germany. The pipeline was ignited when the bridge was hit on 10 August.

German commitments to defend Romanian oil facilities reflected the importance attached to them. Hitler did not trust the Romanians to protect them sufficiently. About 50,000 Luftwaffe personnel were involved in Romanian air defenses. They were concentrated around Ploesti, Constanța, and the Danube shipping port of Giurgiu. Oil fire-fighting units were attached to a special Luftwaffe defense brigade. Antiaircraft regiments were deployed throughout the oil producing and refining region and around the transportation centers. Three squadrons of Messerschmitt Bf 109 (Me-109) fighters were assigned to intercept duty. German records show 143 Russian planes shot down over Romania that summer, with the claim divided almost equally between anti-aircraft fire and fighter kills.

It was not until late September that the threat to the Romanian fields ended. The Crimea then came under attack, and the Red Air Force was preoccupied with defending Russia itself.

At the time Hitler was making his decision on where to concentrate the German force, Romanian oil was still vulnerable. His concerns eventually lessened, and on 6 September, Hitler changed his mind again, declaring

that Moscow would be the main objective of the German Army. *Army Group Center*, which had wheeled around to Ukraine, was forced to regroup and resume its attack on the Russian capital. The one-month delay as winter approached proved to be crucial, however. Panzer units, already in need of rehabilitation and resupply, were hardly prepared to deliver a knockout blow.

The failure of that knockout blow is written over and over in fuel shortages. As 1941 passed, and the lines of supply were extended 600 miles to the gates of Moscow, the levels of frustration, endurance, and anguish rose. The calculations of logisticians and their sometimes-incomprehensible figures do not convey the human experience. Troops suffered because of the fuel shortages, and a semblance of the personal dimension is reflected in the jottings of soldiers at the front, such as the following portion of a letter home from a German gunner.

During the last few nights I have wept so much that it seems unbearable even to myself. I saw one of my fellow soldiers weep also, but for a different reason. He was weeping for the tanks he lost; they were his whole pride. And though I don't understand how a man can mourn dead war material, I am a soldier and I am prepared to believe that tanks are not inanimate material to him. . . . But the loss of material goods never bothers me. Therefore, I would have been incapable of weeping about tanks, which, when they ran out of gas, were used in the open steppes as artillery and thus easily shot to bits. But seeing a fine man, a brave, tough and unyielding soldier cry like a child over them—that did make my tears flow in the night.¹³

Men cried because they had no fuel. Men died, too, for the same reason. The fuel shortages had been predicted, and within days after the invasion began indications of the crisis began surfacing. On 5 July, the *Luftwaffe VIII Corps* reported it was curtailing missions in support of the invading force because it did not have enough aviation fuel. Its commander, General Wolfram von

¹³ Franz Schneider and Charles Gullans, trans., *Last Letters from Stalingrad* (New York: Signet, 1965), 111.

Richthofen, said, "Supply is for us the greatest difficulty." Panzers on their way to Smolensk ran dry and stopped even though opposition was minimal. *Army Groups North* and *Center* halted advances in August to reform when fuel supplies were exhausted and none had been stockpiled in rear supply areas for continuation of their advances.

Bitter lessons were learned. The practical experience for the panzer units was that gasoline consumption in Russia was double original estimates. Each day's mission was across terrain that precluded straight-line driving. Tank routes resembled the tacking courses of sailboats heading windward.

Logistical support was criminally deficient. Rail shipments were late or not received at all. For example, *Army Group Center's* supply needs were supposed to be met by 31 supply trains daily. Only 16 were arriving by October. Seventy percent of the German locomotives broke down on the Russian runs, incapable of maintaining the grueling schedules demanded of them. Trucks to haul in material from the railhead to advance supply areas could not be kept in working order. Only 3 of 10 such vehicles in *Army Group Center's* inventory were still running after four months of combat, and even they could not be fueled. "Those tracked vehicles that survived the mud were in great danger of coming to a standstill through lack of petrol. . . . Reliance on horses was high, and increasing."¹⁴

On 28 October, panzer commander Heinz Guderian found, "We could advance only as fast as our supply situation would allow." That amounted to only five miles a day. Panzers and infantrymen could no longer expect support from the air. The *Luftwaffe*, which had destroyed 2,000 Soviet planes in the first days of the invasion, was losing its dominance over the Russian skies. Soviet air power was rebounding as German planes were increasingly grounded because of fuel shortages. As few as 10 bombing missions were mounted each day by the *Fourth Air Fleet* by mid-September, compared with hundreds the previous month. Records of *V Corps* are filled with repeated requests for emergency fuel deliveries; the only responses to the requests were

¹⁴ Matthew Cooper, *The German Army, 1933–1945: Its Political and Military Failure* (New York: Stein and Day, 1978), 331.

that none was available, “nor was an adequate reserve of supplies to be expected at the airfields in the near future.”¹⁵

Despite all these logistical failures and fuel shortages, the Germans somehow managed to advance to within 160 km of Moscow by November. There was, in fact, little to stop the panzers advancing at this time. Defense of the Soviet capital rested with a handful of tanks and only 90,000 troops. But the Germans could not advance in force, even with their overwhelming numbers, because of the destitute condition of the Wehrmacht and Luftwaffe. Both were undersupplied and overexerted. Guderian’s panzer corps, which started the campaign with 600 tanks, was reduced to 50 by 13 November. And there was not enough fuel for even that number to go forward. In writing to his wife the following week, Guderian vented his frustrations: “The ice cold, the lack of shelter, the shortage of clothing, the heavy losses of men and equipment, the wretched state of our fuel supplies, all this makes the duties of a commander a misery.”¹⁶

Unit after unit reported its dismal supply situation. On 27 November, the quartermaster general finally presented this grim summary to the German Army High Command: “We are at the end of our resources.” When Field Marshal Franz Halder reviewed the supply situation, his notes further reflected the appalling condition of his army: “Horses—situation is very serious; distressing lack of forage . . . only 50% of load carriage vehicles are running . . . six months needed to rehabilitate panzer divisions.” Halder learned that of the 500,000 army vehicles available at the start of the campaign, 150,000 were total losses and 275,000 required overhaul and repair. The field marshal concluded: “The mobile striking power is spent.”¹⁷

Army Group Center was incapable of taking Moscow, and the situation was equally dark in the south. *Army Group South* was pushed out of Rostov,

¹⁵ Hermann Plocher, *The German Air Force Versus Russia, 1941*, vol. 1, U.S. Air Force Historical Studies No. 153 (Maxwell Air Force Base, AL: U.S. Air Force Historical Division, Aerospace Studies Institute, Air University, 1965), 130.

¹⁶ Heinz Guderian, *Panzer Leader*, trans. Constantine FitzGibbon (New York: E. P. Dutton, 1952), 192.

¹⁷ Halder, *The Halder Diaries*, vol. 2.

and prospects for reaching the Caucasus diminished daily. December found *Army Group South* in retreat because it had run out of fuel and ammunition.

The Luftwaffe had been pressed into service to resupply units by airlift, even converting bombers into transports. During the first four months of the invasion, according to a communique issued by the German High Command on 21 November, the Luftwaffe flew 30,000 supply flights with a total load of 40,000 tons of goods. To put that figure in perspective, all the airborne supplies brought in through October would have taken care of the army's needs for 16 hours.

Across the entire front, Germans faced the reality that the promised quick victory had escaped them and they were deep inside the Soviet Union facing cold of killing force. Antifreeze was rushed to units, but mostly too late. Engines froze. Those that did not were kept running day and night. Lubricating oil turned to tar. Fires were lit under parked vehicles. Medical sterilization equipment was used to preheat aircraft engines. General Guderian reported gasoline freezing in his unit's tanks. Normal grease had to be removed completely from rifles and machine guns, and infantrymen improvised to find acceptable substitutes. A finely ground powder of flowers of sulphur or sunflower seed oil was found adequate to replace the unusable standard-issue grease.

Russia's military endured the same bitter cold but was far better prepared to cope. Winter gear was issued to the Red Army, while Hitler would not permit heavy clothing to be sent to the Wehrmacht in the fall because he feared morale would suffer with the realization that the campaign might not be over by winter. It was not clothing alone that gave the Russians an advantage. Apart from fighting on their own soil and under conditions more normal to them, Red Army troops rarely were concerned about receiving essentials. Shorter supply lines made it easier for them to maintain a regular flow of materiel to the front.

Although the Soviet military was huge, and the armored force the more so, it was less mechanized overall than Germany's and less dependent on oil products. In the immediate prewar period, for example, it was estimated the Russian armed forces used 3.1 million barrels annually. Germany, with a much smaller army and skeletal armor force, consumed 6.5 million. Usage climbed dramatically during the fighting, and in 1941 Russia's army and air

force required about 36 million barrels. That same year, Germany's military, laboring under shortages and restricted use, used more than 50 million barrels. The Luftwaffe accounted for almost one-half of Germany's military consumption, the army and navy getting less than would be considered normal in the allocation process of a large force.¹⁸

Russia's military oil needs centered on fuel for its air and armored units. The Red Air Force was rebuilt to a strength of 10,000 aircraft by the end of 1941 while Germany's was reduced to 2,500. Soviet tank production also made up for initial losses, and the Russians were able to boost the strength of their 50 or so armored divisions to normal levels. Although frequently beset by problems in getting diesel and aviation gasoline to forward units, the Soviet military appears to have suffered no basic fuel shortages during this period.

Russia, most importantly, had become almost totally self-sufficient in oil, producing all its needs except for certain specialized products. In 1941, the military used only 13 percent of the Soviet Union's total domestic output. The German military, by contrast, was consuming approximately 75 percent of the crude and synthetic oil the Nazis could produce or import.

Russia was then the second largest consumer of oil in the world behind the United States. Its production also ranked next to that of the United States. Russia's industrial sector was oil-based, unlike that of the rest of Europe, where coal provided most of the power. Agriculture in the Soviet Union was more mechanized than in any other European country. Collective farms in 1939 alone were equipped with 500,000 tractors, 165,000 combines, and 210,000 heavy-duty trucks. Most of Russia's oil went into lower-grade automotive fuels and diesel oil. The only items that might possibly fall into short supply were aviation fuel and special high-grade lubricants.

Hitler, of course, not only coveted the Russian supply but, in 1941, was bent on denying it to the Soviets, and it was this determination that led to his indecisive attitudes on where to concentrate the German attack. As one contemporary observer wrote: "There can be no doubt of Hitler's imperative

¹⁸ Based on a study by V. R. Garfias, R. V. Whetsel, and J. W. Ristori of Cities Service that was published in the *National Petroleum Times*, 21 September 1938.

need of the Caucasian oil fields; he finds himself in the predicament of the alchemist who spent all his gold trying to make gold. To achieve his purpose, Hitler must have new oil supplies and he must deprive the Soviet Union of hers.”¹⁹

With war looming, Russia in 1938 had cut back on exports except for major shipments to Germany right up to Hitler’s invasion. Russia was self-sufficient only if it held the Caucasus, which provided 85 percent of its domestic production. Equally essential was maintaining the movement of the oil. Practically all Russian oil moved by rail (75 percent) or by Volga River tanker or barge (23 percent). Pipeline development lagged. In the case of oil shipments by rail or river, the city of Stalingrad played an important role, the more so as the war progressed.

One critical area to the Russians was the Soviet Far East. A large military establishment was maintained there even though Stalin was assured the Japanese would not attack the Soviets from the rear thanks to information supplied by Russian spy Richard Sorge in the German embassy in Tokyo.

American supplies were brought in through Vladivostok to ease the Russian rail burden by not having to haul oil to the Pacific over the Trans-Siberian Railroad. U.S. president Franklin D. Roosevelt had opened Lend-Lease aid to the Russians after the German attack, and California oil, despite the severe tanker shortage of 1941, was shipped to Soviet Asia.

U.S. aviation fuel for the Russians was given highest priority. By mid-August, about 400,000 barrels of the high-octane fuel were shipped on five tankers chartered by the U.S. Maritime Commission. These shipments were dutifully reported to Tokyo by Japanese spies operating out of Los Angeles, California. Intelligence intercepts of Japanese diplomatic messages by the United States showed how carefully the Japanese tracked American oil shipments.

Acting on reports from agents in California, the Japanese government sought to block the Russia-bound shipments through diplomatic channels.

¹⁹ Frederick Phillip Hellin, “Russia’s Oil and Hitler’s Need,” *Atlantic Monthly*, June 1942, 675.

Tokyo's ambassador to Moscow urged the Russians "to consider this development with extreme caution, not only from the legal viewpoint of international law but from the standpoint of the general world situation."²⁰

The objection was based on Tokyo's view that it was no longer receiving American oil even though neutral, while Russia, a belligerent, was. Protests were lodged with the U.S. State Department as well, but to no avail.

From August through early October, more shipments of California oil arrived in Vladivostok. Belatedly, Berlin became aware of the American aid. The Japanese, though an Axis partner, had not bothered to advise the Germans, who learned of the oil trade through their own intelligence service. Ribbentrop called in the Japanese ambassador, Hiroshi Oshima, on 2 October and said, "I have a report that Japan has approved the sailing of American ships through Vladivostok. Can this be true?"²¹

Ambassador Oshima did not reply until he received instructions from Tokyo, and then he answered that "Japan has taken the stand toward America and Russia that this trade cannot be tolerated from the standpoint, not of international law, but of the whole political situation . . . at the present time."²²

Two months later, Japan was at war with the United States, and oil assumed a new and even more central military role.

²⁰ U.S. Department of Defense, *The "Magic" Background of Pearl Harbor*, vol. 3 (August 5, 1941–October 17, 1941) (Washington, DC: Government Printing Office, 1977), 123.

²¹ U.S. Department of Defense, *The "Magic" Background of Pearl Harbor*, vol. 3, A-444.

²² U.S. Department of Defense, *The "Magic" Background of Pearl Harbor*, vol. 3, A-444.

CHAPTER 6



JAPAN'S SEARCH FOR OIL

Economic obstacles, such as may arise from American embargoes, will seriously handicap Japan in the long run, but meanwhile they tend to push the Japanese onward in the forlorn hope of making themselves economically self-sufficient.

~ Joseph C. Grew, U.S. ambassador to Japan, 1 January 1941

Anyone who has seen the auto factories in Detroit and the oil fields of Texas knows that Japan lacks the national power for a naval race with America.

**~ Admiral Isoroku Yamamoto, commander in chief,
Imperial Japanese Navy, 1941**

Pilots strained to hear telltale signs of engine malfunction in their unfamiliar aircraft as they rolled toward takeoff. Though the planes were new to them, the aircrews were at least grateful for the timing of the mission. It was cool in the predawn hours of 14 February 1942, and the twin engines could achieve greater lift before the searing heat that would come with the rising equatorial sun.

Eight paratroopers were assigned to each plane, but with heavy weapons and other combat cargo aboard en route to the target zone, the load factor was critical. Lockheed Hudson light bomber and reconnaissance aircraft were not designed for this kind of mission. Their hasty conversion from coastal patrol planes to possibly overloaded, low-level attack transports was on the minds of the pilots as the propellers bit into the cool air and pulled the planes skyward.

Only after they reached cruising altitude without undue strain, trimmed their aircraft, and adjusted to the new controls did the pilots relax. It would be nearly two hours before the 50 Hudsons rendezvoused south of Singapore almost exactly over the equator and flew on to the drop zone. At intervals, fuel gauges were rechecked.

There were no cabin windows, so the paratroopers crammed in the rear compartments could not see the other Hudsons closing formation at 10,000 feet. Only the pilots could make out the blue, white, and red roundels of the British Royal Air Force painted on some fuselages and the markings of the Royal Australian Air Force on others.

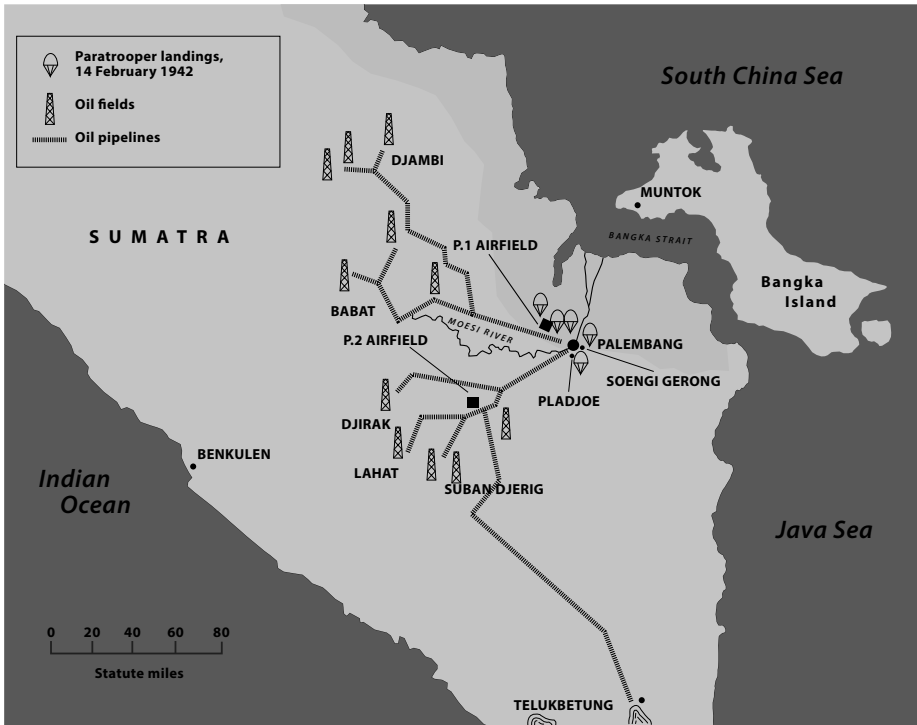
The paratroopers, going into combat for the first time, were apprehensive. Some had made only three jumps from aircraft, and those under ideal non-combat conditions. Like the planes carrying them, the paratroopers had been pressed into this mission hurriedly.

Descending to lower altitudes as they approached the drop zone, the pilots looked for landmarks to guide the formations to exactly the right point. Instinctively, the paratroopers fingered their chutes, harnesses, and weapons through their thin gloves. If all went well, the chutes would open four seconds after the leap. Following a free-fall of 150 feet, there would be another 450-foot drop in a controlled landing. If all went well. Some remembered a training exercise in which 12 of 400 troops were killed when chutes failed to open.

The pilots signaled final approach, and the paratroopers gripped their German submachine guns and made last-minute checks to fasten each pocket of the two-piece greenish-brown uniforms of half-silk and half-cotton. Semiautomatic 8mm pistols were carried in lower right-side jacket pockets. Grenades filled the two deep top pockets. Food rations; compasses; signaling gear; and money, mostly Dutch guilders, were stored in their trousers.

The *Yokosuka 1st Special Naval Landing Force*, temporarily attached to the *38th Division* of the Imperial Japanese Army, was ready for battle. The target was the oil refinery complex at Palembang on the island of Sumatra in the initial attack on the Dutch East Indies (now Indonesia). Deception was the key, so the Japanese had rushed the Hudsons into service for the operation after their capture from the British and Australians during the lightning strike down the Malay Peninsula.

Map 6. Japanese invasion of Sumatra, 1942



Courtesy of William Morrow, adapted by MCUP

The refineries of Palembang were to be taken before British and Dutch defenders could sabotage them. The naval paratroops, though inadequately trained, were to secure the facilities until the *229th Infantry Regiment*, en route by ship, could be landed.¹

Japan's extraordinary early war successes accelerated the push into the East Indies, whose occupation was the main objective of the drive south. On 20 October 1941, the high commands of the Japanese Army and Navy had decided a direct attack on the thousand-island archipelagic chain, so rich in resources, was unsound. All actions, it was decided, would be geared to

¹ "Japanese Parachute Troops," U.S. Army Restricted Pamphlet, 1945.

Figure 6. Japanese paratroopers drop on Sumatra



Japanese paratroopers over the Palembang oil field in Sumatra, January 1942. Oil was vastly abundant throughout the Dutch East Indies, and Japan was determined to have it. *Naval History and Heritage Command*

achieving control of the Dutch colony by first gaining the stepping-stones. Although a surprise attack on the Indies in December 1941 offered the best chance of an immediate supply of oil, it left powerful British and American bases on the southward line of attack and communications.²

The invasion of the East Indies was thus planned to await military conquest of the western Pacific. First, the Philippines and Malaya (now Malaysia) would be taken and the U.S. Navy at Pearl Harbor neutralized.

² S. Woodburn Kirby, *The War against Japan*, vol. 1, *The Loss of Singapore* (London: Her Majesty's Stationary Office, 1957), 91.

Even the most optimistic planners among the Japanese were awed by how fast the first phase of the war had been completed. The giant British naval base at Singapore had fallen in two months. American forces were squeezed into an ever-smaller defensive pocket on Luzon, and 14 American men-of-war had been sunk or seriously damaged in Hawaii. The East Indies were ripe for the long-planned invasion, and Palembang was the first target.

As we think of the Middle East today as the heart of the world's petroleum supply, it was the East Indies in the pre-World War II period that represented unlimited reserves and never-ending production. Their rich oil fields were the prize for which Japan went to war. Oil was abundant there, and the Japanese were obsessed with gaining it. The Indies had been producing oil as far back as 1890, when the first wells of the Royal Dutch Shell Company began flowing. Total output from the Dutch-controlled fields in the 1930s about equaled the total production of *all* the countries of Europe outside of the Soviet Union. Each day, the fields of the East Indies yielded 170,000 barrels. They were manna to a fuel-poor nation like Japan.

Most of the Indies production was centered around Palembang and nearby Djambi in southern Sumatra. Three-quarters of the Indies oil flowed from the compact area of the island's mangrove swampland. Pipelines carried the crude to refineries at Pladjoe (now Plaju) and Sungai Gerong, 8 km east of Palembang and some 72 km up the Palembang River from the Bangka Strait.

At that point, where the river flows into the strait, the Japanese pilots of the Hudsons made their first navigational sightings. From there, they followed the river to the drop zone through heavy black smoke being blown southward to the Sumatran coast from burning oil tanks torched by the British before they surrendered Singapore's naval and air bases 483 km away. Though it made navigating more difficult, the smoke helped the incoming aircraft escape visual detection by British, American, and Dutch air and naval units operating in the area. It contributed to catching Palembang's defenders by surprise.

Coastwatchers did sight a convoy that morning. Several Japanese ships with destroyer escorts were heading for the Bangka Strait with the *229th Infantry Regiment*. The unit, fresh from the capture of Hong Kong, was to dash for the Palembang oil facilities once disembarked and take over from

the paratroopers. RAF Hurricane fighters from Palembang were sent to challenge the approaching naval force, but while they looked for it, Palembang was undefended.

Although the wily Hudsons escaped aerial intercepts, they ran into heavy antiaircraft fire when they descended to their drop altitudes of 600 feet and slowed their speeds to 177 km per hour. British gunners zeroed in after it was established the planes were dropping Japanese paratroopers and not bringing in Singapore evacuees (who were making their way to the Indies by every means possible).

One of the Hudsons was shot down immediately. Another was hit and forced to make an emergency landing. Still, considering the low-level, slow-speed approaches, surprise was achieved. Understandable confusion among ground defenders gave the invaders, with the friendly markings on their Hudsons, precious moments during a period of maximum vulnerability.

One hundred of the paratroopers were landed at the Pladjoe and Soengi Gerong refineries, which were defended by Dutch soldiers. Pladjoe fell quickly, almost without a fight. The Japanese dug defensive positions and beat back several counterattacks during the morning from the regrouped Dutch unit. By afternoon, however, British and Dutch reinforcements arrived and fought their way back into the refinery. About one-half of the Japanese force was killed and the rest fled into the swamps. At Sungai Gerong, a Dutch platoon offered sufficient resistance to permit destruction of much of the refining equipment. After detonating explosives placed at key points, the Dutch withdrew.

The bulk of the Japanese airborne force of 260 troops was dropped near the main Palembang airfield. Its objectives were to seize the strip and block the road leading to the refineries to prevent reinforcements from arriving. Hand-to-hand fighting continued throughout the day. Some of the Hurricane fighters from the raid on the Bangka Strait convoy landed in the middle of the battle, refueled under fire, and took off again without knowing where they would land. By nightfall, the field was under Japanese control.

On the morning of 15 February, more Japanese paratroopers were landed at the airfield. British and Dutch forces were scattered. With the prospect of facing the convoy force about to land, and with no hope of reinforcements,

the Dutch military commander decided to pull back to the southeast. An order from British Army general Sir Archibald P. Wavell, the overall Allied commander for Southeast Asia, was then received to abandon all of southern Sumatra. Units were to make their way to Java any way they could.

With only minimal air opposition, the Japanese *229th Infantry Regiment* went ashore and soon linked up with the paratroopers outside Palembang. Damage to the Pladjoe and Sungai Gerong refineries at first appeared extensive, but closer inspection showed far less than originally believed. The pipelines were unaffected. So, Palembang's oil was captured with the expectation that the prize would soon operate full force and at minimal cost of personnel and materiel.

While Southeast Asia fell quickly, China in years past had resisted Japan's predatory moves, though it was easy prey because of dire internal weaknesses. Rather than bow before Japan's military pressures and demands, China responded economically. Among other actions, China, as early as 1930, increased the export duty on Fushun coal by 400 percent. Japan regarded this as "obstructing" its essential energy development.

Not only was Manchuria a source of coal needed for Japan's industrial expansion program, but the region offered the promise of oil and shale. Synthetic oil could be made from the latter, and Japan's chemical industry formulated plans to develop a synthetic program. With China the most promising source of raw material, the Japanese government did not tolerate a weak Chinese government demanding unrealistic duties on coal and shale. Japan occupied Manchuria and established the puppet state of Manchukuo. China's most promising energy resource area was thus secured by Japan.

Private Japanese firms were invited to join in the economic exploitation of Manchukuo. More than \$590 million (700 million yen or ¥) was poured into the region between 1931 and 1935, much of it to develop the capital-intensive energy sector.³

An oil monopoly was established that barred Western companies from exploration and development programs. All future production was earmarked

³ *Japan Advertiser*, September 1935.

for Japan alone. The results were discouraging. As Japan's leading economist of the time, Dr. S. Washio, noted in 1935, "The essential things which Japan needs seem to be lacking at present. There is no oil, except that Fushun coal may be used for the extraction of oil."

China was not the solution to Japan's basic needs. This realization hit Tokyo hard. Japan's militarism and parallel economic buildup were not suited to a nation of meager natural resources. Between 1931 and 1937, Japan's petroleum consumption nearly doubled to 100,000 barrels a day. The United States, chief obstacle to Japan's ambitions to rule Asia and the Pacific, was the main supplier of that oil. In 1937, 80 percent of Japan's oil needs came from the wells of California. Without those supplies, the Japanese military would have been crippled and industrial production severely handicapped. The Imperial Japanese Navy relied almost exclusively on American oil. Many in Washington were disturbed by this generous trade. They argued that denial of oil would halt Japan's adventurism in its tracks.

Japan's leaders were fully aware that the oil spigot could be turned off if they overstepped themselves in China or elsewhere. But how could Tokyo develop its economic supremacy in Asia without U.S. materials? Japan tried to balance an aggressive policy of militarism with enough restraint to avoid economic retaliation.

Dependence on essential imports from the United States and, to a lesser extent, Britain was the chief reason Japan did not embrace Nazi Germany as enthusiastically as Berlin wished. Japan was linked to the Third Reich by the Anti-Comintern Pact of 1936, but when Hitler pressed Japan in April 1939 to join an Axis campaign to gain world domination, Japan's moderates prevailed and rejected Berlin's bid. The Japanese pointed out that they had to rely on the United States and Britain for raw materials and were "not yet in a position to come forward as an opposer of the democracies."⁴

Japan's admirals in particular were almost obsessed with oil supplies in the event of a sea war, and the island empire's leaders could imagine how

⁴ Telegram to Joachim von Ribbentrop, foreign minister of Nazi Germany, 26 April 1939. Presented as Exhibit 502 during the International Military Tribunal for the Far East, Tokyo, Japan, 29 April 1946–12 November 1948.

any conflict would demand command of essential shipping lanes. Its mighty fleet would be immobilized without secure supplies. Japan's maritime vulnerability was well known to Japan's potential enemies. Even if Japan seized the oil it required, there were doubts it could be transported to where it was needed. Navy admiral William D. Leahy presciently told President Franklin D. Roosevelt that the Japanese would face extreme difficulties in maintaining unimpeded sea lanes to ship vital goods in the event of war.

Japanese domestic petroleum production in the late 1930s, including that of Formosa (now Taiwan), was only 8,000 barrels a day, less than one-tenth of its needs. Minuscule amounts of synthetic oil were being manufactured, but the Japanese were far behind the Germans in synthetic technology. Some shale oil was produced in Manchuria, but China was not the source for fuel imagined in the early part of the decade. Crude oil for Japan was being drawn from Russian-controlled Sakhalin Island, but this was the least secure supply source available. In September 1939, Japan committed itself to a maximum effort "to realize self-supply and self-sufficiency in regard to national defense." Japanese attention was drawn increasingly to the gushing wells of Southeast Asia to meet its goals.

When Germany invaded Poland and plunged Europe into war, Japan declared its neutrality. But Tokyo opportunistically took advantage of the distant conflict. With the Netherlands trying to avoid war in its Asian colonies as well as in Europe, Japan began bidding for greater access to the oil of the Dutch East Indies. In November 1939, Japan demanded immediate trade negotiations. The Indies government had no choice but to agree. On 12 January 1940, Japan ominously informed the Dutch that a long-standing Treaty of Judicial Settlement, Arbitration and Conciliation would be terminated. The action meant that Japan would no longer be bound to resolve disputes with the Dutch colony by peaceful means.

East Indies authorities dawdled in their negotiations with the Japanese, but with the German invasion of the Low Countries and France in the spring of 1940, the status of Dutch and French colonies in Asia became critical. The Dutch had requested Allied assistance in protecting their oil centers of Aruba and Curaçao in the West Indies. Tokyo believed a similar request would be made for the East Indies as well, the more so when German forces swept to the

English Channel. British and American troops had already been dispatched to Greenland and Iceland after the fall of Denmark.

Germany urged Japan to move into the East Indies as a full Axis military power. Japan chose instead to gain a larger share of East Indies oil without armed occupation. It did so when the Dutch were least able to resist. Ten days after the invasion of the Netherlands, Japan demanded a doubling of the oil it had been receiving to 20,000 barrels a day.

The amount would take care of only 20 percent of Japan's oil needs, and the East Indies were producing much larger amounts, so the demand was actually modest. Production in the Indies fields could have ended Japan's dependence on American oil. As the weeks progressed, however, so did Japan's demands. It soon insisted that Japanese companies and individuals be permitted unrestricted opportunity to search for and produce oil in the East Indies.

At the same time, Japan undertook a worldwide campaign to buy as much crude oil as possible, and it actually tried to corner the market in U.S. aviation oil. Standard-Vacuum's board chairman, George S. Walden, informed the State Department on 18 July that "during the last 48 hours," Japan had sought to purchase between 300,000 and 400,000 barrels of high-octane fuel.⁵

In the next six months, American exports of aviation and motor fuels to Japan leaped to 2.3 million barrels, more than three times greater than that in the previous year's comparable period. Japan was stockpiling for war.

An ominous confirmation that such supplies were intended for new military campaigns was the ordering of large quantities of portable metal containers. More importantly, the fuel was to be delivered at ports along the southern coast of China and strategic Hainan Island, all under Japanese control and all obvious jumping-off points for Japan's anticipated "southern penetration."

U.S. treasury secretary Henry Morgenthau Jr., chief hawk in the Roosevelt cabinet, felt the Japanese had gone too far and argued for a total cutoff in trade. He found an ally in the British ambassador to the United States, Philip Henry Kerr, Lord Lothian, and wrote Roosevelt: "There is a possibility that

⁵ Irvine H. Anderson Jr., *The Standard-Vacuum Oil Company and United States East Asian Policy, 1933–1941* (Princeton, NJ: Princeton University Press, 1975).

a plan can be quickly developed with the cooperation of the British government to stop oil and gasoline to Japan.”⁶

Roosevelt seemed to accept the idea and called Secretary of War Henry L. Stimson, Secretary of the Navy William Franklin Knox, and Under Secretary of State Sumner E. Welles (Secretary of State Cordell Hull was out of the country) to the White House on 19 July. Morgenthau argued for a trade embargo against Japan; Welles played the role of dove. Stimson provided this account of the meeting:

Welles put in an objection that an embargo against Japan would cause Japan to make war on Great Britain. I ventured to doubt this and the question came up whether or not the New Netherlands wells could not be put out of commission and thus Japan deprived of her objective for going to war with Great Britain. Altogether it was a long and interesting discussion but whether or not it was intended to be factual left one in the air.⁷

The decision was left in the air, but Welles believed Roosevelt was leaning toward a ban on petroleum exports to Japan. He kept repeating that an embargo would force the Japanese to seize the oil facilities of Southeast Asia, a conclusion Far East experts in the State Department had drawn as early as 1938.⁸

Roosevelt finally decided to impose only limited sanctions on petroleum trade with Japan. On 22 July, he called Welles and told him to do what was necessary “to control the exportation of aviation gasoline and lubricating oil for aircraft engines in order to conserve these materials in the interest of national defense.”⁹

⁶ Herbert Feis, *The Road to Pearl Harbor: The Coming of the War Between the United States and Japan* (Princeton, NJ: Princeton University Press, 1950), 89–90.

⁷ Feis, *The Road to Pearl Harbor*, 123.

⁸ “Memorandum Prepared in the Department of State, 5 December 1938,” *Foreign Relations of the United States Diplomatic Papers, 1938*, vol. 3, *The Far East*, document 390.

⁹ Green to Maxwell, 22 July 1940, item 171, tab DI, box 994, Records of the Foreign Economic Administration, Record Group 169, National Archives and Records Administration, Washington, DC.

For the time being, the doves had won.

Japan responded to this partial embargo by increasing its purchases of American crude oil, which were not restricted, and upgrading it at Japanese refineries into aviation-quality fuel. Tokyo also kept up its pressure on the Dutch East Indies. A high-level mission was sent to renew negotiations. Japanese war minister Hideki Tojo indicated the tone of the talks: “We have decided that for the time being we will try to secure essential resources from that region through diplomatic means but we will resort to the use of force if necessary.”¹⁰

In late September, Japanese forces marched into the Tonkin province of Indochina (now Vietnam) and overwhelmed French and Vietnamese defenders. Simultaneously, Japan made the critical decision to enter into a military alliance with Germany and Italy. For Japan, the Tripartite Pact, signed on 27 September 1940, meant that its Axis partners recognized Japan’s rights “in the establishment of a new order in Asia.”

When the emperor was consulted on the military alliance, oil was a major consideration. Navy minister Koshirō Oikawa reported that a sufficient reserve had been accumulated (from the United States) to keep forces afloat in the short term but that a prolonged conflict would require new sources and supplies.

Reflecting the more bellicose view of the army, Tojo argued that the long-term supply considerations should not deter Japan. Naoki Hoshino, head of the planning board, was more realistic. He saw little hope in the development of synthetic fuels and doubted new overseas sources could supply Japan’s needs in a long war. Hoshino was remarkably prophetic.

Meantime, the ravenous search for oil persisted abroad. Japan continued to buy all the crude oil it could find in California and then bid for Mexican supplies. It also sought to buy outright a potentially oil-rich area of Mexico with the emperor holding the extended lease as sole proprietor.

¹⁰ James William Morley, ed., *Deterrent Diplomacy: Japan, Germany, and the USSR, 1935–1940* (New York: Columbia University Press, 1976), 248.

At the end of October, with the talks in the Dutch East Indies bogged down by Dutch intransigence and skillful delaying tactics, the Japanese sought exclusive rights to begin exploration in Borneo, Celebes (now Sulawesi), Dutch New Guinea (now Western New Guinea or Papua), and the Arroe and Schouten archipelagoes. In effect, the Japanese would have displaced the Royal Dutch Shell and Standard-Vacuum oil companies, which had exploration rights. The Indies government was also asked to sell the Japanese its stock in the two companies. In the end, agreements were signed on 12 November for the acquisition of 72,000 barrels a day for six months. This was not what high Japanese officials wanted. To them, the terms were less than satisfactory. When the delegation headed for home, the top oil expert, T. Mukasi, on loan from Mitsui, said, "I will have a lot of explaining to do when I get back to Tokyo."

When officials in Tokyo heard the explanations of what had happened and why the negotiations with the Dutch had not yielded more, they decided to try again. This time, a Japanese diplomat with more experience in dealing with Westerners, Kenichi Yoshizawa, headed the mission to Batavia. The Yoshizawa negotiations centered on absolute Japanese domination of the Indies economy. All oil exploration would fall to Japan, and current production would be increased to satisfy its entire civilian and military needs. The Japanese also staked out greater claims on Indochina and Thailand under the guise of mediating territorial disputes between the two countries. In the process, they gained a further foothold with more military bases for a strike south.

American officials still groped for a policy to deter Japan without war. The dilemma was succinctly summarized by Roosevelt in a private note to his wife, Eleanor, on 13 November 1940: "If we forbid oil shipments to Japan, Japan will increase her purchases of Mexican oil and, furthermore, may be driven by actual necessity to a descent on the Dutch East Indies. At this writing, we all regard such action on our part as an encouragement to the spread of war in the Far East."

Japan's military buildup, in the meantime, continued apace. The army and navy demanded greater supplies of fuel. The number of air squadrons climbed from 50 to 150 between 1936 and 1941. Japan's army was enlarged from 20 to 50 divisions.

At the beginning of 1941, Japan's domestic oil stocks stood at 70 million barrels, which represented a 16- to 24-month supply. At the request of the Army High Command, a definitive study of Japan's position was prepared by the Economic Mobilization Bureau of the War Ministry. Two hypothetical situations were postulated. In the first, Japan would declare war on the United States and Britain in the spring of 1941. The bureau predicted that under this scenario Japan would be faced with acute fuel shortages by the third year. Severe shipping losses were anticipated, and the bureau concluded that "entire industries would be paralyzed." The second assumption was that Japan would avoid war but the United States and Britain would sever all trade. Then, the bureau said, "Japan's natural resources would be markedly diminished. The shortage of liquid fuels, in particular, would deal a fatal blow to the nation." The study was remarkably astute. It concluded Japan would be in a better position by going to war, even though the country would suffer extreme hardships if the war lasted more than two years. The study also warned that difficulties could arise even earlier if Japan's sea-lanes were closed.¹¹

In February and March 1941, the United States restricted shipments of drilling and refining equipment, storage tanks, and metal containers. This was triggered by a surge of Japanese purchases of lower-grade fuel for naval use. The British interpreted this to mean the Japanese were planning to attack Singapore. Such a move was indeed encouraged by the Germans, who kept pushing for an extension of the war into the Pacific, preferably before the planned invasion of the Soviet Union. Hitler never told Japan he was planning his bold thrust east, but Japanese diplomats were convinced it was inevitable.

Tokyo and Moscow were operating on the same wavelengths. Both wished to avoid a two-front war, so the Japanese and Russians tidied up their relations in April with a neutrality pact. Should either be attacked by a third country "the other will observe neutrality throughout the duration of the conflict," the agreement read.

¹¹ Saburo Hayashi and Alvin D. Cox, *Kogun: The Japanese Army in the Pacific War* (Quantico, VA: Marine Corps Association, 1949; repr., Westport, CT: Greenwood Press, 1959), 23–24.

While Japan was pleased with this assurance of security to the north, it gave up valuable petroleum resources. Foreign Minister Yosuke Matsuoka had wanted to buy North Sakhalin outright from the Russians or win a five-year right to purchase 12 million barrels of the island's oil each year. Instead, he reluctantly agreed to give up all of Japan's oil concessions there. It was a high price to pay, but Matsuoka knew Southeast Asia was a surer bet.

As a further hedge against future shortages, Japan began scouring the United States for equipment to develop a synthetic-fuels industry or to upgrade refinery output. Private Japanese companies were frustrated by legal barriers on such exports when they tried to purchase machinery or buy patent rights.

Japan also shopped Germany and Italy for synthetic rights and equipment. A mission left Tokyo in early May to purchase I. G. Farben patents and fuel-producing machinery, offering hard-to-get tungsten and molybdenum in return. Even though many Japanese still hoped synthetics might be the answer to their energy problems, the army had already concluded that "such production would fall short of the quantity needed and consequently could not provide a solution at all."¹²

Meanwhile, Japan received licenses for 7 million barrels of American gasoline in addition to 1 million barrels already shipped in the first three months of 1941. Licenses had also been received for nearly 16 million barrels of crude oil. The gasoline was being upgraded to higher octane levels for aircraft and the crude refined to extract as much higher quality fuel as possible. Although an estimated 4 million barrels of oil were expected to be shipped home from the East Indies during the year, Japan was still fueling its military with American oil.

Germany's invasion of the Soviet Union on 22 June 1941 demanded a hard decision by the Japanese. Berlin wanted Japan to join the war against Communism. Pleas became demands. Still, Japan resisted and decided it would honor its neutrality agreement with the Russians. At the same time,

¹² Robert J. C. Butow, *Tojo and the Coming of the War* (Stanford, CA: Stanford University Press, 1961), 281.

Japan decided it must claim control over all of French Indochina to prepare additional bases to seize the East Indies. On 2 July, at a conference held in the emperor's presence, it was decided that in order to achieve "a solid basis for the security and preservation of the nation" an advance "into the southern regions" would be necessary.¹³

The die was cast. Japan went to a war footing. Sales of gasoline for automobiles and taxis were banned. Japanese began driving wood- and charcoal-burning vehicles. Operational plans were drawn and circulated for the military advance. To protect its left flank, the Imperial Navy planned to immobilize the U.S. Pacific Fleet by a surprise attack on Pearl Harbor.

Top American officials learned of Japan's intentions to seize all of Indochina through MAGIC intercepts. Admiral Kichisaburo Nomura, ambassador to the United States, was not reticent to defend the impending action. He claimed that Japan obviously required non-American oil and "it was necessary to take appropriate preparatory measures."¹⁴

Still, the United States could not bring itself to turn off the spigot completely. On the afternoon of 24 June, with full confirmation of the Japanese landings in Indochina, Roosevelt did freeze all Japanese assets, but to him and the cabinet this was still a move slightly less severe than a total embargo. Roosevelt's freeze order meant a license for purchases could be issued, even for oil. Selective petroleum purchases would be permitted with one exception. Roosevelt instructed the Treasury Department not to release frozen funds for the purchase of any product that could further be refined into aviation fuel.

The door was left open for additional purchases. As late as 28 August, Roosevelt told Nomura that Japan might still receive unspecified but significant American oil shipments. It was the carrot to go with the stick. Attempts at a diplomatic solution continued into the fall.

In the meantime, a de facto embargo on oil was emerging. Secretary of the Interior Harold L. Ickes and other hardline advocates acted as if Japan would

¹³ Nobutaka Ike, ed. and trans., *Japan's Decision for War: Records of the 1941 Policy Conferences* (Stanford, CA: Stanford University Press, 1967), 78.

¹⁴ *Foreign Relations, Japan* (Washington, DC: U.S. Department of State, n.d.), 499–502.

be cut off from all American oil. Though the official governmental position was ambivalent, no licenses for petroleum shipments were approved. The only exclusions from the freeze were for food and cotton shipments. Public opinion seemed to support a ban on oil for Japan, which was being interpreted more and more as official policy. Still, there was no unambiguous declaration of an oil embargo.

U.S. Navy analysts were asked to evaluate Japan's likely moves if a direct embargo were imposed. They concluded that Japan would probably limit its operations to Indochina unless all oil shipments were blocked: "An embargo would probably result in an early attack by Japan on Malaya and the Netherlands East Indies, and possibly would involve the United States in early war in the Pacific."¹⁵

Time was now important to the Japanese. Weather forecasters indicated problems if attacks were delayed beyond early December. Each day's postponement of strikes against the East Indies and Pearl Harbor meant stronger resistance and further declines in oil reserves.

In September 1941, the Japanese stockpile stood at about 50 million barrels. At a daily reduced consumption of 75,000 barrels, Japan, without new supplies, would be out of oil in less than two years. Military operations would draw down the stockpile even faster.

On 6 September, Admiral Osami Nagano told the emperor: "The government has decided that if there were no war, the fate of the nation was sealed. Even if there is war, the country may be ruined. Nevertheless, a nation which does not fight in this plight has lost its spirit and is already a doomed nation."¹⁶

Japanese experts were growing alarmed. As diplomatic historian Herbert Feis wrote, "If Japan was to fight, the longer it waited the greater the risk that the battle might be lost for lack of oil or other essential raw materials. So, the

¹⁵ Pearl Harbor Attack: Hearings Before the Joint Committee on the Investigation of the Pearl Harbor Attack, 79th Cong., 1st Sess. (December 1945–January 1946), 2384.

¹⁶ H. Vere Redman, *Japan in Crisis: An Englishman's Impression* (London: G. Allen and Unwin, 1935), 123.

oil gauge influenced the time of decision.”¹⁷ The Japanese Navy pressed for a start of hostilities at the earliest possible time. Admiral Nagano kept pointing out that the Imperial Fleet alone was using 2,900 barrels of oil each hour.

In early November, orders went out to all naval units that “X-Day” would be 8 December Far East time, 7 December on the eastern side of the international date line. And so, war came to the Pacific. Just as oil was a principal factor in Japan’s aggression, the conflict’s outcome would also depend on oil.

¹⁷ Feis, *The Road to Pearl Harbor*, 269.

CHAPTER 7



BREAKING THE AMERICAN SUPPLY LINE

Can anyone tell me what good tanks and trucks and airplanes are if the enemy doesn't have the fuel for them? Yet, the High Command can't see it.

**~ Admiral Karl Dönitz, commander, German U-Boat Force,
February 1942**

The losses by submarines off our Atlantic seaboard and in the Caribbean now threaten our entire war effort.

**~ General George C. Marshall,
letter to Admiral Ernest J. King, 19 June 1942**

The small complement of sailors stood transfixed in the conning tower of *U-123*. Ahead, they saw the New York City skyline in fully illuminated brilliance, an image made sharper by the clear, cold air biting into their faces. Like thousands of people in the past who had approached the Narrows from Lower New York Bay, the sailors strained to catch sight of those familiar landmarks, the Statue of Liberty and the Empire State Building.

Kapitanleutnant (Lieutenant) Reinhard Hardegen ordered full stop, and the diesel choked a final whir before an eerie silence enveloped the submarine. He listened and looked, fearing he had ventured too close to shore. He alerted others in the tower to look for American mines outside the shipping channel. Yet, New York City was ablaze with light, and he thought how he would describe this sight when he returned to base. Surely, no one would believe him.

Hardegen was dazzled by the fully lit vista. With childish simplicity, he identified reference points on his chart. Skyscrapers, automobile headlights,

and advertising signs were clearly visible as he scanned the wondrously unwarlike scene of coastal New York. He laughed as he spotted lighted buoys marking the shipping channel.

"I have the feeling that the Americans are going to be very surprised when they find out we are here," murmured Hardegen.

In January 1942, *U-123* was the first German submarine to bring the war to America's shores. Hardegen had taken two weeks to cross the Atlantic, sinking the British steamer *HMS Cyclops* (1906) 483 km off of Cape Cod, Massachusetts, along the way. It was an auspicious start, and the defenseless appearance of New York City a month after Hitler had declared war on the United States made Hardegen think the next few weeks would be even more eventful, especially since the American attitude seemed so lackadaisical. Pearl Harbor was no aberration. Had they learned nothing?

Americans were shocked and surprised when they discovered enemy submarines operating within sight of New York. While Hardegen and his crew observed the city in its nocturnal glory, they were not more than a dozen kilometers from the federal building office of Navy rear admiral Adolphus Andrews, commander of the Eastern Sea Frontier and the one responsible for protecting the entire East Coast of the United States.¹

Hitler declared war on the United States only three days after telling his intentions to his admirals and generals. It was hardly enough time for them to digest the implications of the action, let alone draw plans for military action. Admiral Karl Dönitz, commander of Germany's submarine fleet, was an exception. He knew exactly what he wanted to do. He and his sailors had been frustrated for more than two years by Hitler's orders to avoid action against the American ships that kept the North Atlantic sea lanes open for delivery of the materiel keeping a battered Britain on its feet. Dönitz moved to make up for lost time. His "Grey Wolves," as he called them, were ready.

With no more restraints on him, Dönitz ordered Operation Paukenschlag (Drumbeat, 1942), which involved submarine attacks along the western Atlantic

¹ The *Eastern Sea Frontier* was a U.S. Navy operational command during World War II that included the coastal waters from Canada to Jacksonville, FL, extending out for a nominal distance of 322 km.

shore with tankers as priority targets. As a naval officer, Dönitz felt he had a better understanding of fuel requirements and how he could jeopardize the Allied war effort by cutting off their supplies. Most of the oil for Britain was coming from the United States and the Caribbean region. America was also fueling Russia's tanks and planes. The admiral wanted to send a dozen of his newest long-range type-IX U-boats to interdict supplies. Hitler balked, insisting that six of the later models be part of a 20-submarine force stationed in Norwegian waters for what he believed to be an imminent British invasion of Scandinavia. Germany then had a total of 91 submarines, only one-third of the number Dönitz considered adequate for war. Paukenschlag's allotted share was indeed small.

Dönitz finally mustered five of the type-IX U-boats for his operation. All were commanded by veteran officers with distinguished combat records. To all the captains before they left their bases, Dönitz admonished: "Woe to the man who comes back empty-handed! And don't attack anything of less than 10,000 tons." The restriction did not apply to tankers. Oil-carrying ships of any size were at the top of the target list.

Rear Admiral Andrews, meanwhile, was talking to as many of his superiors at the Navy Department as possible, pleading for more of everything. He reasoned the Germans would make every attempt to attack shipping along the Atlantic coast. Allied intelligence had warned in late December that U-boats were moving across the Atlantic. One warning that German battleships and cruisers were off the coast of Newfoundland turned out to be false (it was a fishing fleet); but Andrews, despite pitifully weak resources, knew he would soon have to face the enemy. His command stretched 3,220 km, from the Saint Lawrence River to the tip of Florida. All he had for this crucial line of defense were 20 ships, 100 planes, and 4 blimps. The largest ship was a 165-foot Coast Guard cutter. Most of the aircraft were obsolete. In early January, Andrews advised Admiral Ernest J. King, the U.S. Navy's commander in chief, "Should the enemy submarines operate off this coast, this command has no force available to take action against them, either offensively or defensively."²

²Dan van der Vat, *The Atlantic Campaign: World War II's Great Struggle at Sea* (New York: Harper and Row, 1988), 241.

In early 1942, *U-123* and the four other German submarines fully appreciated the lack of U.S. defenses. They moved from Cape Cod to Cape Hatteras, North Carolina, with impunity, sinking 44 unarmed and unescorted merchant ships. More than 70 percent of the tonnage lost was in tankers.

The average tanker carried 130,000 barrels of oil, so each sinking was a painful blow to the Allied war effort. About 85 percent of U.S. oil for the East Coast came by ship from Texas and Louisiana. Caribbean oil, much of it destined for Britain, also moved along the now perilous Atlantic coastal route. The early rate of attrition indicated that one-half the Allied oil-carrying fleet would be lost within a year. Britain's navy believed it would run out of bunker fuel in two months. Only a five-week supply of motor fuel was on hand. Four large tanker arrivals a day were necessary to keep the British war economy going.

Kapitanleutnant Hardegen could not believe his victories, which he flashed to Dönitz. A few days after the start of operations, the admiral noted in his war diary, "Reports from the coastal waters off North America indicate that the U-boat campaign there will be successful for much longer than anticipated. *U-123* signals that they have achieved results far above expectations."

After his brief surfacing to see the sights of New York, Hardegen submerged in 100 feet of water off Wimble Shoals, North Carolina, just south of the city. There he waited in silence slightly away from the shipping channel observed during the night. Fifty ships a day passed this point.

Shortly after midnight on 14 January, Hardegen surfaced and moved east. Shortly thereafter, the lookout shouted, "Ship to port, Captain."

Two torpedoes were readied.

"Ten degrees to starboard," Hardegen directed. "Full speed ahead."

The German submarine commander ordered the torpedoes fired almost simultaneously. Two explosions soon ripped the air, and towers of flame rose from the water. The victim was a tanker.

"Captain, the torpedoed vessel is sending out a distress signal," reported the submarine's radio operator. "You won't believe what it is. They say, 'We have struck a mine south of Long Island'."

"What? You're certain they're saying 'mine'?"

"Yes, Sir. They're sending in the clear."

"A mine," muttered a disbelieving Hardegen. He thought them fools.

Minutes later, the lookout turned from watching the fiery tanker to see another ship approaching from port. A single torpedo was fired. It missed.

Before long, however, Hardegen had sighted his next prey, a 10,000-ton tanker that sank before its radioman could get off a distress signal. *U-123's* next torpedo was fired a few minutes later when still another tanker appeared. Even though the merchantman's crew could clearly see the burning debris of the first tanker and had probably seen it explode, the ship followed an undeviating course right across the submarine's path.

"I just don't understand these people," said Hardegen. "They know damned well we're here. They can see one of their ships burning and they don't even bother to zigzag. Well, it just makes our job easier."

When ships were too small to waste a torpedo, Hardegen used his deck guns. Before leaving the New York area, *U-123* caught an 8,000-ton cargo vessel hugging the coast. The night lights of the city could be seen to the northwest. The submarine was not only dangerously exposed, but just as Hardegen closed on his target the diesel engine stopped. The cargo ship was 250 feet dead ahead. Eight rounds were fired from the deck guns of the idled submarine. Several direct hits did not stop the freighter. Finally, a salvo finished the ship off, and it lay dead in the water.

"Captain, look," shouted one of the lookouts, pointing to shore.

Through his infrared binoculars, the U-boat commander saw hundreds of parked automobiles facing the ocean, their drivers and passengers gawking at the deadly drama spread out on the fiery water before them. Many headlights remained turned on as if to give greater illumination to witness the sight.

It was a familiar scene during the winter months. The *New York Times* told of the "grim spectacle for early morning watchers of the Jersey coast" when the 10,000-ton tanker *R. P. Resor* was torpedoed. Virginia Beach and Atlantic City visitors were frequent witnesses to spectacular sinkings, but the biggest crowds were in Miami Beach, where the resort season was at its peak. The Miami area was said to have cast a neon glow of 10 km. There were no blackouts at night. Chambers of commerce and hotel operators fought any move that would interfere with business even though it was known that the U-boats were aided by the lights, which marked the coastline.

Figure 7.1. *Tiger* sunk by German U-boat



The U.S. tanker *Tiger* sinks near the coast of Virginia, April 1942. The month before, 43 vessels were sent to the bottom of the Atlantic by U-boats, greatly straining the Allied supply line.

Naval History and Heritage Command

Admiral Andrews concluded that at least 3 of the 13 sinkings in January were the result of ships providing a silhouetted target while sailing between fully illuminated coastal cities and German submarines. The U-boats had only to wait to seaward along the trade routes for the ships to pass the lighted shore. Dönitz's Grey Wolves feasted under these conditions.

Hardegen's *U-123* alone sank eight ships. His biggest prize was a tanker off Cape Hatteras carrying 72,000 barrels of Colombian crude oil to New York City. As he headed home, the German officer wrote in his war diary:

It is a pity that there were not twenty U-boats last night, instead of one. I am sure all would have found ample targets. Altogether, I saw

twenty steamers, some undarkened; also a few tramp steamers, all hugging the coast.³

Even as *U-123* returned to base, its radioman listened to Allied ships chattering in the clear on the 600-meter band, revealing their positions and reporting on other ships in the area. The information was passed on to the next group of U-boats, fully loaded, which was replacing the original wolfpack.

Operation Paukenslag was declared an unqualified success. Dönitz said, “Our U-boats have inflicted damage comparable to that of 80,000 bombers.” Hitler congratulated him, and Iron Crosses were awarded by the score. For Dönitz, the adulation accorded to his sailors and the appreciation of Berlin meant little. Not only had he originally wanted double the number of subs for Paukenslag and been denied them by Hitler, but his later efforts to increase the size of his U-boat fleet in the western Atlantic were also resisted by the German High Command.

Dönitz argued that “if we engage all our Grey Wolves along the American coast, we will be able to bleed enemy shipping to death.” The admiral lost again. Hitler’s orders would be obeyed: “Operations against convoys to and from Murmansk and Archangel [Russia] have absolute priority.” The führer also insisted on keeping the large force of U-boats in Norwegian waters.

Admiral Erich Raeder, commander in chief of the German Navy, shared Dönitz’s view on submarines and their ability to strangle an enemy dependent on long supply lines. Raeder claimed, “The more ruthlessly economic warfare is waged, the earlier it will show results and the sooner the war will end.”⁴ But the navy could never convince Hitler of the role it could play in the war, and full submarine construction was not emphasized until 1943, much too late.

Hitler and his High Command were slow to grasp the effects of economic war fought by Nazi submarines. As the American naval historian Samuel

³ Jean Noli, *The Admiral’s Wolf Pack*, trans. J. F. Bernard (Garden City, NY: Doubleday, 1974), 137–76.

⁴ *Nazi Conspiracy and Aggression*, vol. 2 (Washington, DC: Government Printing Office, 1946), chap. 16, pt. 15.

Eliot Morison wrote, “The massacre enjoyed by the U-boats along our Atlantic coast in 1942 was as much a national disaster as if saboteurs had destroyed half a dozen of our biggest war plants.”⁵

Paukensschlag’s successes and Dönitz’s persistence finally won approval for a second and slightly larger wave of submarines to be sent to the western Atlantic. Four more type-IX subs and seven standard type-VII boats were ordered to join in the kill. The second group arrived in mid-February for Operation Neuland (“New Territory”). This time, Dönitz concentrated even more on the supply of Allied oil, targeting not only tankers but refineries in the Caribbean. Aruba and Curaçao facilities alone produced a half million barrels of oil products daily. On 16 February, both refineries were shelled by German U-boats.

It was a measure of the defenseless state of the Allies that Aruba was guarded by a lone Dutch motor whaleboat and a few coastal guns. The commander of *U-156*, Werner Hartenstein, arrived on station unmolested a few kilometers from the refinery when he received his orders: PRIORITY DESTRUCTION OF STORAGE TANKS, SHIPPING ATTACKS NOW SECONDARY.

Hartenstein peered through his binoculars, carefully recalling the information passed on to him during the intelligence briefing before he left base: “Don’t confuse the target tanks, which are probably camouflaged under painted netting, with the old tanks which have not been used for several years and which are slightly to the left of the docks.”

Undetected, *U-156* slipped into firing range in the night fog, but Hartenstein believed the people on shore were totally indifferent and that the weather made no difference. Still, the attack was not to be all milk and honey for the Germans. When he gave the order to fire the 105mm deck gun, an explosion ripped the gun and its mount. The shell had exploded in the chamber, and two gunners lay critically wounded. The gunnery officer, his knee shattered, told Hartenstein, “The bung [stopper or cork], we didn’t remove it from the gun.”

⁵ Samuel E. Morison, *The Two-Ocean War: A Short History of the United States Navy in the Second World War* (Boston, MA: Little, Brown, 1963), 109.

As searchlights from shore played on the water around the sub, Hartenstein turned and headed for the open sea at full speed. Negligence probably prevented destruction of Aruba's storage tanks and refinery.⁶

Though an inauspicious beginning for Operation Neuland, Aruba and Curaçao were bombarded by other members of the Nazi wolfpack during February and March. The Germans soon learned, however, that shelling oil installations was less effective than anticipated. Although fiery displays resulted, actual damage was minimal. Once the element of surprise was eliminated and defenses were strengthened, U-boats were exposed to great danger. Coastal shelling was resorted to only infrequently after the first few days of the operation. The wolfpack went back to preying on tankers in open seas.

When the full U-boat force returned to hunting down ships, the results were again spectacular. Lazily coursing the Caribbean and its approaches by night and lying on the bottom by day, the submarines were limited only by fuel supplies and the number of torpedoes they carried. Reflecting the spirit and determination of the U-boat force, crew volunteered to reduce their food and water rations while on patrol in order that more weaponry could be carried and the range extended with additional fuel.

Forty-three vessels were sent to the bottom by U-boats in March 1942. As British naval historian Captain Stephen W. Roskill observed, "What made these losses more serious was that a high proportion of the sunken ships were tankers, of which we were woefully short."⁷

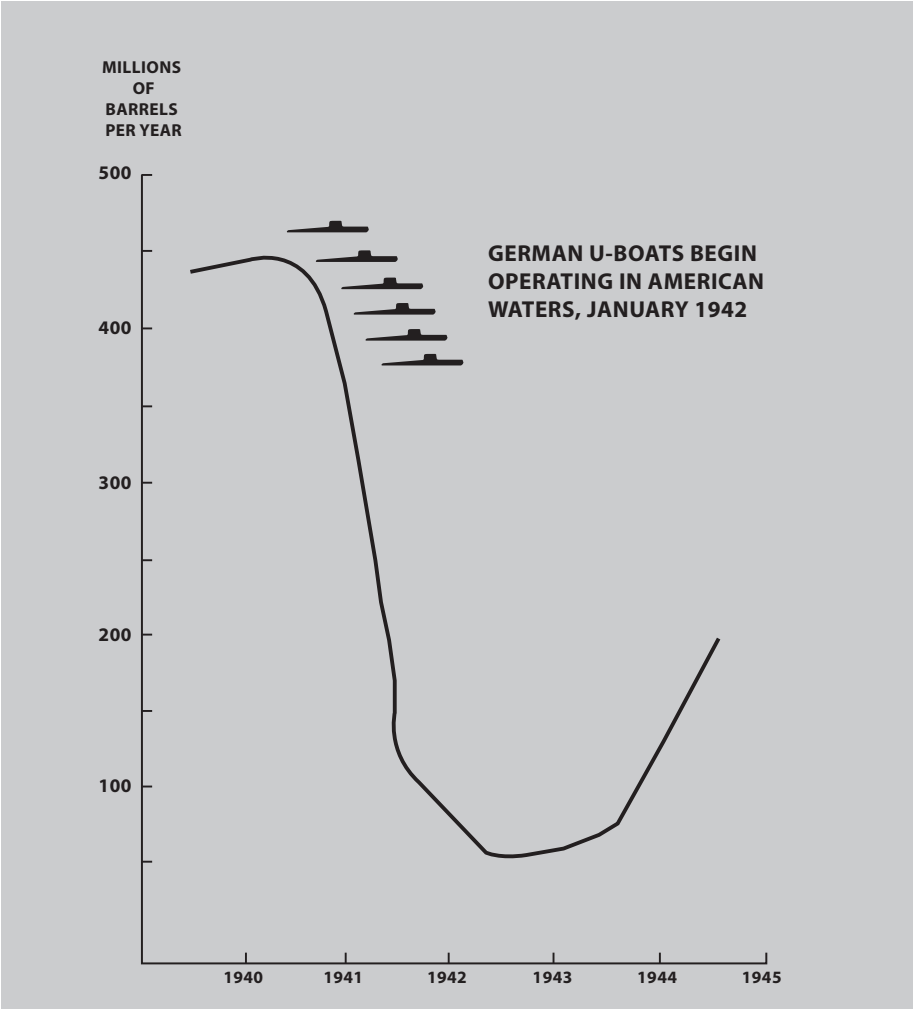
On 12 March, British prime minister Winston Churchill wrote to President Franklin D. Roosevelt: "I am most deeply concerned at the immense sinkings of tankers west of the 40th meridian and in the Caribbean Sea." He knew that at a loss rate of 200,000 tons a month, Britain would soon run out of oil. Oil stocks in Britain that spring fell below the level considered to be the absolute minimum for safety.

Roosevelt was aware of the British plight but could reply only, "My navy has been definitely slack in preparing for this submarine war off our coast."

⁶ Noli, *The Admiral's Wolf Pack*, 155–57.

⁷ Stephen W. Roskill, *White Ensign: The British Navy at War, 1939–1945* (Annapolis, MD: Naval Institute Press, 1960), 194.

Figure 7.2. Petroleum shipped by tankers from the U.S. Gulf Coast to East Coast ports



Courtesy of William Morrow, adapted by MCUP

The United States also felt the pinch. A Petroleum Industry War Council Committee, established to review tanker losses, concluded that if the loss rate suffered through March continued, it “would result in not enough fuel to carry on the war.”

Despite the concern, improvement in defenses was slow. “Mystery ships,” or “Q-ships,” were introduced in March. These were heavily armed, navy-manned ships disguised as merchant or fishing ships and used as decoys to draw out German U-boats. The disguised ships could speedily unveil their weapons and open fire on unsuspecting U-boats. The plan ended quickly when the alerted Germans sank two of the six ships. One survivor was decommissioned after nearly capsizing in a storm, and the others were refitted as weather ships.

Three U.S. destroyers were pulled off North Atlantic convoy duty for coastal defense. As if in scornful response, a German submarine torpedoed and sank one of them, USS *Jacob Jones* (DE 130), when it arrived off the Delaware cape. A few additional wooden subchasers, *Eagle*-class patrol craft left over from World War I, and private yachts pressed into military service provided little protection.

More aircraft were diverted to spotter duty, and by 1 April, 170 Army and Navy planes were operating from 19 bases along the coast from Bangor, Maine, to Jacksonville, Florida. In May, radar was used for the first time in night operations along the Atlantic seaboard.

As these defensive measures became apparent, the wily Dönitz shifted his attack zone, sending the U-boat force to the Gulf of Mexico. The new hunting ground brought instant rewards. Three of every four tankers leaving Texas and Louisiana ports were sunk within two weeks of this new phase of the German campaign. Six submarines concentrated their destructive power in the mouth of the Mississippi River. The U.S. Navy’s Gulf Sea Frontier reported the loss of 41 ships of 220,000 gross tons in May. Fifty-five percent was tanker tonnage.

Emergency defensive measures were hurriedly put into place, but Dönitz moved his force to still another area. In June, the U-boats struck outside the Panama Canal, where 5 submarines sank 14 ships in two weeks. With their presence clearly evident, the U-boats switched locations again, this time as far south as the bulge of Brazil.

Dönitz kept his submarines and crews, with their limited fuel, ammunition, and food, steadily shuttling back and forth across the Atlantic from home bases, always delivering quick strikes in defenseless areas. At the time, it was hard to believe how few U-boats were involved. A total of only 37 were em-

ployed in American waters during 1942, with no more than 12 on station at once.

U-boat captains maintained an almost regular schedule. Each averaged a 42-day cruise: two weeks from base to target, two weeks in combat attacks, and a final two weeks to return to base.

In order to extend the range and give his U-boats more time on station, Dönitz conceived the idea of underwater supply ships. Most of these were large, 1,600-ton U-boats that carried 42,000 barrels of diesel fuel to refill tanks of operational submarines while using an additional 7,000 barrels themselves. Known to the Germans as *milchkuhs* (or milk cows), the submarine tankers could refuel a dozen hunter subs, permitting each an additional week or so to engage in combat operations. The first milchkuh, the *U-459*, refueled *U-108* on 22 April. Crews found the added supply link a blessing because the milchkuhs also provided fresh food. *U-123* under Hardegen had another successful patrol through late April when it sank 11 more ships, in part by being able to extend its time on station.

Not enough of the supply vessels became operational, however, to be a decisive factor in the campaign. While Nazi submarine losses were rare in the spring of 1942, as summer operations began and Allied defenses improved, they mounted. The first U-boat to be lost was depth-charged by a Canadian-based U.S. Navy patrol plane south of Newfoundland on 1 March. A Coast Guard cutter sank *U-352* off the shores of South Carolina in May. After that, U-boats found themselves in increasing peril. Through August, 10 were lost by air or surface attack from Canada down to the north coast of Cuba. Oddly, no German submarines were lost to U.S. mines, but five Allied ships were sunk or damaged when they strayed off prescribed courses.

Dönitz felt the losses were worth the results, and he went back to Hitler to win approval for more U-boats and supply submarines. While applauding what the admiral had done, Hitler and his top military planners still felt Dönitz was “oversimplifying” when he argued that an increase in his activity would bring about a crippling cut in the flow of Allied oil. Hitler was too obsessed with the Russian front to pay more than lip service to Dönitz.

The admiral pushed his case wherever he could. He extolled his U-boats in meetings with the press, emphasizing the ease with which they inflicted

heavy losses in the enemy's front yard: "Our submarines are operating close in shore along the coast of the United States of America so that bathers and sometimes entire coastal cities are witnesses to that drama of war whose visual climaxes are constituted by the red glorioles of blazing tankers."⁸

Dönitz might have seen a continuation of his successes even with his limited-size fleet had not the Allies finally resolved to end the U-boat menace.

American inter-Service military rivalries and squabbles over commands had contributed to the sorry state of the coastal defenses. Bickering among generals and admirals was finally set aside as the situation became more grave. One of the areas of dispute was the use of planes coming into operation. Over the objections of the U.S. Army Air Forces, some of its long-range, four-engine North American B-25 Mitchell bombers were pressed into anti-submarine service under command of the navy. By 1 August, the military had 319 aircraft flying patrol. More U.S. Navy ships were committed to Atlantic and gulf coasts, augmented by 24 antisubmarine trawlers and two escort groups of the British Royal Navy manned by experienced crews.

A long-overdue coastal blackout had been imposed on 18 April 1942 and was extended to inland areas in May. Wardens made regular rounds to ensure that blackout curtains were drawn or lights extinguished in homes and commercial establishments. Merchant-ship crews were instructed to maintain radio silence and run without lights. Automobile headlights still outlined coastal roads, however.

By far the biggest factor in combating U-boats was the introduction of the convoy system. The first coastal convoy moved out of New York harbor on 29 April, the first day that month that tankers were permitted to sail the coastal routes. From then on, ships moved only by daylight escorted by a force of 28 Allied men-of-war. At night, the convoys holed up in protected harbors or bays. Known as the "bucket brigade," the convoys moved in roughly 193-km stretches, from Key West to Miami, then to Cape Canaveral and Jacksonville, Florida; Savannah, Georgia; Charleston, South Carolina; Wilmington, North Carolina; Norfolk, Virginia; the Delaware Bay, Pennsylvania; New York;

⁸ Morison, *The Two-Ocean War*, 121.

Boston, Massachusetts; and finally to Portland, Maine. Though long and arduous, the trips were infinitely safer than previous sailings.

Admiral King had been mainly responsible for blocking a convoy system. Right or wrong, he felt that ships assigned to such duty weakened other operations and impeded the rebuilding of the Navy in the Pacific after Pearl Harbor. Above all, he resented the constant pressure from the experienced British to institute controlled convoys. King said he “hated taking orders from the limeys [British].” He finally capitulated when the First Sea Lord of the Admiralty, Admiral Sir Dudley Pound, flew to Washington to offer further British aid in the form of ships and aircraft.

A fully interlocking system went into effect in August with two main routes. One was from New York City to Cuba and the other from New York City to Key West. There were feeder lines to all ports extending from Halifax, Nova Scotia, terminus of the North Atlantic convoys, southward to Florida, through the Gulf of Mexico, and then to Brazil. All ships sailed in compact formation and only along those shipping lanes in the company of warships.

Though slowed, the Dönitz menace continued. Gordon Martin is a farmer now in southern Michigan, but he still vividly remembers one night in late 1942 or early 1943 in Miami Beach as a member of the air corps cadet class of 43-A.

“The night still sticks in memory,” Martin recalled. “My platoon was patrolling our sector. Blacked-out Miami was on one side with the open ocean on the other and clearly visible were seven ships burning on that ocean. Two or three were just big red glows against the horizon but most of them were close enough so we could see the outlines of the ships’ structures against the flames with an occasional big puff of flame as something on a ship blew up. We all expected lifeboats with survivors to come ashore at any moment but none came to our sector while I was on duty.”

Martin’s squadron was stationed just off Collins Avenue at the Crest Hotel, where the beach was completely polluted. The sand was black with oil spills, he said, and wreckage that had washed ashore seemed to be everywhere. “It was common to see ships burning a few miles off shore. Pillars of smoke during the day and red glows at night were a regular sight.”

Martin went on to become a captain in the U.S. Air Force.

Figure 7.3. *Spencer* depth-charging U-boat



U.S. Coast Guard personnel sailing on the USCGC *Spencer* (WPG 36) watch as a depth charge strikes a German U-boat that was stalking their convoy, April 1943. The Allies' convoy system proved the best way to combat U-boats during voyages across the Atlantic.

National Archives and Records Administration

Dönitz finally called his U-boats home from American waters, but they had left a horrendous toll behind. During their operations in the West, the German subs sank 391 merchant ships totalling 2.2 million gross tons. Of the total, 141 were tankers under American or British control.

At the beginning of 1942, the U.S. tanker fleet represented 5.6 million aggregate tonnage. About one-quarter of the fleet was sunk during the year.

Shipyards built new ships as fast as possible, but only a million tanker tons were added by the end of the year. The net drop, though small, came at a time when demand for U.S. oil increased dramatically and shipping needs grew as fighting spread around the globe in a two-ocean war.

Even at home, American oil was not flowing in sufficient quantities. The German U-boats had crippled supplies alarmingly. Daily tanker shipments from the Gulf of Mexico to the eastern seaboard dropped from a 1941 level of 1,421,000 barrels per day to 391,000 during 1942. A scramble for rail tank cars filled part of the gap. Daily oil loads by rail increased from 62,000 barrels a day in December 1941 to 856,000 by September 1942. Even so, total shipments from the gulf to the East Coast dropped by 321,000 barrels per day in 1942 from 1941 levels.⁹ Limits to the amount of transportable oil seemed to have been reached, and other ways had to be found to meet the emergency.

President Roosevelt called on Americans to cut their driving by half, but it was estimated that three out of four car owners ignored the appeal. When voluntary measures failed, gasoline rationing was imposed. Since the problem was centered in the eastern states, an allotment of 16 gallons a month was ordered in July for 17 states and the District of Columbia. In order to “share the shortage,” the rest of the country was placed under rationing in December. While drivers west of the Appalachians received 16 gallons, the eastern drivers were reduced to 12 gallons monthly. The nationwide system was imposed more out of a need to conserve rubber than to conserve fuel, but the East’s problems were directly attributable to tanker losses.

Industrial consumers and homeowners in the East and Midwest were persuaded to switch from oil to coal and other energy sources for power and heating. The manufacture of oil-burning equipment was banned. Thermostats in homes were required to be set no higher than 65 degrees during the day and 55 at night. Home heating oil was rationed after the end of the year. By converting to coal, homeowners and many industries were able to escape the full force of the oil shortage. Britain did not enjoy the benefit of available coal

⁹ John W. Frey and H. Chandler Ide, eds., *History of the Petroleum Administration for War, 1941–1945* (Washington, DC: Government Printing Office, 1946), 449.

when it started cutting back on oil, so conversions on the other side of the Atlantic were small. Coal and oil shortages already existed. Efforts were made to increase coal production, and tar oil replaced home heating oil in many homes and factories. Ten ships that had hauled wheat from Canada were converted to the petroleum trade.

While gasoline rationing had been in effect since September 1939 and progressive cutbacks followed, Britons tightened their belts again as a result of sharply reduced imports in 1942. In July, no fuel was permitted for discretionary private use. The only exception, and it lasted throughout the war, was for about 40,000 drivers living in remote country districts where no alternative transportation existed. They received enough fuel to travel 193 km a month. The summer of 1942 also brought a sharp cut in Britain's bus and motor coach services, and intercity traffic was reduced to absolutely essential travel only. Bicycles became treasures.

One project that helped the Allied fuel crisis bears special mention. Construction of the "Big Inch" pipeline from Texas to the East Coast was born of the German submarine offensive. "You can't sink a pipeline" was the slogan voiced. When the project was completed, 300,000 barrels of oil flowed through daily. Secretary of the Interior and Petroleum Administrator for War Harold Ickes proposed the pipeline in 1940, but was turned down because scarce steel was needed for projects considered more urgent. With the tankers falling victim to U-boats, priorities changed, and the "old curmudgeon" had his way. The 24-inch diameter pipeline contained 360,000 tons of steel and was built in 350 days. It stretched 2,253 km from Longview, Texas, to Linden, near New Jersey's shore. A barrel put in one end would take nearly two weeks to reach the other, pumped along at 8 km an hour. When he dedicated the "Big Inch," Ickes said, "Removed though it may be from those scenes of violent conflict, it will nevertheless have a positive, decisive influence on their eventual outcome."

"Big Inch," together with the Plantation "Little Inch" and other pipelines that traversed different routes to achieve the same purpose, did have a direct bearing on the war, and these pipelines were remarkable achievements. Today, building a beltway around a major American city is a 15-year project. Yet, in 1942, under the pressures of war, a total of almost 11,000 km of pipe

was laid or converted to pumping oil in less than a year. Overland routes by pipe and the complementary rail network precluded any renewal of enemy attack on the shipment of U.S. oil to industrial and export centers. Caribbean and Atlantic shipping routes were made more secure because ships and aircraft were concentrated along fewer lines of supply.

While 1942 represented the nadir of Allied military fortunes, the new year began with justifiable optimism. U.S. war industry targets were high: 125,000 new planes; 75,000 tanks; and 8 million tons of ships. Military spending for the fiscal year represented 89 percent of the federal budget. The goals would actually be surpassed and always with enough fuel available to run the ever-increasing engines of war.

The situation contrasted sharply with the Axis scramble for means to power its military forces. At times the measures were extraordinary, as the *Ole Jacob* (1939) could attest. The Norwegian tanker was among the fastest and most modern afloat. Even in the first months of the war, it maintained its neutral right to sail unimpeded and was pressed to maintain a rapid turnaround schedule to meet the demands of fuel from all quarters. In November 1940, it was in the Bay of Bengal with 85,000 barrels of aviation gasoline from the East Indies destined for British aircraft.

On the night of 8 November, lookouts spotted a ship in its wake and flashed a message asking for the follower's identity. The signal came back, "*Atenor*," a British armed merchant vessel. But the tanker's captain was suspicious. He asked for confirmation. It was duly given, but as the pursuing ship closed in, the tanker radioed a distress signal: "Being stopped by an unknown vessel."

A boarding party approached, and two English-speaking officers clambered up the ship's ladder. They confronted *Ole Jacob*'s captain with pistols and shouted, "Hands up!" Ten sailors brandishing automatic weapons scrambled from under the tarpaulin of the launch in the water below and boarded the tanker to reinforce their officers. The Norwegians did not resist. The German raider *Atlantis* (HSK 2) had taken another prize of war.

Raiders and blockade-runners! Another phase of the oil war. *Ole Jacob* was ordered to Japan, flying the Norwegian flag until it arrived in the port of Kobe. By January 1941, the vessel had been renamed *Benno* and was ready for

blockade-running under Captain Fritz Steinkraus, a veteran merchant master and now a German naval officer who had been sent to the Far East for his command by way of Russia on the Trans-Siberian Railroad. The ship's aviation fuel had been traded for an equal amount of bunker fuel, plus a Japanese Nakajima 90-11 seaplane. The bunker oil increased the fuel available to German ships operating in Asian waters by a full 50 percent, and the plane was turned over to another German raider, *Orion* (HSK 1), as a scout aircraft.

Sailing the South Seas, the *Benno* served as a mother ship for other Nazi raiders searching the waters for British ships. Finally, its cargo gone, Captain Steinkraus took the ship around the Cape of Good Hope into the Atlantic and up the African coast to occupied France. Reloaded, the tanker returned to the South Pacific, and in December it was again on its way back to Europe for another load of oil.

Two days before Christmas, a Short S.25 Sunderland flying boat from the 10th Squadron of the Royal Australian Air Force (RAAF) operating out of England spotted *Benno* about 322 km northwest of the tip of Spain below the Bay of Biscay. The plane carried only antisubmarine depth charges but attacked, dropping the weapons as if they were bombs and inflicting minor damage. *Benno* altered course to find a safe port in Spain while Captain Steinkraus radioed for help. The Germans sent a U-boat pack and aircraft from France, but before they arrived, a Bristol Beaufort of the Royal Air Force Coastal Command caught the tanker a few hundred yards off of the Spanish mainland. With a single torpedo amidships, the Beaufort inflicted a mortal wound. Captain Steinkraus edged *Benno* closer to shore and finally beached the ship at Carino. So ended, after sailing almost 805,000 km, a year of service for the Reich of a captured Norwegian tanker turned blockade-runner.¹⁰ By now, the high seas were swarming with vessels whose missions gave no clue to their origin and whose crews devised every bit of chicanery to deceive and destroy.

¹⁰ Based on material from August Karl Muggenthaler, *German Raiders of World War II* (Englewood Cliffs, NJ: Prentice-Hall, 1977); and Martin Brice, *Axis Blockade Runners of World War II* (Annapolis, MD: Naval Institute Press, 1981).

With the outbreak of war in 1939, there were 386 German merchant ships in foreign ports around the world. Each carried cargo needed in Germany and had to break through the British blockade. On 4 September, the newly created British Ministry of Economic Warfare issued a list of items of value to the German war effort that were to be interdicted. Heading the list were “all kinds of arms, ammunition, explosives, chemicals or appliances suitable for use in chemical warfare.” Second on the list, ahead of communications equipment, machinery, and food, was:

Fuel of all kinds; all contrivances for, as means of transportation on land, in the water or air, and machines used for their manufacture or repair; component parts thereof; instruments, articles or animals necessary or convenient for their use; materials or ingredients used in their manufacture; articles necessary or convenient for their production or use of such materials or ingredients.¹¹

Some of the German ships stranded at the beginning of the war were tankers, mostly in the East Indies and the Caribbean, that had been hauling oil, which Berlin was stockpiling as fast as possible before the invasion of Poland. By April 1940, 82 German merchant ships had evaded the Royal Navy and made it back to Germany safely. Fifty-eight ships were captured or sunk. Another 246 were still at large, nesting in friendly or neutral ports, waiting for their chance to run the blockade.

Fully aware of Germany’s precarious fuel position, the British concentrated on German ships in the Dutch East Indies (now Indonesia). To prevent the breakout of 17 German tankers believed to be there, a special Malaya Force was created with three cruisers, two destroyers, two submarines, and a sloop. Additional tankers were in Aruba and Curaçao in the Dutch West Indies, and British men-of-war together with French submarines patrolled the Caribbean and the central Atlantic to intercept them.

¹¹ The full text of the ministry directive is in Bernard Stubbs, *The Navy at War* (London: Faber and Faber, 1940).

Some German ships waited patiently for the right moment to break for home. The German tanker *Nordmeer*, for example, sailed from Curaçao, evaded the French submarine *Ouessant* (1936) through the passages of the Antilles, and dashed across the Atlantic to Vigo, Spain, where the Germans could be assured access to the tanker's oil.

Others were less successful. A British armed merchant cruiser intercepted the German oiler *Biscaya*, whose tanks were empty, in the Denmark Strait. The tanker was taken as a prize and put into service for the Allies.

Some empty German tankers were scuttled to prevent their falling into British hands. It was obvious to the Germans that they could never rely on sea routes to supply Germany with significant supplies of oil. The Reich's primary need for tankers was to supply U-boats on raiders, whose activities ranged around the globe. For instance, *Winnetou*, which had been caught at Las Palmas in the Canary Islands when the war began, was eventually told to break out and was assigned to supply the raider *Orion*. The two ships moved to Asian waters, where the tanker met every rendezvous until its cargo was expended.

Germany improvised to find tankers to serve its far-flung oil needs. The marauding pocket battleship *Scharnhorst* (1936) captured three Allied tankers early in the war and turned them into fuel suppliers for the German Navy in the South Atlantic. Captured Norwegian whale factory ships served as oilers with little need for conversion.

Ranging around the world, the German raiders accounted for 128 Allied ships sunk or captured during their extended cruises, including 21 tankers. *Widder* (HSK 3), *Pinquin* (HSK 5), and *Michel* (HSK 9) each accounted for four tankers.

The American tanker *William F. Humphrey* (1921) tried to fend off the raider *Michel* on 16 July 1942 while steaming empty from Cape Town to Trinidad. Gunners on the U.S. vessel fired several rounds from a 5-inch gun. The raider easily overpowered the tanker, sinking it in six minutes with 60 direct hits from deck guns and administering a coup de grâce of three torpedoes broadside.

When fully loaded, the tankers were usually death traps. The Dutch oiler *Oliva* was caught in the Indian Ocean on 14 June 1942 by the raider *Thor* (HSK

4). The first few salvos touched off a series of fiery explosions. Only 1 of the 46 crew from the tanker was picked up by the raider.

Five days later, *Thor* pounced on another tanker, the 7,900-ton Norwegian *Herborg* in the Indian Ocean. Third officer Haagen Poppe recalled the experience:

We hoisted our flag and were standing on the bridge looking at him [the raider] with our glasses when we saw a plane coming in from port, its machine gun chattering. It had a trailing line with which it tore out our aerial and then it dropped two bombs. “Bak, bak, bak,” went the other ship, which we thought was a Jap[anese]. I ducked and heard shells go “whuuuum whuuuum, whuuuuming” by overhead. They all missed but as there was little point in using our 3-inch gun, we abandoned with our crew of 38 Chinese. On board the raider we were searched by white-jerseyed Germans, who, I must admit, were very nice and polite about it. They were decent, probably thinking that they might be prisoners tomorrow.¹²

Poppe was right. The German crew that took over the tanker eventually met a worse fate. In Japan, the *Herborg* was renamed *Hohenfriedberg*. Drawing on stockpiled German-controlled oil in Kobe, the tanker operated in Asian waters for three months before its supply tanks ran dry. It headed back to Europe, and the importance of even a single tanker to the Germans was underscored on its return voyage. After making it through the Indian Ocean and around Africa, six U-boats were sent to protect *Hohenfriedberg* on its final leg from the Azores to France. On 21 February 1943, a U.S. Consolidated B-24 Liberator patrol bomber from Port Lyautey in Morocco spotted the tanker about 322 km west of Gibraltar. The cruiser HMS *Sussex* (96) chanced to be nearby, and it was dispatched by the Royal Navy to an intercept point. *Sussex* came under attack from *Hohenfriedberg*’s U-boat escorts, but a combined surface and air attack sank the tanker in a matter of minutes.

¹² Muggenthaler, *German Raiders of World War II*, 226.

In all, 16 blockade-runners tried to scamper from Japan to Europe from April 1941 to May 1942. Twelve made it. From that time on, few were successful as Allied control of the sea lanes and mastery of the air ended the voyages of German blockade-runners and raiders. The pivotal year of 1943 found the Germans scrambling on all fronts. The last of the raiders, *Michel*, was sunk by the American submarine *Tarpon* (SS 175) on 17 October south of Japan after limited success in the South Pacific and along the South American coast. Its last victory was the sinking of the Norwegian tanker *India*.

The raiders accounted for the destruction of at least 80,000 barrels of oil and the capture of more than five times that amount. They also expended the energies of Allied ships and planes around the world. Countless operations were undertaken to hunt down the raiders and their supply ships.

CHAPTER 8



MIDEAST OIL AND THE MEDITERRANEAN

On the produce of these two oil areas [Iran and Iraq] Great Britain largely depended for the maintenance of her war effort. Let the Axis powers once sever her connection with either and the consequences might be disastrous.

~ Christopher Buckley, *Five Ventures: Iraq, Syria, Persia, Madagascar, Dodecanese* (1954)

Shortage of oil was one of the limiting factors upon Germany's, and still more Italy's, capacity to wage war. Control of the major oil fields of the Middle East would have eliminated that problem.

~ Geoffrey Warner, *Iraq and Syria, 1941* (1979)

The island of Rhodes in the Italian-controlled Aegean Sea was a perfect base for the newest formation of German oil commandos. Tucked beneath the southwest corner of neutral Turkey, Rhodes provided air access and instant entry to most of the oil fields and refineries of the Middle East. Berlin raced to assemble the petroleum engineers and skilled oil-field technicians to catch up with the swift military and political successes of April 1941. Abundant Mideast oil was within Germany's grasp.

General Erwin Rommel's *Afrika Korps* had swept through the Libyan desert and penetrated 10 km into Egypt by the end of that month. The mixed German-Italian force was hammering eastward toward Cairo and the Suez Canal. King Farouk I of Egypt informed the Germans he would welcome their

forces “as liberators from the unbearably brutal British yoke.”¹ A pro-Axis Arab revolutionary government had seized power in Iraq and blocked the flow of its oil through the pipeline from Kirkuk to British-held Haifa. Anti-British Iraqi military units controlled most of the wells in al-Basra. Iran was falling into the German orbit as thousands of Germans filled positions of responsibility in Tehran and other key cities. The Iranian economy was increasingly dominated by Germans as the country’s political leanings tilted dramatically to pro-Axis positions. Nearly one-half of Iran’s trading, excluding oil, was with the Germans, and Iran was prepared to increase that trade by delivering oil to the Germans instead of the British.

It was the best of all worlds for Germany. The inevitable triumph of Nazism seemed secure. Middle East successes from the Mediterranean to the Persian Gulf merely represented a continuation of those enjoyed during 20 months of war, and Germany planned to exploit the favorable developments as quickly as possible. The oil commandos were poised on Rhodes for quick deployment in early May. It was not clear where they would be sent, but Iraq seemed most likely. Its production alone could provide Germany all the oil it would need. Iran was another possibility. Berlin knew that Iran’s petroleum production was more than twice that of Iraq and a veritable bonanza.

The most direct overland route to the Middle East oil fields was through Syria, the French mandate whose leaders supported the Nazi-allied rump government of France in Vichy. Though the Germans coveted Mideast oil for their own use, they would have been equally content to have denied it to the British. Iran was the world’s third largest producer of crude in the immediate prewar period, trailing only the United States and the Soviet Union. Iran’s output of 214,000 barrels daily was greater than Nazi Europe’s combined production in Romania, Poland, Hungary, Austria, and Germany.

Iran’s petroleum was controlled by the Anglo-Iranian Oil Company (now BP), in which the British held controlling interest. The British foresightedly bought majority rights in 1914 to assure themselves sufficient oil to fuel

¹ U.S. Department of State, *Documents on German Foreign Policy, 1918–1945*, vol. 12, no. 350 (Washington, DC: Government Printing Office, 1962).

the Royal Navy, a purchase initiated by the then First Lord of the Admiralty, Winston Churchill. Under terms of a concession granted Anglo-Iranian, the company enjoyed a monopoly until 1961. The Iranian shah found this a constant irritant and tried to cancel the concession. Iran went to the League of Nations at one point, charging the company with “confiscatory” tactics. The Iranians received a royalty of 16 percent of Anglo-Iranian’s net profits.

Anglo-Iranian was also part owner with Dutch, French, and American companies of the consortium that operated the Iraqi fields. In normal times, Iraq produced 84,000 barrels of oil daily, and both Iraqi and Iranian oil were vital for British military operations from the Mediterranean to India.

What made the Mideast oil fields vulnerable to military attack was that a few wells, concentrated in compact areas, yielded extraordinary amounts of crude. Only 70 production wells in Iran accounted for all output. Each well yielded 3,000 barrels a day, and the wells were all centered around Abadan, Iran. The Kirkuk fields of Iraq produced 75,000 barrels daily from only 42 wells. Contrast this, for example, with what the German oil commandos found in Poland. The Polish fields were scattered across several hundred kilometer, and the country’s 3,800 wells produced only 10,660 barrels each day, an average of a mere 2.8 barrels per well.

In anticipation of direct military action to secure the Middle East, Germany began sending arms and experts to the area. The Luftwaffe sent several dozen fighters and bombers to Mosul, initially to aid the rebel Rashid Ali al-Gaylani (hereafter Rashid Ali) government of Iraq. German Army military intelligence completed plans to blow up the oil installations in Iran if the British threatened to occupy them. German agents were already involved in small-scale sabotage of oil production at Abadan.

Vichy France obliged the Germans by granting them full rights to airfields, fuel, and equipment in Syria, a development that turned the entire country into a base for German military moves in Iraq or Iran. By mid-May, the French also started shipping arms directly to the Iraqis fighting the British. Syria, for good reason, was viewed by London as the “Trojan horse” through which Germany could gain unrestrained entry into Britain’s Middle East citadel. German policy was clearly spelled out in a letter to the pro-Axis Grand Mufti of Jerusalem, Muhammad Amin al-Husayni:

Map 8. The oil of the Middle East



Courtesy of William Morrow, adapted by MCUP

Germany, which has never possessed Arab territories, has no territorial aims in the Arab area. She is of the opinion that the Arabs, a people with an old civilization, who have demonstrated their competence for administrative activity and their military virtues, are entirely capable of governing themselves. Germany therefore recognizes the complete independence of the Arab states, or where this has not yet been achieved, the claim to win it. Germans and Arabs have common enemies in the English and the Jews and are united in their struggle against them. . . . [Germany] is glad to cooperate in a friendly manner with the Arabs and, if they are forced to fight England in order to achieve their national aims, to grant them military and fi-

nancial assistance in so far as possible. In order to assist the Arabs, in their preparations for a possible struggle against England, Germany is also prepared to supply them with war material at once, in so far as a route for transporting it can be found.²

The blanket support for an ouster of the British from the Arab lands was designed to spur revolt of the type that was manifesting itself in Iraq. Had Germany been able to deliver the arms required for a full-scale Islamic revolt, they would have swept the British out of the Middle East, from Egypt to Iran, within a matter of months. This would have brought them considerable strategic advantages. They would have threatened the British position in eastern and southern Africa and in India. They would have outflanked Russia to the south and been dangerously close to her Caucasian oil fields. Not least, they would have acquired oil fields of their own in Iraq and Iran, which . . . produced sufficient oil in 1941 to cover Germany's actual consumption during that year, including six months' blitzkrieg in the Soviet Union.³

The spring of 1941 marked the nadir of British control of the Middle East. Reeking of potential tragedy, the situation demanded swift counteraction. These were crucial months. British and Indian troops, originally to be sent to Malaya (now Malaysia) to counter the growing Japanese threat, were rerouted and landed at al-Basra and Shaibah to quell the Rashid Ali revolt and secure the oil fields there. Heavy fighting continued as Arab Legion forces from Jordan marched on ar-Rutbah (a.k.a. Rutba) to retake petroleum facilities that had been seized by rebels in early May.

By then, the Germans were providing a modicum of direct military aid to the Rashid Ali forces. At least 60 German planes operated out of air bases in Syria and Iraq, with all combat and supply flights coordinated by a German colonel based in Beirut. The Royal Air Force (RAF) began attacking Vichy

² Geoffrey Warner, *Iraq and Syria, 1941* (Newark: University of Delaware Press, 1979), 84–85.

³ Warner, *Iraq and Syria*, 167.

French staging areas, marking the opening of an all-out military campaign against the pro-German French colonial government and the German forces operating there. Initially hitting airfields at Damascus, Aleppo, Riyaq (a.k.a. Rayak), and Palmyra, the British followed up with ground attacks aimed at occupying the entire Levant. Vichy France reacted with spirited resistance and opened up all its bases in the Middle East and Africa to the Germans.

Syria and Lebanon became a battleground, with Free French fighting Vichy troops and British Commonwealth forces, made up of Anzacs and Indians, battling French-led German foreign legionnaires and West African colonial troops. Offshore, the Royal Navy imposed a blockade along the Mediterranean coast and engaged Vichy French ships in mutually destructive combat.

Damascus was occupied by Australian troops on 21 June, but four-fifths of Syria remained under Vichy control. It took several more weeks of fighting before the entire region was secured. The armistice that followed permitted French soldiers and government officials the choice of opting for Vichy or the Free French. Only 6,000 of 37,750 troops chose the Free French, while just 400 of 1,200 civilians elected to side with General Charles de Gaulle, leader of Free France.⁴

Events, guided by firm action, turned more rapidly to British favor in Iraq. Denial of Syrian bases was the key. By late May, desperate Iraqi revolutionaries pleaded for more German military aid, including direct unit support. German representatives in Baghdad offered Rashid Ali a deal: German intervention in exchange for rights to the Baghdad railway and all Iraq's oil fields in perpetuity. Even Rashid Ali's inner circle balked at those terms, though it seems unlikely that Germany could have delivered, preoccupied as it was with the imminent invasion of the Soviet Union. With German support not forthcoming, Iraq's revolutionary government collapsed, its leaders fleeing to Turkey or Iran. Mosul was occupied by the British in early June, and

⁴ Christopher Buckley, *Five Ventures: Iraq, Syria, Persia, Madagascar, Dodecanese* (London: Her Majesty's Stationary Office, 1957), 160.

full control was restored by the end of the month. The flow of oil was restored from the Kirkuk fields after a two-month cutoff.

With the Levant and Iraq back in the British fold, Iran became less vulnerable to further German penetration. Russia, allied with Britain after the German invasion, feared the overbearing Nazi presence on its southern flank. The prospect of an enemy force advancing to the Caucasus from the south sent chills through the Kremlin. Britain, believing that the loss of Iran's oil would be disastrous, eagerly joined with the Russians to occupy Iran. British Commonwealth and Red Army troops marched in and within a week effectively controlled the country. On 25 August, Indian troops who had fought in Iraq crossed the Iranian border and secured the Naft Shahr oil area. Commonwealth troops from India were landed to occupy Abadan, the most important petroleum facility in the country. Royal Navy ships at the top of the Persian Gulf made sure the oil fields and terminals were not attacked by unfriendly Iranian naval units by sinking two of their patrol craft.

The Iranian shah ordered his military forces to cease hostilities, and by 30 August British and Russian units linked up at Hamadan. When the shah abdicated on grounds of failing health in September and was exiled to Mauritius in the Indian Ocean, 3,200 German "civilians" and all Axis diplomatic personnel in Iran were expelled.

Although the British acted quickly and decisively to turn a potentially disastrous situation around, it was more a lack of German effort that precluded the possibility of the Middle East falling under Nazidom. Germany's grander invasion of the Soviet Union had prompted Hitler on 23 May to issue a directive barring any major effort in the form of arms or troop support until the Russians had been conquered. Since he expected total victory within months, the pause was seen as short-lived. A longer-range plan, codenamed Orient, was already drawn up, with a giant pincer of German forces coming down through the Caucasus meeting up with the Balkan-based units coming through Turkey or with Rommel's *Afrika Korps*.

This is not to suggest the Axis campaign in North Africa was totally neglected in 1941. To the contrary, an aggressive position was viewed in Berlin as strategically sound. While the Italians may have erred in invading Egypt in the first place and had to be rescued by Rommel and the Germans, it was

to Germany's advantage to keep pressure on Britain in the theater. Hitler had coaxed Italy into an attack aimed at taking the Suez Canal. He told Mussolini shortly after their military alliance was sealed, "Any such strike would be a great gain."

From the day the Italians crossed into Egypt from Libya in September 1940 through the next two and a half years, armies seesawed back and forth across the Mediterranean littoral in successive advances and retreats of awesome distances. Offensives under Italian field marshal Rodolfo Graziani and Rommel were matched by counterthrusts led by British army major Archibald John Arthur Wavell, Field Marshal Sir Claude John Eyre Auchinleck, and Field Marshall Bernard Montgomery that stretched forces from El Alamein, Egypt, in the east to Tripoli, Lybia, in the west. A thousand air miles separated the terminal combat points, and to the troops on the ground the distances seemed twice as far.

Axis and British armies constantly struggled to maintain their supply lines, and it was typical of the North African campaign that each side faced its gravest logistical problems when most successful. Advances deep into enemy territory imposed the need to haul the stuff of war over ever-longer distances. To gain land was to add to the logistics burden.

Fuel was a dominant need, and a gallon of gasoline was precious to German, Italian, and Briton alike. A German tank operating over the desert sands required nearly 100 gallons to advance 97 km. The British Eighth Army, for its part, relied primarily on three-ton trucks to carry its fuel. Each of the trucks carried a 1,000-gallon load of fuel but averaged less than 6 km a gallon when traversing desert supply routes. That meant that on a 201-km trip from the supply center and then back, a truck would consume more fuel to carry the gasoline than it would itself deliver.

It was even more difficult for the Axis and British to get fuel from refinery to supply point. In 1941, for example, the disruption in Iraqi and Iranian production forced the British army and air force to rely on oil from as far away as West Africa. Refineries of the Standard and Shell companies in Lagos, Nigeria, provided supplies during the critical period, augmented by shipments from Douala in Cameroon and Brazzaville in the Congo. The crude came mostly from the United States and the Caribbean, with the African facilities serv-

ing as refining and distribution points. From West Africa, finished products were transported to Fort-Lamy (now N'Djamena) in what is now Chad, deep in French Equatorial Africa, an unlikely oil supply center. From Fort-Lamy, British cargo planes flew 2,735 km across forbidding and uncharted desert to military supply terminals on the Nile.

Egyptian oil production was the mainstay for the British during the darkest hours. The fields of Hurghada and Ras Gharib provided 18,000 barrels a day. Rommel's drive threatening Egypt made these fuel sources uncertain in 1941, and more reliable wells and refineries were sought constantly.

Saudi Arabia was a promising source for both crude and finished products, but production there was actually curtailed during the early stages of the war. The newly built Ras Tanura refinery on the Persian Gulf and the adjacent rich fields were shut down in 1940 because of their vulnerability to attack and an inability to bring in sufficient equipment to develop them. Italian bombers attacked the Bahrain and Dhahran facilities that October, and although only minor damage resulted, the fear of further raids greatly curtailed operations.

Ethiopia and Eritrea, which had been under Italian control, were taken by the British in the spring of 1941, ending the risk of aerial attacks on Red Sea shipping from Italian bases in those colonies. Axis aerial or naval strikes in military situations that changed rapidly could not be discounted, however. The Axis, in retrospect, failed to inflict damaging blows to British oil-supply centers. Apart from the Italian air attacks on Saudi Arabian facilities, there was no concerted campaign to interfere with the oil production on which the British depended. Had longer-range aircraft been utilized along with naval strike units in the Red Sea and Persian Gulf, Britain's oil problems would have been compounded to a distressing degree.

Special missions by German airborne commandos to disrupt the flow of Allied oil from the Middle East were planned through most of the war, but none materialized. Arab saboteurs paid by the Germans frequently dynamited the pipelines from the Iraqi oil fields to Haifa and Tripoli, but the British were able to repair the damage within a day or so. The oil flow continued, and the Germans felt it was too costly to continue employing Arab agents who were achieving no real successes. Instead, the Germans began training commandos to destroy the pumping stations along the pipeline. Photographic recon-

naissance missions established specific targets and the extent to which they were defended. The key was in landing six long-range aircraft at the pumping stations, most of which were located close to landing strips, but the plans were abandoned when the Luftwaffe was unable to provide enough planes for such missions.

Another operation, codenamed *François*, was planned to cut Allied lines of communications in central Iran, including oil supplies shipped from Abadan to the Soviet Union. Waffen SS troops were to be airlifted in summer 1943 to points along the rail and truck routes, but the Germans were forced to cancel the operation again because of the lack of aircraft and the difficulties of sustaining such a commando force at such distant points.

Axis fuel problems were no less pronounced. Even Rommel's first offensive almost faltered at the start because of a fuel shortage. While leading his *5th Light Division*, the original unit from which the *Afrika Korps* was formed to hurl the British out of Libya in March 1941, Rommel's tanks ran out of fuel within days. Only by sending every division truck he had to the rear to bring back fuel could he continue the advance. He left his force helplessly immobile for a full 24 hours, a disastrous situation had the British attacked during that static interlude. The British were unaware of Rommel's gamble, however, and the situation was never exploited. (Ultra intercepts were not available to the British in North Africa until the following September) Further shortages were averted when Rommel captured a large British fuel dump at the old caravan center of Mechili in Cyrenaica, Libya. At the same time, the British almost faced a fuel crisis when they prematurely blew up fuel stored in underground tanks at Msus in the mistaken belief the Germans were preparing to assault the town.

Rommel's introduction to campaigning in North Africa, and every subsequent action, was characterized by a scramble for fuel. At every turn, the Desert Fox was limited by insufficient supplies. His record is a chronicle of despair about a lack of gasoline for his tanks and subsequent inability to press his advantages. No commander on either side during World War II suffered more fuel uncertainties during prolonged periods of time than Rommel.

The primary reason for the precarious fuel-supply problem was the inability of the Axis to control the eastern Mediterranean because the Italian

Figure 8. Gen Rommel in North Africa



Gen Erwin Rommel, nicknamed “the Desert Fox,” with the *15th Panzer Division* in North Africa, 1941. The German *Afrika Korps*’ campaign in North Africa was largely characterized by a desperate scramble for fuel.

National Archives and Records Administration

Navy never had sufficient fuel for its ships to operate in that sector. The main body of the modern, first-class Italian fleet should have operated from bases in Greece and Crete to permit a flow of supplies to North Africa. It could do so only if it had had the necessary fuel oil to exercise operational control. Still, it would have been absurd to become involved in such a major effort if the ships were only going to have to lie in port afterward for lack of fuel. The nec-

essary fuel oil was not on hand; it never came; nor was it even promised by the Germans.⁵

No military arm of the Axis suffered fuel shortages as grave as its navies. The formidable German and Italian fleets required about 26,000 barrels of oil daily. As early as December 1941, the navies were receiving only 42 percent of their needs. The combined oil reserves of both Germany and Italy at the time would have provided enough fuel for only four months of consumption even at reduced levels. Unable to provide additional supplies, the German hierarchy told the navy that it would have to cut its consumption by half in the future. Admiral Erich Raeder, the German commander in chief, responded by stating his ships would henceforth be almost totally immobilized. No forays, beyond submarine activities, became the rule. The Italian Navy, with corresponding cuts in fuel supplies, was rendered impotent.

Admiral Eberhard Weichold, who served as Germany's chief liaison officer to the Italian admiralty (the *Supermarina*), would later state:

The Italian navy had undertaken the necessary preparations [to move its fleet bases from Italy to Greece and Crete] but it must be remembered that the execution of this planned transfer and the rapidity with which it could be done depended above all on the fuel problem. Because the German High Command, as well as the German Navy General Staff, remained deaf to my every effort to have fuel oil shipments increased, the necessary shift of Italian naval power eastward never took place.⁶

Italy depended on Germany, hardly a nation with any abundance itself, to provide virtually all its oil. The Italians produced a mere trickle domestically, only 150 barrels daily in 1940. By annexing Albania in April 1939, they added controlled supplies and entered the war with 4,500 barrels per day of Albanian supplies. It is difficult to imagine a more colossal error in planning. It was inescapable that Italy could never maintain a huge navy and air force

⁵ Marc'Antonio Bragadin, *The Italian Navy in World War II*, trans. Gale Hoffman (Annapolis, MD: Naval Institute Press, 1957), 197.

⁶ Bragadin, *The Italian Navy in World War II*, 197–98.

and build a modern army on the minimal supplies it could muster. Normal Italian consumption was 58,000 barrels daily, making it dependent on imports for 92 percent of its needs in 1940. Before going to war, Italy imported 21,000 barrels a day of U.S. crude and products alone, 36 percent of its needs. Another 10,000 barrels a day came from Romania, and the remainder from British, Dutch, or French international company production in the Western Hemisphere and East Indies. Once at war, Italy could not have imagined receiving American or Far Eastern oil. Romania alone was a feasible source after 1940, but Germany would soon control Romanian oil, and Hitler needed most of that production for his own use.

Dependent as it was on oil imports, Italy might have been expected to stockpile large quantities before embarking on a fuel-draining conflict. That was not the case. The Italian Navy entered the war with only 12 million barrels of fuel oil, about one-quarter of the amount the Japanese Navy hoarded before Pearl Harbor—and the Japanese had better cause to believe their future supplies would be gained through conquest. The Italian admiralty estimated its fleet required 1.3 million barrels a month for routine operational activity. So, the Italian Navy began the war with a fuel supply that would have lasted only nine months in peacetime. Once war began, the admiralty restricted activity by cutting operations in half. The reverse would have been normal, doubling activity.

Even when it limited consumption, the Italian Navy faced a crisis as early as February 1941. By then, fuel supplies had dwindled to the point where it was forecast that they would be completely dried up by the coming summer. Germany rushed deliveries to the desperate Italians during the spring, but the situation remained precarious at best. The admiralty pleaded for more naval fuel, but German deliveries were delayed or suspended altogether. A point was reached that summer when the Italian fleet was “forced to conduct operations only as the arrival of fuel permitted them.”⁷

Distribution of available fuel to the 32 ports maintained by the Italian Navy in home waters and the Mediterranean was fitful. Many ships expend-

⁷ Bragadin, *The Italian Navy in World War II*, 82.

Table 8. German oil supplies to Italian Navy, 1941

	Fleet consumption	Fuel promised	Fuel delivered
	(all figures in barrels)		
1st quarter	2,333,000	None	None
2d quarter	1,871,000	2,000,000	260,000
3d quarter	1,788,000	1,000,000	433,500

Figures from Italian admiralty records, contained in Marc’Antonio Bragadin, *The Italian Navy in World War II*, trans. Gale Hoffman (Annapolis, MD: Naval Institute Press, 1957), 189–90.
Courtesy of William Morrow, adapted by MCUP

ed large quantities of fuel simply to reach a base where they might be replenished. This resulted in a drawdown of limited fuel that achieved nothing in the process and at times found ships in a port distant from action in which they were urgently needed.

Germany, dependent on the Italians to transport supplies for Rommel’s *Afrika Korps*, agreed to supply them 670,000 barrels a month when Rommel was pinched by inadequate fuel shipments. The Germans explained they would like to have given the Italians more fuel for transiting the Mediterranean, but the demands for gasoline on the Russian front and disruptions on rail routes between Romania and Italian ports made that impossible.

By October 1941, the Italian Navy was down to 200,000 barrels. Germany was delivering only half the amount promised, causing “grave restrictions on operations at sea.”⁸ Italy calculated it would be able to fuel its battle fleet one more time and then be compelled to keep the ships unfueled and sitting at whatever ports they might be in when the fuel gauges read empty.

Table 8 reveals the plight of the Italian Navy in 1941.

⁸ Message to Berlin from Adm Eberhard Weichold, KM, 23 October 1941.

Italian naval activity was reduced to minimal levels during a period “when it was most necessary that the fleet enjoy maximum freedom of movement.”⁹

With the Italian Navy rendered ineffective in the eastern Mediterranean because of a lack of fuel, the flow of fuel to drive the Axis forces in North Africa was disrupted with disastrous consequences. At first, Germany tried to close the supply gap by putting into service all the merchant ships it could muster. These were mostly captured vessels. In the first five months of 1941, however, 11 of the cargo ships were sunk hauling material to Rommel. Those losses amounted to 42,000 tons of shipping, and there was no way to replace them.

When it was realized the Italians would have to assume the entire supply burden, the Germans were shocked to learn how little Italian capacity remained afloat. General Wilhelm Keitel pressed for an increase in supply shipments to Rommel, but Mussolini told him that 74 percent of Italy’s pre-war maritime fleet had been lost in the Mediterranean between January and July. All that remained were ships representing a mere 65,000 tons.¹⁰ July was a particularly calamitous month, during which 12 percent of the supplies shipped from Italy were destroyed and 41 percent of the fuel destined for the Axis forces in North Africa was lost. Only 85,000 barrels actually made it across the Mediterranean.

For Rommel, shortages were the norm in his hand-to-mouth existence. The siege of Tobruk, Lybia, in the spring had to be called off because he “was desperately short of fuel, ammunition, food and vehicles.”¹¹ Rommel finally took Tobruk, and it was only with captured British fuel stocks that the *Afrika Korps* was able to resume its advance into Egypt in June.

Brief interludes of adequate shipments kept the Axis forces in the field maneuverable. The shipping losses of July, for example, were partially made up the following month when 225,000 barrels of fuel reached North Africa.

⁹ Message to Berlin from Adm Eberhard Weichold, KM, 23 October 1941.

¹⁰ Denis Richards and Hilary St. George Saunders, *The Royal Air Force, 1939–45*, vol. 2, *The Fight Avails* (London: Her Majesty’s Stationary Office, 1954), 169.

¹¹ Ronald Lewin, *Rommel as Military Commander* (New York: Ballantine, 1970), 162.

Most of it came through the port of Tripoli. Benghazi would have been a preferable delivery point, but RAF bombers steadily pounded the larger Libyan port. The Italian Navy, eager to protect its dwindling supply fleet, felt the ships would be dangerously exposed by entering Benghazi. This meant having to haul fuel 965 km from Tripoli to Benghazi over the worst transportation routes imaginable.

A coastal rail line existed, but it covered only part of the distance. Track ended after short distances, and trucks had to carry loads to the next section of rails. Only one road, the Via Balbia, stretched along the entire length of the coast, but it was frequently blocked by nature in the form of floods or by people in the form of the RAF. Small coastal cargo ships were in short supply and were easy prey for British air and naval units.

Even if the coastal transport problem had been licked, a more serious difficulty was Tripoli itself. Though it was the largest port in Libya, it was far from adequate. Only five cargo ships could be unloaded at a time. Maximum off-loading capacity was 50,000 tons a month. Axis forces in North Africa at that time, seven divisions and the air and naval units operating out of bases there, needed 70,000 tons.¹²

To translate that tonnage into actual physical movement reveals the logistical nightmare that confronted the Axis. Extrapolated figures of the German High Command showed that no fewer than 16,800 two-ton trucks would have been required for the 965-km haul from Tripoli to Benghazi to ensure deliveries at the rate of 2,300 tons a day. The more than 1,930-km round trips by that number of trucks, if available, would have required more fuel than was being delivered for all the Axis tanks, planes, and ships in North Africa.

Despite the hopeless calculations, the war in North Africa could not be abandoned. Somewhere, somehow, the Axis felt the situation would resolve itself. There was a scramble to provide additional trucks, but only the Vichy French were able to assist. Military and civilian vehicles in Algeria, Morocco, and Tunisia were collected for delivery to the Germans. Even so, there was

¹² Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge, UK: Cambridge University Press, 1977), 183–85.

never any hope of acquiring enough trucks and even less chance of getting enough fuel to drive them.

It was an impossible situation. Only in June 1941 did total delivered supplies exceed minimum demands. That bare surplus was quickly expended. During the next five months, the Axis forces received only 69 percent of their needs. November was the worst month. Of the 80,000 tons shipped from Italy, only 30,000 arrived. The rest was lost when British ships and planes, enjoying the benefits of Ultra intercepts and knowing precise sailing schedules and routes, sank merchant ships with unprecedented success. One entire convoy of two tankers and five transports was sunk off Cape Bon, Tunisia, on 9 November with a combined loss of 60,000 tons despite an escort force of two heavy cruisers and 10 destroyers. More than 20 cargo ships were destroyed in as many days. Most of the destruction was inflicted by the British Navy's "Force K," made up of just two light cruisers and two destroyers based at Malta.

Rommel's fuel tanks were running dry by then, and only the emergency shipment of fuel in containers aboard Italian Navy cruisers and destroyers kept Rommel's tanks in action, but on a restricted basis. No tankers made it through during November, and the total fuel deliveries of 17,500 barrels were provided by the men-of-war. That meant the delivery of about 150,000 filled jerry cans, which were dumped on the beaches as near the *Afrika Korps* as possible.¹³ Ten times as many would have been necessary to handle the army's needs. The combined Axis forces required 160,000 barrels a month, roughly one-third of all supply needs. Only in August was that much delivered. A total of 175,000 barrels reached North Africa in the following two months, roughly one-half the required volume. In September and October, the Axis could count on one of every five barrels being lost by sinkings. The use of the limited facilities at Tobruk, which was only an anchorage, and Benghazi to

¹³ The handy stackable fuel containers were developed by the Germans and called *handkoffers*. Many were captured by the British early in the North African campaign and became highly popular. It was the British who acknowledged their German origin by dubbing them "jerry cans."

bring in limited supplies, simply made it easier for the British to pound them and further clog the pipeline.

When the British Eighth Army launched its big counteroffensive, Operation Crusader, on 18 November, the Axis forces were in perilous shape. Two merchant ships laden with fuel to be delivered at Benghazi were sunk near Crete on 23 November, a fatal blow to Rommel's plans to stand and fight. Truck convoys to the *Afrika Korps* were restricted to night runs. Even so, 50 percent of the supply vehicles were destroyed by marauding British mechanized units. This only added to Rommel's fuel problem. Tanks sat idle. On 4 December, Rommel realized he could not remain static and hold a thin line with immobile forces. He ordered a general retreat. The Desert Fox, it should be noted, was also deceived in a British intelligence ploy. He was fed false information through a Nazi agent in Palestine that the troop buildup for Operation Crusader was a cover plan to move a large British force "to help Russia protect the threatened and vital oil fields" of the Caucasus.¹⁴ The British, in fact, did make plans to move two divisions to the Soviet-Iranian border. Germany tried to meet the fuel crisis by pressuring the French into selling about 40,000 barrels of fuel oil and aviation gasoline, and these supplies were turned over in December and January. Italian submarines were also used to haul jerry cans of fuel across the Mediterranean. In order to provide air cover for the surface ships trying to deliver fuel, Hitler personally ordered the transfer of various Luftwaffe units from the Russian front. Rommel, however, did not need more planes. Depleted supplies in December restricted combat aircraft to a single sortie per day. Neither planes nor tanks were of use without gasoline.

Illustrative of the Axis plight was a futile attempt to rush fuel to Rommel in early December aboard two cruisers of the Italian Navy. *Alberico da Barbiano* (1930) and *Alberto da Giussano* (1930), each capable of 37-knot speeds, were ordered to fill the role of tankers. Their decks were piled with containers of gasoline in Palermo, Sicily. Thousands of jerry cans and barrels occupied every inch of free space. Even the bridge was crammed with them.

¹⁴ Lewin, *Rommel as Military Commander*, 168.

Movement was restricted, and sailors had to press their way down deck aisles between stacked gasoline cans. The ships were to make the dash across the Mediterranean to Tripoli. They were barely out of port when Ultra-alerted British torpedo planes operating out of Malta intercepted them. Somehow, they escaped any hits, but the disastrous consequences of a torpedo slamming into the hulls, or even a single shell exploding topside, were obvious. The stacked fuel was “a grotesque sight, and a deadly menace.”¹⁵ The cruisers turned tail back to Palermo, and Rommel used what fuel he had to retreat across the desert.

¹⁵ Cajus Bekker, *Hitler's Naval War*, trans. Frank Ziegler (Garden City, NY: Doubleday, 1974), 241.

CHAPTER 9



JAPAN'S OIL GAINS

The calculations and hopes of the war planners were fixed . . . on the rich oil fields of the Netherlands East Indies, the prize for which Japan went to war.

~ U.S. Strategic Bombing Survey

In every phase of the war, oil determined Japan's strategy and governed the tactical operation of its navy and air forces.

~U.S. Strategic Bombing Survey

"Victory disease," a Japanese malady of ultranationalism in the early months of the war, was epidemic among the passengers lolling about *Taiyo Maru's* (1911) three upper decks a day out of port. For five months, Japan had enjoyed an unbroken string of military triumphs beyond the wildest imagination. Victory was in the air, the future as bright as the Rising Sun, not the setting sun the passengers viewed as the ship sniffed southward through the East China Sea in the balmy twilight of 8 May 1942.

The azure sky and calm waters made the war seem distant. Passengers socialized, reestablished old acquaintances, and met new colleagues. Their bond was their work. Each was an industrial specialist, most from the giant Mitsubishi conglomerate. The communality among them was oil. All were on

a special mission for the Imperial Japanese government—to exploit recent breathtaking conquests of the Japanese armed forces in Southeast Asia.¹

The Rising Sun flew from captured oil fields throughout the region, and each person had a specific assignment. Some would go to Sarawak on the northeast coast of Borneo to restore production in the fields the Dutch and British vainly had tried to destroy before abandoning them on New Year's Day. Others would repair and restore fields near Balikpapan on the island's east coast. Still others would go to the oil centers at Palembang on Sumatra, Wonokromo on Java, or Yenangyaung in central Burma (now Myanmar). In all, the captured fields could produce 116,000 barrels a day, enough to make Japan self-sufficient in oil. *Taiyo Maru's* passengers were the vanguard of a new energy era.

True accommodations were crowded. Nine hundred men were aboard, more than double the number of passengers carried by the 14,900-ton ship before the war. No one grumbled. As the oil experts peered at the vast expanse of sea and sky, they were aware of their importance.

Taiyo Maru was the center of a zigzagging convoy, clearly the most protected of its ships. Flanking destroyer escorts, darting in and out, served as the convoy's eyes and muscles. Six accompanying smaller freighters hauled supplies and equipment. But it was the 560-foot-long liner that stood out most prominently as the convoy cleared Kyushu, southernmost of the home islands. To port was the Ryukyu Island chain.

American forces did not know *Taiyo Maru's* whereabouts that day, although U.S. naval ships in the Pacific had its silhouette and basic structural details in their lists of enemy merchant vessels. Built in 1911 by the Germans and christened *Cap Finistere* as part of the Hamburg-South American line, *Taiyo Maru* was not new to war. In 1917, during World War I, the ship was interned in Brazil and converted into a U.S. troopship. It began operation as a

¹ U.S. Strategic Bombing Survey, *Oil in Japan's War* (Washington, DC: Government Printing Office, 1946), 70.

Pacific liner by the Japanese in 1920, plying the cruise route between Kobe and San Francisco under the flag of the Nippon Mail Steamship Company.²

The most recent information on *Taiyo Maru* held by the Americans was that it had been one of the charter evacuation ships that the Japanese government sent scrambling around the world to bring expatriates home in the two months before the attack on Pearly Harbor. On 1 November, the ship docked in Honolulu, where it was involved in a curious bit of blackmail.

In October, the Japanese government had refused to issue permits for the American embassy in Tokyo and the consulate in Yokohama to buy fuel oil to provide heat and hot water. All fuel was rationed in Japan, but the U.S. government believed that since the oil came from California in the first place, special consideration should be given. A protest was lodged with the Japanese ambassador in Washington. He caught the point when it was made clear to him that *Taiyo Maru* and two other evacuation ships could not sail from Honolulu without taking on bunker fuel. The American diplomats got their heat and hot water. The Japanese ships got their fuel.³

Taiyo Maru's mission seemed to be one of mercy. In truth, its role had a sinister quality. The ship had followed the course to be taken a month later by the Japanese task force that would attack Pearl Harbor. Two naval intelligence officers, posing as civilians, were aboard, gathering weather data and checking what other ships might be encountered on the extreme northerly route from Japan to Hawaii.

When the war began, *Taiyo Maru* slipped into a safe port in Japan. The U.S. Navy had not located where the ship was and was unaware that it had set sail with a shipload of oil experts.

Then, something serendipitous happened.

The American submarine *Grenadier* (SS 210) was 26 days out of Pearl Harbor on its second war patrol. Its new commander, Lieutenant Commander

² Frederick Emmons, *Pacific Liners, 1927–1972* (New York: Arco, 1973); and *Lloyd's Register of Shipping, 1941–42* (London: Lloyd's of London, 1941).

³ U.S. Department of Defense, *The "Magic" Background of Pearl Harbor*, 8 vols. (Washington, DC: Government Printing Office, 1977). Citations in cable traffic relating to *Taiyo Maru* are contained in several of the volumes and appendices.

Willis A. Lent, was a decorated 1925 U.S. Naval Academy graduate who hoped to turn the submarine's fortunes around. The sub's first patrol had been a total failure. Every other boat in the squadron had sunk at least one Japanese vessel during the initial combat patrols; *Grenadier* alone returned to base without a kill.

Now, at the end of April, *Grenadier* crept into the hostile waters off Kyushu. This time, under Lent, it was in fighting form. The night of 1 May, beneath a hunter's moon, *Grenadier* attacked and sank a 9,000-ton coastal freighter and then moved northward. After several days, thick weather closed in, and the submarine set course to patrol the intersection of the Shanghai-Yokohama and Nagasaki-Formosa (now Taiwan) shipping lanes.⁴

On 8 May, *Grenadier* cruised just under the sea's surface at periscope depth. Shortly before 1900, with the weather improving, it picked up a trail of heavy smoke. Minutes later, the masts and two stacks of a large ship loomed into sight. Beyond, other ships were visible.⁵

"As range closed, it became evident we had encountered a southbound convoy of at least six freighters with a large liner in van," recorded *Grenadier*'s diarist.

With sparing use of its scope and running deep, *Grenadier* maneuvered to within 1,400 yards and identified *Taiyo Maru*. The location was plotted at 30° 40' N and 127° 54' E. Lent decided to attack the big transport before sunset. Four torpedoes were fired. One, maybe more, struck home. Then, the Japanese destroyer escorts struck back with depth charges. Several explosions bloomed above *Grenadier*, just where the torpedo bubbles surfaced. Lent ordered a dive to 250 feet. At 90 feet, several more explosions thundered overhead. Three even more powerful blasts rocked the submarine at 1938 based on the log.

⁴ Clay Blair, *Silent Victory: The U.S. Submarine War against Japan* (Philadelphia, PA: Lip-pincott, 1975).

⁵ "Grenadier War Patrol Reports" and "Original Action Report, *Grenadier*," Operational Archives, Office of Naval History, Washington, DC. Subsequent references on details of action are also taken from these files.

According to the diary, “These could have been from the sinking ship or depth barges though they were not close aboard and did not sound like depth charges and no water turbulence was noted.”

Grenadier’s crew could only guess what was happening on the surface as the submarine slowly eased eastward, but they believed *Taiyo Maru* was blown apart. Actually, the liner went down in minutes. It was poorly compartmented, and the hit or hits sent it to the bottom like a lead sinker.⁶

The submarine surfaced at midnight. At dawn on 9 May, it submerged again. Shortly, the Japanese renewed their depth-charge assault. In all, 58 were dropped during the two days, disrupting depth-control gear and jamming equipment in the superstructure. Still, *Grenadier* survived and sneaked away. Nine days later, it set course for Pearl Harbor, its fuel dwindling.⁷

On 14 May, the Japanese announced that a large merchant ship had been sunk in the East China Sea and “many persons perished.” Not until July, when United Press war correspondent Robert Bellaire reached Portuguese East Africa (now Mozambique) from internment in Japan did the full force of the sinking become known. In a front-page story in the *New York Times* filed from Lourenço Marques (now Maputo), Bellaire revealed that 780 of the petroleum experts and technicians aboard *Taiyo Maru* had been drowned.⁸

Japan had always regarded individuals of special talent as “national treasures,” and these men of high skill who could restore the damaged oil fields were deemed particularly important. Their loss had a dramatic impact during the early phase of the war. Major General S. Woodburn Kirby, Britain’s official historian of the war against Japan, wrote: “The exploitations of the oil fields was seriously delayed.”⁹ The postwar U.S. Strategic Bombing Survey

⁶ LtCdr William A. Lent, USN, left *Grenadier* in August 1942 to take another command. He retired a rear admiral and died in 1959 in New London, CT.

⁷ Samuel Eliot Morison, *History of U.S. Naval Operations in World War II*, vol. 4, *Coral Sea, Midway, and Submarine Actions, May 1942–August 1942* (Boston, MA: Little, Brown, 1949).

⁸ “Three Enemy Vessels Sunk,” *New York Times*, 24 July 1942.

⁹ S. Woodburn Kirby, *The War against Japan*, vol. 4, *The Reconquest of Burma* (London: Her Majesty’s Stationary Office, 1965).

concluded that the loss of the experts aboard *Taiyo Maru* dealt a “severe blow” to Japan’s desire to reap the rewards of its lightning conquests.¹⁰

Japan wanted Southeast Asia’s oil desperately. Its leaders also felt that the early successes of the war would turn American public opinion against a continuation of the conflict and force an early negotiated settlement in which Japan’s hegemony over Asia would be acknowledged. Loss of the oil experts aboard *Taiyo Maru* contributed greatly to negating that advantage. Vital oil would no longer be instantly available. Those who knew the empire’s needs already saw the beginnings of defeat. Leaders “who thought in economic terms knew that the war must be won quickly or not at all.”¹¹

Economic considerations were paramount when Japanese Imperial Headquarters laid down plans for the Pacific War. Points of attack and areas to be occupied were dictated by Japan’s resource needs, and all military planning focused on the earliest capture of those lands that the empire could draw on in the future. To “ensure the capture of the oil-producing centers in Borneo, Sumatra and Java as soon as possible and to reduce the chances of destruction of plant, the principle of surprise had to be exploited to the full.”¹²

Since the oil target zone was at the southern extremity of the planned campaign, opposition to the deep thrust had to be eliminated. Attacks on Pearl Harbor, Hong Kong, Singapore, and the Philippines were necessary actions that would make possible the achievement of the ultimate goal. Southeast Asia oil was to the Japanese what Caucasian oil was to the Germans.

The burden of occupying the oil resource areas in swift actions fell to eight divisions of the Imperial Japanese Army. Three other divisions were assigned to take the Philippines, two to Thailand and Burma, and one to Hong Kong. Most of the force was thus allocated to the stepping-stone seizure of Malaya (now Malaysia) and Singapore and eventually the oil centers. The Imperial

¹⁰ U.S. Strategic Bombing Survey, *Oil in Japan’s War*, 70.

¹¹ Mitsui and Company, *The Mitsui Story: Three Centuries of Japanese Business* (Tokyo, Japan: Mitsui Trade News, 1972).

¹² S. Woodburn Kirby, *The War against Japan*, vol. 2, *India’s Most Dangerous Hour* (London: Her Majesty’s Stationary Office, 1959), 90.

Map 9. Asia's oil



Courtesy of William Morrow, adapted by MCUP

Japanese Navy's prime assignment was to transport the invasion forces and to maintain lines of supply against a formidable Allied naval fleet.

Borneo, defended by the British and Dutch, was an immediate target. Occupation of its oil fields meshed with military strategy. In addition to seizing petroleum facilities, the vast island would provide a base for the attack on Java and afford flank protection for the advance down the Malayan peninsula.

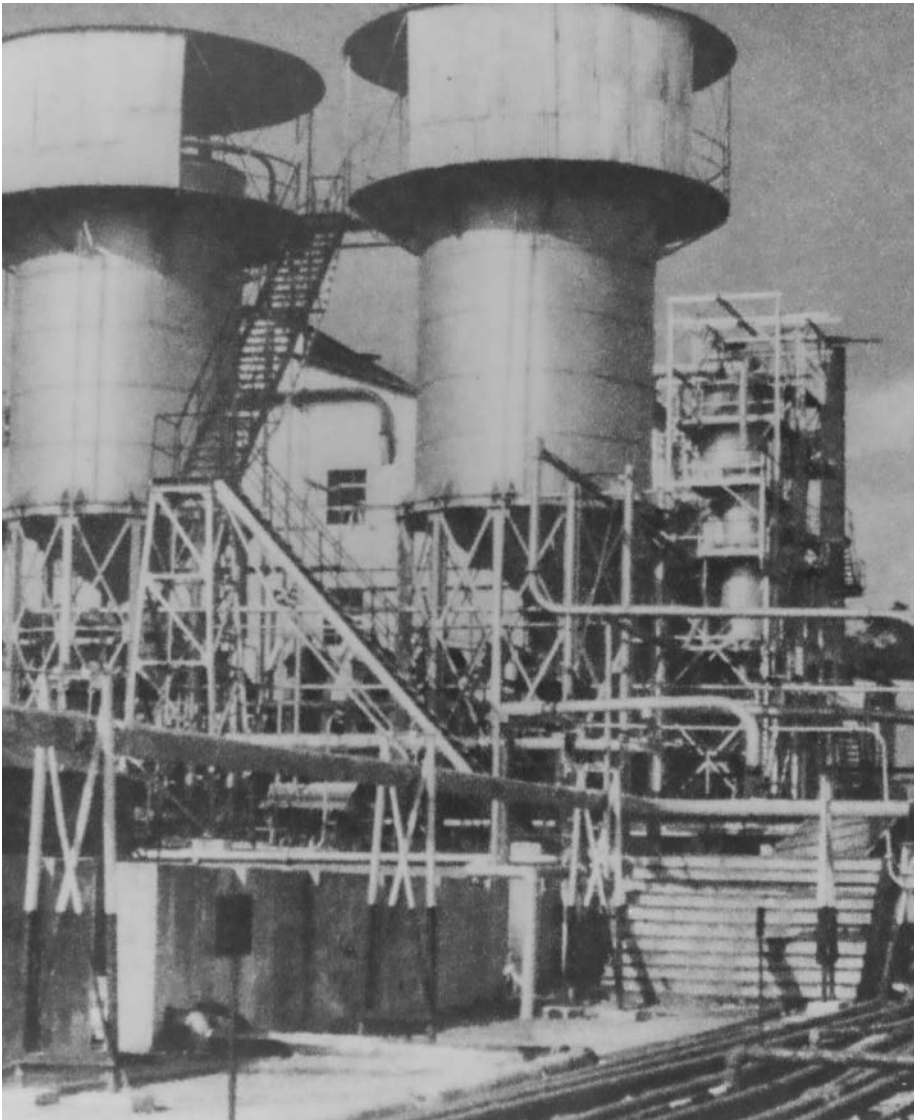
Weeks before the outbreak of war, British and Dutch officials decided not to defend north Borneo, Brunei, and Labuan if hostilities began. Only a handful of Indian troops were available at these points, which were deemed too distant for reinforcement. Evacuation was ordered on 8 December, the first action taken by authorities when they learned of the Pacific-wide Japanese attacks. Demolition of the oil-producing equipment and storage areas was completed the next day. Japanese Army and Navy landing teams from Indochina (now Vietnam, Cambodia, and Laos) came ashore at Brunei unopposed on 15 December and immediately claimed nearby oil installations before advancing on Sarawak and north Borneo.

On Borneo's east coast, the oil facility on the island of Tarakan was occupied on 12 January as the Dutch garrison of 1,200 troops was easily overwhelmed by Japanese units that had previously taken Mindanao in the Philippines. From Tarakan, the Japanese sent a group of emissaries to the Balikpapan to demand surrender, under threats of reprisal, of the pitifully weak 200-troop Dutch defense force. Grossly outnumbered though they were, about 200:1, the Dutch refused and promptly sabotaged the oil fields and installations.

The facilities of Balikpapan fell on 24 January. The nearby inland oil center at Banjarmasin was occupied shortly thereafter. The only losses suffered by the Japanese during this operation were inflicted at sea. American destroyers sank four large troop transports approaching Balikpapan, and most of the sailors aboard were drowned. The casualties were the largest of the Borneo campaign. Still, the Japanese had claimed possession of all the island's oil riches in a mere two months.

Sumatra's oil was seized in February after the capture of Singapore gave paratroopers a base for the deceptive strike at Palembang. With all of Sumatra occupied, Java was an easy target.

Figure 9.1. Oil wells and refineries in Balikpapan



The oil wells and refineries at Balikpapan, Borneo, were among the largest prizes of Japan's conquests throughout the Dutch East Indies.
Naval History and Heritage Command

Allied forces were still regrouping from their staggering defeats of the two previous months, and Java's defense was little more than a holding action. American, British, and Dutch ships had relied on fuel from the lost oil facilities of Borneo and Sumatra. Replenishment was a day-to-day problem, and operations suffered as a result. Ships were unable to leave port. Supplies were short. Small amounts of bunker fuel were stocked at Surabaya and Batavia, but men-of-war were hard-pressed to reach those ports, and tankers to deliver fuel were rarely available. Java's ports were also subjected to Japanese aerial attacks.

In order to forestall the Japanese invasion of Java, the entire Allied naval force was committed to a final effort to destroy the oncoming enemy fleet. From 27 February until 1 March, the Japanese inflicted the worst naval defeat to be suffered by the Allies. The Battle of the Java Sea (27 February 1942) resulted in the loss of a dozen American, Australian, British, and Dutch cruisers and destroyers. Four American destroyers left from the original force were ordered to Australia. No Japanese ship suffered anything more serious than minor hits. In a curious twist of fate, the Australian cruiser HMAS *Hobart* (D 63) was spared destruction in the Battle of the Java Sea. Though undamaged and fully equipped for combat, it had to remain in port and miss the engagement because it had no fuel.

Two Japanese invasion forces were landed at the east and west ends of Java, and Surabaya was occupied by 7 March. So, in three months, the Japanese "had completed the conquest of Malaya and the Dutch East Indies (now Indonesia) and had gained possession of all the resources of that rich southern area for which they had gone to war."¹³

When no fuel was available at East Indies ports, Allied warships were sustained by emergency tanker runs to Abadan in Iran. The tanker USS *Trinity* (AO 13), after exhausting its fuel-oil load replenishing ships from Timor to New Guinea, was the first to make the 8,046-km journey through perilous waters. Another oiler, USS *Pecos* (AO 6), did not survive. It was sunk by the Japanese shortly after starting off for the Persian Gulf on 1 March.

¹³ Kirby, *India's Most Dangerous Hour*, 449.

While the main prizes were now in their hands, the Japanese had one other oil center in Southeast Asia to add: Burma. Rangoon (now Yangon) came under attack in early March, and the invading force struck first at the refineries and storage tanks at nearby Syriam. The facilities were blown up by the withdrawing British on 7 March, leading the departing governor to observe: "Flames topped by columns of dense smoke rising thousands of feet into the air from refineries presented an awe-inspiring sight and as night fell the whole sky was lurid with the glare of the inferno."¹⁴

While the fight for Burma continued, Allied forces were supplied almost completely with fuel from Yenangyaung installations in the central part of the country. An entire Japanese division was hurled against Yenangyaung to seize the fields and deny the fuel to the British. It was not until the last minute, when farther retreat was inevitable, that the British set torches to the facilities. About 100,000 barrels of stored crude oil alone went up in a huge pall of smoke, one of the few completely successful Allied demolition efforts undertaken in Southeast Asia before facilities fell into Japanese hands.

Throughout 1942, Japan's principal effort was restoration of the oil fields and refineries of the East Indies. Loss of the experts aboard the ill-fated *Taiyo Maru* was a serious setback, and the Japanese acted quickly to replace them by draining the manpower pool at home, a move that seriously crippled domestic production. In the first months of the war, however, exploitation of the richer fields of the southern zone was uppermost in the minds of Japan's rulers.

The technicians, drilling experts, and field workers who accompanied Imperial Japanese forces into the oil facilities were not as formally organized as the German oil commandos, nor were there as many, but the Japanese soon had scores of them in the fields and refineries to resume, so far as possible, normal operations. Anyone with experience in Borneo was rushed in, and among the first to arrive were experienced exploration workers who had worked on the mainland of Borneo near Tarakan under a prewar concession granted the Japanese by the Dutch.

¹⁴ Kirby, *India's Most Dangerous Hour*, 95.

Estimates of damage were made at each facility, and reports were submitted to Tokyo on required replacement equipment. Because Japan assumed its stockpiled oil would last for two years, the pressing need for immediate reactivation of the fields was to provide fuel for Imperial forces in Southeast Asia without having to ship it from the home islands.

A goal of prewar production was established, with dates for achieving individual objectives based on the extent of battle damage or sabotage. The combined output of the Indies fields in 1940 had been 180,000 barrels daily, and this was the immediate target. Eventually, new fields would be developed, and geologists were brought in to identify future exploration sites. Refineries in the region had a daily capacity of 197,000 barrels, and plans were made to restore the units to that level as quickly as possible.

When the smoke of battles for the oil facilities of Sumatra, Borneo, Java, and Burma had cleared, damage was not as severe as anticipated. Some were virtually intact, a few demolished, and the majority damaged slightly with renewed operations possible within reasonable periods of time.

The Pladjoe refinery at Palembang had sustained only minor damage, and operations were resumed in three months with output at times exceeding prewar levels. At Balikpapan and Pangkalanbrandan, pumps, instruments, and other equipment had to be replaced, but the facilities were usable. Limited amounts of crude were being processed by September 1942. Destruction of essential facilities was more thorough at Sungai Gerong, where it took until January 1943 to resume operations. Only the Lutong refinery in northern Borneo appeared to be hopelessly beyond repair. As it turned out, construction crews spent more than two years rebuilding the facility, and near-normal levels of output were achieved eventually.

A year after the capture of the first Indies facilities, Japanese production reached 70 percent of the region's prewar oil output. It was a remarkable achievement. The largest and most productive fields were those on Sumatra, which also suffered the least amount of damage.

In 1943, Sumatra yielded 88,000 barrels daily, or 64 percent of all oil produced in the East Indies. Products coming out of the Palembang refinery attested to the high quality and suitability of crude from nearby fields. Palembang produced a 20 percent yield of aviation fuel, 12 percent as vehicle

gasoline, and the remainder as fuel oil. Ships of the Imperial Japanese Navy required the most fuel, and the highest portion of each barrel came out as bunker fuel. The primarily naval operations area extended from the South China Sea to the Indian Ocean, with Singapore as the main base. Singapore's proximity to Palembang permitted convenient access to its fuel both for the hundreds of warships involved in military operations and for the merchant ships hauling raw materials back to Japan. A measure of the quality of Indies oil was that some ships took on crude directly as bunker fuel without refining.

In aviation fuel, the windfall production eased fears that stepped-up operations might deplete the 4,250,000 barrels stockpiled at the time of Pearl Harbor. Those supplies would have been drawn down to dangerous levels if required for operations in Southeast Asia as well as the home islands. The output from Sumatra and, to a lesser extent, Borneo provided a comfortable margin of safety for the Japanese Air Force. In fact, the Japanese developed overconfidence.

In order to exploit Indies production, 4,000 employees from Japanese oil companies were sent south in 1942, a move that reduced the labor force employed in oil production in the home islands by 70 percent. Unconcerned, the Japanese replaced them with Korean and Chinese slave laborers, farmers, women, and students, none of whom had ever worked in the industry. Domestic production, as a result, dropped 10 percent during the year.

Unlike Germany, which funded domestic synthetic and crude programs generously, Japan neglected both industries by limiting expenditures and placing them low on the priority list for essential materials. The oil industry received only 2 percent of carbon steel production and 1 percent of cast steel as its allotment, which was substantially lower than all other industries involved in wartime production. Even the limited targets were not met. Allocations for shipbuilding, on the other hand, were tripled in 1942, a further indication of Japan's decision to rely on captured oil rather than expand domestic facilities. At the time, Japan saw no reason to believe the overseas spigots would ever be turned off.

The mood of Japanese officials concerned with oil supplies in 1943 was euphoric. Bonanza production in Southeast Asia saw most prewar expectations fulfilled. Oil flowed from the region's fields at a rate of 136,000 barrels

daily. Of the amount, 96,000 barrels were consumed within the area and the remainder shipped home. Prime minister Hideki Tojo confidently proclaimed that the oil problem, which had sent Japan to war, was solved.

While the military situation would change rapidly and put an end to Tojo's sanguine attitude, other difficulties surfaced in 1943 that should have sounded an alarm. Army and navy rivalries almost placed oil supplies in jeopardy, even while petroleum was available in abundance. Even before the oil fields of Southeast Asia were taken, the military branches feuded over how they were to be regulated, and planning for the southern penetration became a bitter fight for future oil control. Finally, the army and navy agreed that each would retain those fields and production facilities that its forces actually captured. This suited the army, which had most of the say in determining national strategy because of its growing hold on the government. Tojo, who also served as Japan's war minister, was premier because of the army's dominant position.

Army forces captured the more accessible and productive areas west of the central mountain range of Borneo. The navy won the right to fields and refineries to the east, a lesser prize. In other areas, too, the army gained the advantage. After all the conquests had been made and the areas secured, the army possessed three major refineries in Sumatra, one in Borneo, two in Java, plus nearby production fields. Burma was completely under the control of the army.

The navy fared less well. A single refinery at Balikpapan in Borneo and the oil fields of Sanga-Sanga and Tarakan were the navy's only holdings. In total, the army controlled 85 percent of the area's oil. Still, it was the navy that had responsibility for distributing the oil.

Allocation disputes threatened to make a shambles of captured supplies. Each service jealously guarded its own interest to the detriment of national military needs. Requests for fuel were constantly overstated. Shortages were exaggerated in the hope that the rival service would be denied requests for oil products. Army and navy officers traded accusations for greed. The army oftentimes refused the navy even minimal supplies, and the navy would not ship oil needed at distant island outposts manned by the army. The haggling reached a point where the chief of staff of the *First Southern Expeditionary Force* said he was convinced the army would have left the navy without any oil

but for the threats made by navy officers to refuse to carry oil for the army. Interservice blackmail became the norm.

An army-navy oil committee was finally established to end the feuding and make allocations on a rational basis. Vice ministers of the two services and the respective supply bureau chiefs met monthly to determine who would get what amounts. In true Japanese military tradition, the committee members met on neutral ground, the Tokyo Army-Navy Club. In addition to resolving the problems of Southeast Asia, the committee established how much oil would flow to the civilian sector. Amounts about military requirements and stockpiles were specified and given to the Fuel Board for civilian rationing. It was rare, however, for the services not to inflate their estimated needs, and less and less oil was turned over to nonmilitary users.

Generals and admirals had absolute control of their services' oil supplies, from production through refining, throughout the war. That control extended to the home islands as well. Each domestic refinery handling imports was under contract to either the army or the navy. So strong was the military that even government bureaus involved in domestic industrial or other civilian allocations were usually headed by a military officer.¹⁵

Japan's attack on Pearl Harbor was described by a U.S. congressional investigating committee as "the greatest military and naval disaster" in American history. Hard to imagine, perhaps, but it could have been even worse. Numerous studies have concluded that Japan lost an opportunity for even greater success by going after the wrong targets and not following through with another raid after 7 December.

Although eight battleships and six cruisers and destroyers were sunk or put out of commission and 189 planes were destroyed, the United States retained its ability to wage war in the Pacific. That might not have been so had the Japanese attacking force knocked out Pearl Harbor's oil supplies and repair facilities. They were more prosaic targets than the men-of-war that filled berths and anchorages, but in the months that followed they were of inestimable value.

¹⁵ U.S. Strategic Bombing Survey, *Oil in Japan's War*, 8–10.

Figure 9.2. Aftermath of Pearl Harbor attack



The U.S. Pacific Fleet at Pearl Harbor was devastated by the surprise Japanese raid in December 1941 that swept the United States into World War II. The Japanese, however, could have achieved a much greater and longer-lasting victory had they concentrated on attacking Pearl Harbor's oil supplies and repair facilities instead of the fleet's warships.

National Archives and Records Administration

Fleet tankers had just resupplied Pearl Harbor, and on the morning of 7 December the storage tanks on the base were filled to the brim with 4.5 million barrels of oil. All the tanks were clearly visible, as easy to spot as the battleships that were the main targets of the Japanese. Had the tank farms not been spared, "so much fuel would have been lost that the navy yard probably could not have continued to function as a major naval base."¹⁶

Admiral Husband E. Kimmel, commander of the U.S. Pacific Fleet, said if the Japanese "had destroyed the oil which was above all ground at the time

¹⁶ Paul S. Dull, *A Battle History of the Imperial Japanese Navy, 1941–1945* (Annapolis, MD: Naval Institute Press, 1978), 18.

. . . it would have forced the withdrawal of the fleet to the [west] coast because there wasn't any oil anywhere else out there to keep the fleet operating."¹⁷ Admiral Harold R. Stark, chief of naval operations, declared that if the Japanese had "devoted some of their attack to our shops, oil storage, etc.—it would have been a lot rougher going for a considerable period."¹⁸

How much rougher? The undamaged storage tanks held enough fuel to fill to capacity all the tanks of 50 *Yorktown*-class aircraft carriers, 50 *North Carolina*-class battleships, and 50 *Fletcher*-class destroyers. With access to the supplies, the U.S. Navy was able to continue using Pearl Harbor as its main Pacific base and erect a solid defense line against further Japanese penetration. Three carriers that were fortuitously absent from Pearl Harbor on 7 December, as well as two others that were rushed from the Atlantic, might have been immobilized without the fuel. Six months later, these carriers won the critical Battle of Midway (3–6 June 1942).

Only two of the ships damaged at Pearl Harbor were never salvaged or repaired. This was possible because the navy yard's dry docks and machine shops, like the oil tank farms, were left unscathed. When they rejoined the fleet, beginning in 1943, the repaired ships had access to fuel without interruption or shortages. As historian Gordon W. Prange noted, Japan's failure to "pulverize" the entire base at Pearl Harbor was "its first and probably greatest strategical error of the entire Pacific conflict."¹⁹

It was an egregious error of omission that the Japanese themselves realized belatedly. The decision to concentrate the Pearl Harbor attack on the battleships was the result of the Japanese Navy's conviction that destruction of the capital ships was an absolute essential to holding the western Pacific. No one at the planning level ever suggested hitting other targets at Pearl Harbor. Another strike at the base, however, was possible, though a calculated risk. In retrospect, Japanese naval leaders concluded it was a risk they should have

¹⁷ *Hearings before the Joint Committee on the Investigation of the Pearl Harbor Attack*, part 6 (Washington, DC: Government Printing Office, 1946), 2812.

¹⁸ Louis Morton, *Strategy and Command: The First Two Years*, U.S. Army in World War II Series: The War in the Pacific (Washington, DC: Government Printing Office, 1952), 133.

¹⁹ Gordon W. Prange, *At Dawn We Slept: The Untold Story of Pearl Harbor* (New York: McGraw-Hill, 1981), 550.

taken. Admiral Isoroku Yamamoto, who commanded Japan's *Combined Fleet*, said a year afterward, "Events have shown that it was a great mistake not to have launched a second attack against Pearl Harbor."²⁰ Rear Admiral Matome Ugaki, chief of staff for the *Combined Fleet*, agreed, saying, "Had I been C-in-C of the task force . . . I would have firmly resolved to continue to attack strongly . . . until Pearl Harbor was completely destroyed."²¹ Neither man, however, made any attempt to countermand the withdrawal orders of the task force commander on the scene, Vice Admiral Chuichi Nagumo. Nagumo's decision not to return can be criticized with the benefit of hindsight, but his on-the-spot decision made sense to those directly involved.

Captain Mitsuo Fuchida, who was the strike leader, defended Nagumo even after the war:

We did not realize how many planes we had destroyed. We knew we had knocked out four battleships but we did not know the extent of damage to the American planes and, of course, the carriers were not there. We figured if we could sink four battleships, then it was a success. About three days afterwards, when the intelligence was gathered, it was realized what had been done but we thought you [the United States] would be resupplied with planes from other islands in the Hawaiian group, so it wouldn't pay to return.²²

Until May 1942, the Japanese could not be stopped. Their reach extended to within 500 air miles of Australia, which lay exposed and vulnerable across the Coral Sea. The final stepping-stones were New Guinea and the Solomon Islands, both already partially under Japanese occupation. Port Moresby, on the southeastern tip of New Guinea in Papua, was the major target, and the Japanese loaded 11 transports with troops to seize the air and naval base.

A force of three Japanese carriers, two battleships, and a dozen destroyers from Rabaul entered the Coral Sea in early May to spearhead the Port

²⁰ Prange, *At Dawn We Slept*, 550.

²¹ Prange, *At Dawn We Slept*, 550.

²² U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials* (Washington, DC: Government Printing Office, 1945), Interrogation No. 29.

Moresby invasion force. Allied naval forces intercepted them. The famed Battle of the Coral Sea (4–8 May 1942) resulted in staggering American losses, but the Japanese suffered the strategic setback. When the outcome of the battle was still in doubt, Vice Admiral Shigeyoshi Inoue called off the invasion of Port Moresby. He concluded the landing could not be assured without air and naval domination.

Commanders Masatake Okumiya and H. Sekino, both shipboard officers during the battle and later members of the Imperial General Staff, agreed the Port Moresby invasion force turned back “because we couldn’t completely destroy the American task force. Our carrier-based planes were of little use because of the shortage of fuel on board. Although most of your carriers were sunk or badly damaged, the remaining surface craft were not damaged. We were not strong enough to try occupation.”²³

Not only did the Japanese carriers run sort of aviation fuel, but the carriers and other ships involved were running out of propulsion fuel. At the height of the battle, they had been at sea almost a week and did not have the means to replenish from tankers. They retired to Rabaul and Truk to refuel, leaving Port Moresby in Allied hands.

This was the first instance of crippling fuel-supply problems for the Japanese. Other factors affected the outcome of the Battle of the Coral Sea—poor communications, for one—but lack of fuel was a major reason. The battle presaged the myriad fuel problems that would plague the Japanese for the rest of the war.

It was Guadalcanal, where U.S. forces went on the offensive for the first time, that demonstrated the fundamental differences between Japan and the United States in meeting fuel and logistical needs. The six-month fight for the island was a supply struggle for both sides. Guadalcanal was distant from main bases, and materials had to be shipped thousands of kilometers.

Initially, Japan had control of the seas around the Solomons, and American submarines and destroyers were called on to slip through the enemy naval

²³ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 29.

net with supplies. Occasionally, a transport could unload. Marine fighter pilots at Henderson Field repeatedly came perilously close to being grounded for lack of fuel. The commander of the force, Marine brigadier general Louis E. Woods, later said that he spent “ninety percent of the time worrying about supplies, five percent holding what we had and five percent fighting the [Japanese].”

A critical situation was reached in October 1942 when the Japanese bombed storage tanks. After that, supplies trickled in gallon by gallon. On 13 October, virtually all fuel was destroyed when Japanese battleships hurled a thousand 14-inch shells on compact Marine positions around Henderson Field. Major General Alexander A. Vandegrift, Marine commander on the island, sent an urgent dispatch: “Absolutely essential aviation gas be flown here continuously.”

Marine and Army Air Forces transport planes were pressed into service. Most could carry only ten 55-gallon drums at a time. At one disparate point, only the discovery of 4,000 gallons of 100-octane gasoline in holes and revetments at the edge of Henderson Field kept the Marines flying. They were literally at the bottom of their fuel barrel when an aged, four-stack destroyer converted to a tender made a miraculous delivery. The venerable USS *McFarland* (AVD 14) sneaked through the dangerous waters with 40,000 gallons of aviation gas. It was unloading its precious cargo off Lunga Point, the spit of land just north of Henderson Field, when Japanese bombers appeared and turned the ship’s fantail into flaming wreckage. *McFarland* limped to Tulagi, where the intact aviation gasoline was off-loaded and shuttled to Guadalcanal.

Replenishment of naval support forces was equally uncertain. No ship’s captain could be assured fuel supplies. The appearance of oilers meant staying on the battle lines rather than withdrawing. At one crisis point, Admiral Robert L. Ghormley, commander of the South Pacific area, said the arrival of four tankers turned the battle: “If they hadn’t arrived when they did, we wouldn’t have Guadalcanal.”

U.S. naval forces involved in support of the Guadalcanal operation required 28,000 barrels of oil daily, mostly for combatant vessels. Experience had shown that the average ship was able to stay operational for six days be-

fore being resupplied. So far as possible, the men-of-war were refueled at sea by tankers. Each tanker was eventually equipped with enough cable and hose to replenish two ships simultaneously from their 50,000- to 100,000-barrel capacities. Also, the commercial tanker *Gulfwax* (1929) rushed 200,000 barrels of oil from Pearl Harbor to the advance base at Samoa, where it was on hand to aid in resupplying Guadalcanal.²⁴

By November, the Japanese were determined to make a final effort to take Guadalcanal. General Harukichi Hyakutake, who commanded Japan's land forces in the area, declared, "The operation to surround and recapture Guadalcanal will truly decide the fate of the control of the entire Pacific."²⁵ The ensuing action resulted in what Admiral Ernest J. King called "the fiercest naval battle ever fought."

Eleven Japanese transports were loaded with troops for the assault. Seven were sunk. Only 4,000 of the 10,000 troops aboard made it to the beach. Most of their supplies were lost. While the Japanese army blamed the navy for the failure, the admirals believed that delays in the operation caused by the army's modification of plans were responsible for the debacle. The navy knew its ships could not remain exposed without land-based air cover. As the chief of staff of the *Southwest Fleet*, Captain Toshikazu Ohmae, said, "The navy lost ships, airplanes and pilots while trying to give support to the land assault which was continually delayed. The army did not understand the position of the navy in that it could not stay in one area indefinitely without being attacked. We were also consuming valuable fuel."²⁶

Remnants of the Japanese force were resupplied, if at all, by submarines and fast-running destroyers dumping drums near the beach at night with the hope they would float ashore with the morning tide. Thousands of containers were dispatched this way. Few made it. The Japanese were also woeful-

²⁴ RAdm Worrall Reed Carter, USN (Ret), *Beans, Bullets and Black Oil: The Story of Fleet Logistics Afloat in the Pacific During World War II* (Washington, DC: U.S. Navy, 1953), 17–34.

²⁵ Robert Sherrod, *History of Marine Corps Aviation in World War II* (Washington, DC: Combat Forces Press, 1952), 94.

²⁶ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 108.

ly short of ammunition and food. There were times when the malnourished troops were reduced to eating jungle moss and roots. Unlike the Americans, they were not critically pressed for fuel, but their lack of supplies was directly related to fuel. Air cover and naval protection was essential, and both required fuel-sufficient bases from which the Japanese could dominate the sea-lanes and airspace. Such superiority was impossible. Japanese carriers were never secure in the contested waters, and land bases were too far away.

Japanese pilots had to fly from Rabaul on New Britain and Kavieng on New Ireland, a round trip of at least eight hours. Fighters were equipped with large belly tanks to cover the long distances. In combat, the half-filled heavy tanks could not be jettisoned since the remaining fuel was still needed to return to home base. With the extra weight, even the vaunted Mitsubishi A6M Zeros fought with near impossible burdens.

In holding Guadalcanal, the United States overcame the basic problems of conducting a campaign of attrition at long distance. The Japanese displayed fundamental weaknesses of supply. Those deficiencies became more apparent during the remaining three years of Pacific fighting.

Guadalcanal was fundamentally important to the United States. As Admiral William F. Halsey Jr. later commented: "Unobstructed, the enemy would have driven south, cut our supply lines to New Zealand and Australia and enveloped them."²⁷

It is interesting to note that November 1942 marked not only the turning point of the war against Japan but also the Battle of Stalingrad and the Second Battle of El Alamein.

²⁷ William F. Halsey and J. Bryan III, *Admiral Halsey's Story* (New York: McGraw-Hill, 1947), 131.

CHAPTER 10



AMERICA'S FOUNTAIN OF OIL

No matter how well fed, equipped, or officered, without oil and gasoline the modern army is a hopeless monster, mired and marked for destruction.

~ T. H. Vail Motter, U.S. Army historian

It was recounted as a personal vendetta, akin, perhaps, to a gnat attacking an elephant, but satisfying nevertheless to Imperial Japanese Navy commander Kozo Nishino. His was a private grievance, and in February 1942, he brought the war to the Santa Barbara Channel, off California, one of the richest petroleum sources in the United States.

Nishino commanded the 85-member crew of *I-17* (1939), one of the Japanese Imperial Navy's high-speed, long-range submarines that could cruise for almost 26,000 km and reach a top surface speed of 24 knots. The craft carried its own scout plane in a watertight hangar. Shortly after sunset on 23 February, Nishino surfaced and prepared to avenge his honor.

The area was familiar to him. Before the war, Nishino had been the captain of a tanker that had taken on full cargoes of crude oil from Ellwood Oil Field just off the Santa Barbara Channel. According to the story, embellished with telling through the years, Nishino was returning to his tanker from a welcoming ceremony marking the first delivery of crude from Santa Barbara to the Japanese in the late 1930s when he slipped and landed in a patch of cactus. He lost face and suffered painful punctures from the prickly plant.

Humiliating laughter from American oil hands who witnessed his embarrassment infuriated Nishino, and he is said to have vowed to get even.¹

Nishino picked his time of attack to coincide with the start of a nationwide radio address by President Franklin D. Roosevelt. Precisely at 1900 late that afternoon, the nine-member deck crew began firing the submarine's 5.5-inch gun at Ellwood Oil Field. The first volley slammed into the slopes of a canyon near the Signal Oil Company's gas absorption plant and Wheeler's Inn. Off-duty oil workers at the restaurant raced outside to see what was happening. Ferris W. Borden, superintendent of the Barnsdall Oil facilities, recalled, "The sub was firing not far from the Bankline Marine loading buoys, which would make the range . . . one mile [1.6 km] offshore . . . a plot of the hits indicated the prime target was the Richfield tank near the highway, but no damage resulted."²

I-17 fired for 45 minutes, peppering the cliffs below the oil field and the foothills of the Santa Ynez Mountains with five-foot-wide craters. Members of the Trout Club at San Marcos Pass, who had bleacher seats for the action, counted 30 muzzle flashes. The *Santa Barbara News-Press* reported, "With diabolical cunning and boldness the enemy struck as the whole nation was listening to the President's report on the war. . . . An Axis brand of hell was turned loose on the Santa Barbara coastline."³

At 2020 in the evening, the U.S. Army ordered all radio stations in southern California off the air. Local residents continued to pick up newscasts from distant stations, however, which were broadcasting that Santa Barbara had been destroyed.

The exaggerated tones of the *Santa Barbara News-Press* and radio accounts were typical of the hysteria that seized the West Coast in the early months of the war. In the weeks following Pearl Harbor, air raid alarms sounded almost nightly in the West, but the attackers were phantoms conjured up by citizens

¹ A full account can be found in Charles S. Jones, *From the Rio Grande to the Arctic: The Story of the Richfield Oil Corporation* (Norman: University of Oklahoma Press, 1972).

² Robert E. Kallman and Eugene D. Wheeler, *Coastal Crude: In a Sea of Conflict* (San Luis Obispo, CA: Blake Printery, 1984), 43.

³ *Santa Barbara (CA) News-Press*, 24 February 1942.

and military personnel who saw and heard what did not exist. Wild reports of Japanese invaders up and down the coast triggered pandemonium, and some Californians fled to the interior. The grimmest consequence of the collective state of paranoia was the eventual relocation of more than 100,000 Americans of Japanese ancestry to the U.S. equivalent of concentration camps.

There was little if any reason to believe that Japan planned a major military move against the U.S. mainland, but the pitifully defended West Coast was vulnerable. Lacking faith in any form of adequate safeguards against attack, a frightened citizenry magnified the threat and wondered only when the wily Japanese would strike.

The sinking of a tanker off the California coast a month after Pearl Harbor heightened fears. Port Saint Luis on San Luis Obispo Bay, an outlet for the rich Bakersfield, California, oil-production area, was guarded by four antiquated French 75-millimeter (mm) guns positioned on a plateau above the bay. The World War I-era guns had a range of 12,000 yards. Robert C. Lilley of Lompoc, California, then a newly commissioned lieutenant of artillery, recalled that a Japanese submarine “surfaced and almost leisurely shelled it [the tanker] until it sank.” Lilley said that the 75-mm guns “were of course ineffective and apparently the submarine knew it as it went about its business several thousand yards beyond range. The 4th Interceptor Command radio and wire net was alerted, but it was not until almost 30 minutes after the tanker went down that one lone airplane showed up.”⁴

California oil was supremely important in the war effort. Nishino had not disrupted the flow of oil from Santa Barbara as he left through a fog bank near Dos Pueblos Ranch after his shelling, but “the Japanese submarine commander knew the importance of oil in wartime and had tried unsuccessfully to destroy the oil fields he had visited.”⁵

Oil production in California was on par with that of Texas, and fuel for the Pacific theater came mainly from California. Wells in the Santa Barbara Channel had produced hundreds of millions of barrels since its discovery in

⁴ Robert C. Lilley, letter to authors, 14 February 1984.

⁵ Kallman and Wheeler, *Coastal Crude*, 46.

1896. Despite this eminence as a primary source of oil, the first weeks of the war were marked by a pullout of the area's already thin defenses. The single Coast Guard patrol boat was withdrawn from Santa Barbara. Marine Corps patrol bombers operating out of the air station at Goleta were moved to other locations. Even the Army's two howitzers at Ellwood and Coal Oil point were removed.⁶

The war came to North America in force when the Japanese invaded the Aleutian Islands of Kiska and Attu in June 1942. Seizure of the barren outposts had a devastating psychological effect in the United States and Canada and triggered undeniable concern about strategic implications. The territory of Alaska was menaced. Canada and the United States were placed in perilous proximity to real and potential enemy air and naval bases. Although only a few thousand Japanese were ashore in the Aleutians, Allied military and political leaders feared they were the spearhead force for larger contingents that would advance down the 2,736-km chain.

Alaska, long neglected by the military and Congress, suddenly loomed large in the national defense effort. A military buildup already underway was accelerated to prevent further Japanese advances, and eventual recapture of the Aleutians depended on hauling military essentials to the vast isolated territory. Military logistics in a mutifront war were still mysteries to be solved.

Japanese submarines were more of a nuisance than a direct threat along the shipping lanes between the Pacific Northwest and Alaska, but any upsurge in sea traffic would most certainly tempt the enemy's underwater fleet. Still, in the spring of 1942, sea transport was the only feasible means of strengthening Alaska. No existing land route, rail or road, was available to bring Alaska up to required troop and supply levels. Airlift plans were limited by the few widely dispersed fields in the territory, even if enough heavy-lift planes could be found.

In recognition of Alaska's new strategic importance, planners sought to make it the center of two of the most ambitious engineering projects of the war then underway. The first was the Alaska Highway, the 2,414-km concrete-

⁶ Kallman and Wheeler, *Coastal Crude*, 42.

and-gravel ribbon between Dawson Creek, British Columbia, and Fairbanks, Alaska. The second was Canol (short for Canadian oil), a series of pipelines to transport petroleum to Allied forces. Canol was considered essential to Alaska because, while the highway would be able to move an army with most of its supplies, a continuous flow of oil would have required a thousand-truck fleet operating around the clock in good weather and bad. The assumption was that there would be as much of the latter as the former.

The actual oil for Canol was to come from a field lying under the Mackenzie River along the rim of the Arctic Circle, a thousand kilometers north of Edmonton. Norman Wells Field, as it was called, first flowed in August 1920, but because of its forbidding remoteness, there was no economic justification for tapping the 60 million barrels believed to be there. The war lent sudden urgency to its exploitation.

Crude oil from Norman Wells Field was to flow by pipeline across the prohibitive, almost uncharted Mackenzie Mountains to a refinery in Whitehorse in the Yukon. More than 100,000 barrels would then move daily by other pipelines northwest to Fairbanks and southwest to Skagway, where it would link up with the Alaska Highway. Road transport would still be required, but distances would be cut appreciably.

Preliminary plans for Canol were approved in April 1942. Contracts were awarded the following month, and work was accelerated after the invasion of the Aleutians. Canol was underway by that fall. A force of 2,500 U.S. Army engineers and 2,000 civilian employees were recruited for the Herculean task. All were mindful of the difficulties that lay ahead. U.S. civilian applicants for work on the Canol were warned:

THIS IS NO PICNIC. Working and living conditions on this job are as difficult as those encountered on any construction job ever done in the United States or foreign territory. Men hired for this job will be required to work and live under the most extreme conditions imaginable. Temperatures will range from 90 degrees above zero to 70 degrees below zero. Men will have to fight swamp, rivers, ice and cold. Mosquitoes, flies and gnats will not be annoying but will cause bodily harm. If you are not prepared to work under these and similar conditions, do not apply.

Figure 10.1. Building the Alaskan highway



American laborers widen the Alaskan Highway, 1942. The passageway was built to ensure safe passage of materiel and supplies between British Columbia and the U.S. territory of Alaska, the latter of which gained new strategic importance during World War II.

Library of Congress

The conditions were not overstated, as the adventurous applicants painfully discovered.

Despite the myriad obstacles, Canol was completed, but much later than planned. The final weld was made on 16 February 1944, almost a year and a half beyond the initial target date. It also turned out to be far more expensive than originally projected. Costs for completing the pipeline and a scaled-down refinery with an output of only 3,000 barrels a day had soared to \$134 million.

It was money wasted. The Japanese had abandoned the Aleutians by then. The idea of using Alaska and the islands as bases for offensive actions was pushed out of mind as campaigns in the South Pacific rolled the gravely weakened Imperial Japanese forces back toward Tokyo. As *Newsweek* put it, Canol became “the white elephant of Whitehorse.”⁷

What Canol did prove was the almost impervious attitude toward money adopted by U.S. and Allied authorities to complete even the most difficult projects when fuel problems arose. The underlying philosophy was to accept judgmental errors, however wasteful, rather than be caught strategically short. The Germans and the Japanese could neither afford to be similarly cavalier, nor did they have the means to exploit energy opportunities in the manner of the resource-rich Allies.

During the war years, the United States produced 5 billion barrels of oil. That was sufficient to supply the nation’s domestic needs and 70 percent of all the oil used by the Allies. The effort was substantial. Though competing for personnel and materiel with every other war-related industry, petroleum companies discovered new sources (proved reserves increased by 15.7 percent through 1945) while finding improved ways to refine crude and fashion barrels into weapons of war. Billions of dollars were spent by the government and industry working in harmony to meet what seemed like impossible demands and quotas. Fields once neglected or abandoned were worked over or reopened to increase yields at whatever cost.

While New York hardly approached the reputation of Texas or California as an oil-producing state, its output during the war years was considerable. In the 1880s, New York was a major producer, but then its output fell to a trickle. When the war began, oilmen returned to New York and produced 4 million barrels in 1942 by employing new and expensive recovery methods.

Throughout the war, the United States dominated every phase of oil. The following chart relating U.S. production to total world output illustrates its overwhelming position (table 10).

⁷ Earle Gray, *The Great Canadian Oil Patch* (Toronto, ON: Maclean-Hunter, 1970).

Table 10. U.S. crude oil production

	United States	Rest of world	United States as percent of world
	(in millions of barrels per day)		
1939	3.5	2.2	60.6
1940	3.7	2.2	62.9
1941	3.8	2.3	63.1
1942	3.8	2.1	66.3
1943	4.1	2.1	66.7
1944	4.6	2.5	64.7
1945	4.7	2.4	66.0

Courtesy of William Morrow, adapted by MCUP

In addition to providing two out of every three barrels of oil produced around the world, the United States possessed more than 60 percent of the global refinery capacity. Adding the West Indies, the Western Hemisphere processed about 70 percent of all petroleum products produced worldwide.

Only the Soviet Union approached the United States as a comparable source of crude oil and petroleum products. The Russians produced an average of 625,000 barrels a day during the war years, one-seventh of the U.S. output, and possessed 10 percent of the world’s refining capacity.⁸

Even though American wells provided a seemingly unending flow of oil, the U.S. government preached a conservation ethic. A strain on supplies did exist, with demands rising each month for oil as a component of explosives, chemicals feedstocks, and as an industrial fuel and lubricant. American civil-

⁸ Data is contained in annual reports of the U.S. Bureau of Mines and summarized in editions of *Twentieth Century Petroleum Statistics* (Dallas, TX: DeGolyer and MacNaughton).

ian needs became secondary, although the public was accustomed to getting all it wanted.

U.S. secretary of the interior Harold Ickes declared in 1943: “Until recently there was a disposition on the part of the public to take it as a matter of course that there was as much oil in the ground as there was water. We burned it on that basis. In fact, we have been shamefully extravagant of it.” It was a profligate motor-minded America that had to adjust to new ways, although the U.S. civilian was deprived of far less than their counterpart in other combatant nations.

Rationing, as noted earlier, was instituted to save rubber, not to conserve oil. Still, increased consumption by the U.S. military and other Allied forces cut sharply into the domestic civilian share. In 1942, only 6 percent of all oil used went to the American Armed Services. In the final months of the war, U.S. military requirements took one of every four barrels consumed by Americans. It was patriotic to save fuel, and Americans were exhorted to cut back wherever possible. There were constant reminders of the importance of oil to the military:

- “It takes nine million gallons of fuel to keep a battleship at sea.”
- “An hour’s flight of a navy Hellcat fighter consumes enough gasoline to take your car from Chicago to Los Angeles.”
- “It takes 60,000 gallons of gasoline a day to keep a single armored division fighting.”⁹

Fuel switching was encouraged by the government. If energy could be obtained from a source other than oil, mostly coal and natural gas, all sectors of society were urged to do so. Industries particularly went back to coal. More than 47 million barrels of residual oil were saved in the process. About 120,000 homeowners in the East and Midwest converted to coal, a move that netted a 20 percent reduction in heating-oil consumption in those areas.

⁹ U.S. Office of War Information posters; and *Look Magazine*, eds., *Oil for Victory: The Story of Petroleum in War and Peace* (New York: McGraw-Hill, 1946).

Gasoline rationing, however, was not widely accepted. Congressional inquiries, spurred by angry constituents, were conducted to determine if rationing was necessary. There were complaints that the shortages were contrived. Drivers objected to the maximum speed limit of 35 miles per hour.

A survey by the Office of War Information (OWI) in late 1943 showed that “a sizeable minority either did not believe rationing was necessary or objected to the way rationing was managed. The size of these minorities takes additional significance against the background of a popular war, whose exigencies could by themselves command majorities in almost any public poll.”¹⁰

Forty percent of the Americans surveyed by the OWI were aware that a black market in gasoline existed, and 20 percent condoned illegal trafficking in ration coupons. It was estimated that one in every five gallons of gasoline bought during the war was procured on the black market or by thievery. By June 1944, coupons for buying 300 million gallons of gasoline had been stolen in 640 reported robberies of local rationing boards. Officials identified 132 different types of bogus coupons. One printing press was rushing an order for 15 million counterfeit “A” coupons (variously good for the purchase of between 6 and 24 gallons a month) when the operation was cracked.¹¹

The most severe action was taken in January 1943 when the Office of Price Administration announced a total ban on “nonessential” driving. It even extended to those with coupons. A heavy and unanticipated drain on East Coast gasoline stocks created a shortage. No one had defined nonessential driving.

Borderline cases were sticky. Resentment mounted quickly. People who had saved their coupons for a vacation felt cheated. Others who saw neighbors violating the ban with impunity were angry; some appointed themselves volunteer enforcement officers and behaved like vigilantes. Adverse public reaction caused the ban to be relaxed by summer and to be withdrawn in September.¹²

¹⁰ Roger Wollstadt, “Gasoline Rationing in World War II” (unpublished study prepared by the American Petroleum Institute, 3 July 1979).

¹¹ Details from a study by Marshall B. Clinard, quoted in the *Wall Street Journal*, 5 March 1980.

¹² *National Archives*, July–August 1979.

Black markets flourished primarily “in the major metropolitan centers of the east coast and their existence was a serious threat to the supply balance” in the region. Transporting fuel refineries to the Atlantic seaboard states of the Northeast was made easier as the war progressed, but the underworld of illegal gasoline procurement continued. “A major radio and newspaper campaign was mounted in the spring of 1944 against the black market but there is no evidence that widespread black market practices ended before rationing did.”¹³

However grudgingly the American public accepted gasoline rationing, or however hard it tried to circumvent the law, the nation muddled through without impairing the war effort. A far more serious problem, which directly affected military operations, was aviation fuel. All during the war, Allied air arms were perilously close to shortages. For those responsible for 100-octane gasoline, it was a daily struggle to meet crisis heaped on crisis. The challenge was staggering for the U.S. refineries destined to turn out 86 percent of the total Allied aviation fuel production of 439 million barrels.

Not only were American air forces demanding fuel for ever-increasing numbers of aircraft, but other Allied nations came to rely on U.S.-produced 100-octane in increasing quantities as well. After the Battle of Britain (July–September 1940), the Royal Air Force sought 27,650 daily barrels of aviation, and the British Purchasing Commission declared, “We are lost without it.”¹⁴

Russia became a major user of U.S. aviation fuel. It was a key element in the Lend-Lease program that began before the United States was at war. The Soviet Union placed requests for a daily supply of 18,000 barrels in September 1941, and transport had to be found to carry the fuel to Russia’s Pacific ports. From there, the Soviets hauled it across Siberia. As the war expanded into

¹³ Wollstadt, “Gasoline Rationing in World War II.”

¹⁴ The main sources for the section on aviation fuel are Charles G. Forbes, *Aviation Gasoline Production and Control*, U.S. Army Air Forces Historical Studies No. 65 (Washington, DC: Air Historical Office, U.S. Army Air Forces, 1947); and D. J. Payton-Smith, *Oil: A Study of War-time Policy and Administration* (London: Her Majesty’s Stationary Office, 1971). A more limited account of the problems from a contemporaneous viewpoint is Harold L. Ickes, *Fightin’ Oil: The History and Politics of Oil* (New York: Knopf, 1943).

the Pacific and Vladivostok was no longer a practical terminal, most Russian-bound fuel was supplied from refineries in the Mideast.

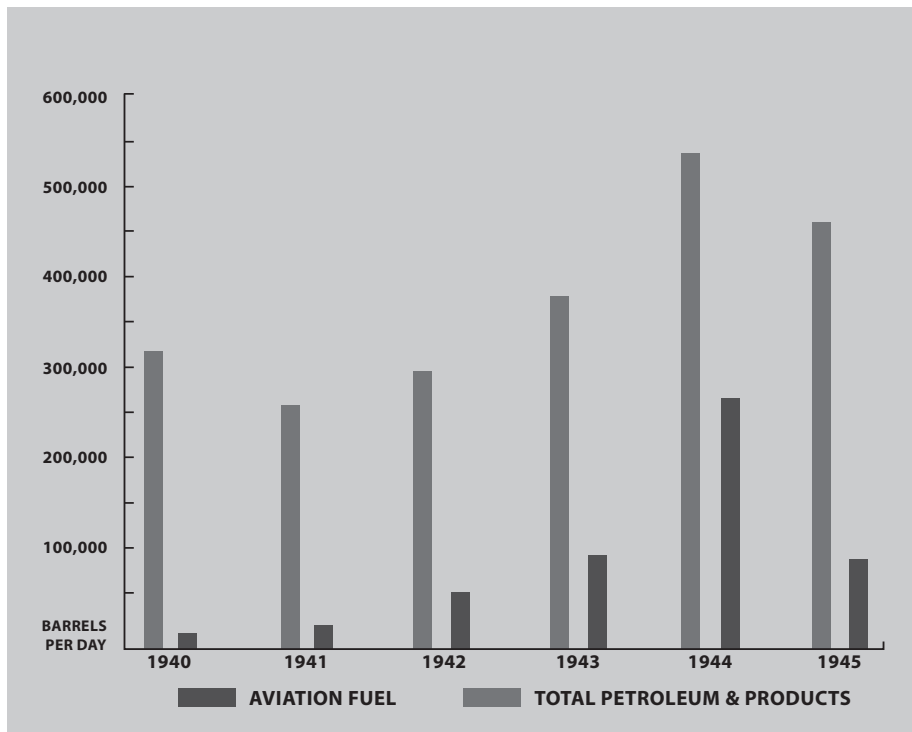
U.S. production of aviation fuel was being increased dramatically by the summer of 1942, but the Allies were expected to use 20 million barrels that year, and refining capacity indicated a maximum output of only 9 million. Refineries in Iran, Curaçao, Trinidad, and Calgary were upgraded to produce more 100-octane, but the burden fell on U.S. installations. Despite a scarcity of materials, 32 new American refineries were rushed into construction. All were financed by the government. During the war, more than \$1 billion was spent to build nearly 200 refineries to produce aviation fuel. That was 50 percent of the total number of refineries that existed throughout the United States when the war started.

Estimates for aviation fuel usage were based on a formula that broke down performance and anticipated combat operations on a plane-by-plane basis. Monthly consumption rates were computed by taking 75 percent of the maximum fuel load, adding 10 percent for contingencies such as takeoff and climb, and multiplying the total by the number of missions flown. The calculations were easy; producing the fuel was not.

Chemical engineers found ways to add more power to 100-octane gasoline while maintaining all the antiknock qualities demanded by newer and more powerful aircraft engines. Additional bending agents that helped boost octane ratings, including xylydine and cumene, were introduced in 1943. Smaller plants were hurriedly constructed to increase the production of butylene and isobutane as enhancers. Since octane rating expresses the capacity of a gasoline to be compressed without knocking, the new superfuels were given a “performance number.” The fuel was still 100-octane, since it was impossible to improve the percentage of isooctane in a blend, but the performance numbers ran up to 130 and above. They indicated the percentage power increase obtainable compared to pure octane. A fuel designated 130, for example, developed 30 percent more than a comparable all-isooctane mixture.

Enhancement of the fuel required new refining techniques and a greater use of base crude oil. A plant capable of producing 23,000 barrels of 100-octane could make only 20,000 barrels of 130-grade 100-octane. While 130 became a standard for Allied aircraft, the British and U.S. military Services pressed

Figure 10.2. U.S. aviation fuel and total petroleum exports



Courtesy of William Morrow, adapted by MCUP

for even higher qualities. A step up to 140 further increased speed, boosted takeoff power and thrust, raised the rate of climb, and permitted larger bomb loads. Production of 140-performance 100-octane could be achieved through complex refining procedures without running the risk of knocking or detonation. While 130 fuel became standard for bombers, a boost to 140 was approved for fighters on a “when available” basis in 1943 by a joint U.S.-British petroleum committee. The continuing effort in this search for higher octanes prompted authorities to begin plans to provide 145-performance fuel for all combat aircraft, but the war ended before this was possible.

Only the limited refining capability and the need to stretch crude oil supplies for the manufacture of synthetic rubber and explosives precluded fuller

utilization of the superfuel. It was a necessary tradeoff. Even so, “strict economy in the use of aviation gasoline was necessary to meet the world requirements and the production of aviation gasoline was considered one of the most difficult problems faced by the United States at war.”¹⁵

There were delays in constructing refineries. Plants expected to be completed in 16 months were taking nearly two years, with most of the difficulties arising out of delayed approvals for material through the harried War Production Board (WPB). Synthetic rubber was assigned a higher priority by the WPB, which sought to balance the conflicting demands for essential materials with judgments on direct contributions to the war effort. There was no remaining source of natural rubber, and the requirement for synthetic material was absolute.

As a consequence, aviation fuel of the higher grades could not be produced to meet all demands even though overall quantities were generally sufficient. Shortages of 130-grade fuel forced some aircraft to operate on lesser fuels for temporary periods. New Republic P-47 Thunderbolt fighters, for example, burned pistons when substitutes for 130-grade were used. It was found that when 91-octane fuel was used in Consolidated B-24 Liberator, some missions had to be aborted and forced landings made because of engine failures. By then, training units were limited in their use of higher quality fuels.

Authorities, with eyes on dangerously low supplies, ordered the use of 73-octane for primary training, 87-octane in basic, and 91-octane for advanced, with 100-octane limited to actual training for combat. While the lack of sufficient 100-octane delayed the strengthening of overseas combat units, the Army and Navy did not compromise on flight-training standards. Newly qualified pilots, however, were not being turned out as fast as planes were being manufactured. In July 1943, shortages of 100-octane resulted in training delays for 147 pilots and 81 bomber crews. Another 160 aviation cadets and 29 bomber crews were diverted to nonflying training until supplies could be increased. Part of the problem was alleviated when the British were asked

¹⁵ Forbes, *Aviation Gasoline Production and Control*, 32–33.

to turn over 200,000 barrels of 100-octane fuel from their allocation. At the same time, the first 32 new manufacturing plants were now running at full capacity to turn out high-grade gasoline on a round-the-clock schedule. Even with strong competition for skilled laborers, the industry was able to employ 40,000 construction workers to build still more facilities.¹⁶

While the Petroleum Administration scraped for materials and sufficiently high priorities to ameliorate the shortages, the demands of Russian Lend-Lease programs added to the difficulties of American and British aircrews operating worldwide on a joint allocation basis. It was U.S. policy to provide the Soviet Union with aviation fuel and refinery equipment throughout the war, and there were inevitable arguments on how much could be spared for the Russians.

Russia had received \$426 million worth of scarce refinery equipment and material through September 1943, a time when aviation-fuel output in the United States was barely able to meet the combat demands of the American and British forces. Most of the aviation fuel supplied to the Russians came from British-controlled Iran. More than 4.7 million barrels from the Abadan refinery went to Russia, and the British, in turn, received equal amounts from U.S. refineries. Direct shipments of aviation fuel from the United States to Russia totaled 383,000 barrels during the war. By far the largest aid from the United States was in motor fuel, with 15 million barrels delivered during the war.

Only after the Germans were defeated and the Allies began fighting a one-front war in the Pacific were aviation supplies delivered without uncertainties of grade availability. By September 1945, the United States was producing 600,000 barrels of 100-octane fuel daily, up from 73,000 barrels in 1942. Other refineries worldwide increased their production for the same years from 20,000 barrels daily to 80,000 at the war's end.

In the United States, "the tremendous increase in 100-octane production was primarily the result of excellent industry-government cooperation."¹⁷ Of the nearly \$1 billion spent, 75 percent came from industry. Difficulties

¹⁶ Forbes, *Aviation Gasoline Production and Control*, 26–27.

¹⁷ Forbes, *Aviation Gasoline Production and Control*, 52.

abounded but “aviation fuel was produced in quantities which, though not satisfying every demand of war, would have been considered miraculous a few years before.”¹⁸

Whatever problems the Allies faced in the manufacture of aviation fuel were minor compared with those of the Axis. As the *New York Times* editorialized in 1944:

Hitler’s air force not only has seen its supply of oil continuously reduced by the action of the RAF and our forces . . . it has never been sufficiently supplied with fuel of maximum power and maximum anti-knock rating which spells the difference between victory and defeat in those critical moments of bombing or fighter combat when the last ounce of performance is demanded of aircraft . . . we may be confident that the margin of superiority will become progressively greater from now until the end of the war by reason of the ability of the petroleum industry to furnish fuels which will provide those aircraft with their last full measure of effectiveness expressed in quick take-offs, sustained speed, combat radius and load.¹⁹

¹⁸ Forbes, *Aviation Gasoline Production and Control*, 54.

¹⁹ *New York Times*, 21 August 1944.

CHAPTER 11



GERMANY BLEEDS FOR OIL *The Caucasus and Stalingrad*

If I do not get the oil of Maikop and Grozny [Russia], then I must end the war.

~ **Adolf Hitler, 1 June 1941**

The primary cause of our failure was a shortage of fuel.

~ **General Paul Ludwig von Kleist, commander, Panzer Forces,
Army Group A, in Russia**

With the defeat before Stalingrad, the Nazis only hope of obtaining adequate oil resources was shattered.

~ **U.S. Strategic Bombing Survey**

Unlike most German veterans of the Russian campaign, oil commandos recall experiences surviving scorching heat and malaria, not killing cold and frost-bite. By August 1942, an advance element of the Technical Oil Brigade was camped in the Transcaucasian village of Edissja. Here, in the debilitating heat of the Nogay Steppe, where Caucasian peaks could be seen rising mightily to the south, the oil commandos endured tropical misery.

Daily medical reports were filled with cases and treatments of diseases and afflictions more common to a military unit in equatorial Africa than European Russia. The incidence of malaria was high and appears to have accounted for more hospitalizations than any other medical problem. If personnel lost days at Edissja through illness, productivity was not affected. The oil commandos were doing nothing anyway. Their only job was to wait. Sinking

morale caused by inaction in a suffocating, remote outposts was the greatest concern of the unit's leaders.

Moved slowly southeastward during the offensive of 1942, the oil commandos were in sight of their main objective. The visible mountain range of the Caucasus contained the oil fields they were to put into operations. Beyond the peaks, 322 km from Edissja, were the Dagestan wells along the Caspian Sea, Russia's most concentrated and productive oil area and the key goal of the Nazi offensive.

Panzer and infantry divisions had advanced 32 km beyond Edissja when the drive stalled. Idle oil commandos waited for the breakthrough. Existing in the parched, dust-cloaked village meant exposure to swarms of mosquitoes and other insects common to the Caucasus. The ochre drabness was boundless and diversion impossible. Except for the nearby Stalin Road, which ran the length of the field region between the Caspian and Black seas, there were no paved outlets for brief respites away from Edissja. Even the Stalin Road was reduced at intervals to a dust-covered path clogged with trucks and horse-drawn wagons.

A shortage of food added to the woeful existence. The Wehrmacht decided that members of the oil brigade would be issued half-rations (a full combat ration constituted 3,720 calories daily). Not qualified as a combat force and still contributing nothing to the war effort, the commandos' repeated pleas to supply officers for larger food shares fell on deaf ears. Only later was the food ration for the oil commandos increased to three-quarters.¹

While the oil commandos waited impatiently to move on, Hitler and his top aides were increasingly anxious to complete Germany's conquest of the Caucasus. Messages poured out to field commanders to advance faster, though it was close to miraculous that any kind of offensive had been mounted at all so soon after the lightning campaign of 1941 had sputtered and died before the gates of Moscow. Hitler removed Field Marshal Walther von Brauchitsch as army commander in chief and personally took over as su-

¹ File of the Technical Oil Brigade, National Archives and Records Administration, Washington, DC; and A. E. Gunther, "The German War for Crude Oil in Europe, 1934–1945," *Petroleum Times* (London), 31 January 1948.

preme commander. Other generals considered recalcitrant were shunted to lesser commands or dismissed. Hitler would no longer tolerate officers who refused to accept his grand strategies.

It had been four months since the German leader had issued *Directive No. 41* on 5 April 1942. In order “to seize the initiative again in Russia,” he had spelled out his desires in unambiguous language:

In pursuit of the original plan for the Eastern campaign, the armies of the Central sector will stand fast, for those in the North will capture Leningrad and link up with the Finns, while those on the Southern flank will break through into the Caucasus.

In view of conditions prevailing at the end of winter, the availability of troops and resources, and transport problems, these aims can be achieved only one at a time.

First, therefore, all available forces will be concentrated on the *main operations in the Southern sector*, with the aim of destroying the enemy before the Don [River], in order to secure the Caucasian oil fields and the passes through the Caucasus mountains themselves.

The final encirclement of Leningrad and the occupation of Ingermanland may be undertaken as soon as conditions in the area permit or sufficient forces can be made available from other theaters.²

Hitler recognized the extent to which his military forces had been decimated. *Army Groups North* and *Center* were stripped of motor vehicles for *Army Group South*. Even this concentration of force toward the Caucasus was insufficient. Panzer and motorized infantry divisions scheduled to lead the offensive were still at only 80 percent of full strength. As one historian noted, it made sense to aim for Russia’s oil, but “what did not make sense was the belief that German forces possessed the strength and logistical capacity to reach the oil fields, to seize them undamaged, and to hold them long enough to allow exploitation of their production.”³

² Emphasis in original.

³ Williamson Murray, *Strategy for Defeat: The Luftwaffe, 1933–1945* (Maxwell Air Force Base, AL: Air University Press, 1983), 121.

Germany's overall supply situation at the time was described by Field Marshal Franz Halder as "disastrous." As Hitler waited for his offensive to roll, the Wehrmacht counted only 140 tanks fully serviceable on the eastern front among 16 panzer divisions. Only 7,500 motor vehicles were available to replace the 75,000 lost. Try as it did, the supply corps could find only 20,000 horses to make up for the 180,000 that were killed or died in the winter of 1941–42. The High Command staff concluded the situation "cannot be made good."⁴

Fuel for the Wehrmacht remained critically short. Only one-third of the amount that Germany had stockpiled in 1941 was on hand now a year later. The only hope for sufficient fuel was getting Russian oil. Hitler recognized this, telling General Paul von Kleist, who would lead forces driving for the Caucasus, that unless the Russian oil fields were seized by the fall it would be impossible to prosecute the war.

The oil offensive began auspiciously on 8 May. The Kerch Peninsula was occupied within two weeks. Two Russian armies were annihilated and three others badly mauled by the end of the month when Stalin foolishly permitted an orderly withdrawal from the Kharkov (northeast Ukraine) front. With the bulk of the Red Army's armor smashed and shorn of its reserves, the Germans rolled on toward the Caucasus and the Don River while the Russians again were scrambling to find available forces to halt the advance.

With barely enough fuel to move and only small quantities in reserve, Hitler began the second phase of the offensive on 28 June. Newly formed *Army Group A* was charged with capturing the Caucasian oil fields and pushing to the Turkish and Iranian frontiers. *Army Group B* was to establish a flanking defensive line to the northeast along the Don River, southward from Voronezh, through Stalingrad (now Volgograd), to the Caspian Sea.

In July, Hitler established his headquarters deep in the Ukraine to be as close as possible to his advancing armies. He sensed victory and issued specific details (Operation Blücher II in April 1945, curiously named for the

⁴ Walter Warlimont, *Inside Hitler's Headquarters, 1943–45*, trans. R. H. Berry (New York: Praeger, 1964), 240.

Prussian general who helped defeat Napoleon) for divisions advancing on the Caucasus. *Army Group A* was to occupy the entire eastern coastline of the Black Sea and drive to Grozny and Baku on the Caspian Sea. The drive to the Caspian meant penetrating the Caucasian range. German mountain units, supplemented by *Romanian Mountain* and *Italian Alpine* corps, were ordered forward for the final stages of the operations. Until the breakthrough occurred, the more accessible fields of Maikop in the northwest Caucasus region were ordered to be “quickly occupied.” To make sure Maikop would be exploited immediately, a parachute landing force was assembled to hold the installations until the main force arrived.

While *Army Group A* concentrated on realizing the full benefits of the oil offensive, *Army Group B*’s role was changed in a most significant way. Hitler’s *War Directive No. 45* of 23 July made Stalingrad, which earlier had been given no particular priority, a key objective of the overall campaign. *Army Group B* was ordered to “move forward to Stalingrad and smash the enemy forces concentrated there.” The *Luftwaffe*, which previously had acted only in support of ground forces, was directed to bring about “the early destruction of the city of Stalingrad.”

As a result of Hitler’s modified orders, previously concentrated power was diffused. Seeking two major objectives at the same time, Hitler was to achieve neither. Stalingrad became equal to the Caucasus, and *Army Group B* would no longer merely protect the flank of *Army Group A*.

Supply problems mounted. Both army groups began running short of fuel by late July. The main railhead for *Army Group B* was at Stalino (now Donetsk, Ukraine), 354 km from the front. Shipments for *Army Group A* had to go through Rostov, Russia, a constant bottleneck, since Black Sea routes were considered too dangerous. Locomotives were in short supply, and there was not enough motorized transport to move materiel forward regularly from either Stalino or Rostov. Because oil supplies were running dangerously low for the panzers, an emergency airlift was begun, again diverting from strictly combat missions. As General von Kleist, commander of the panzer forces of *Army Group A*, said, “A certain amount of oil was delivered by air, but the total which came was insufficient to maintain the momentum of the advance, which came to a halt just when our chances looked best.”

Tanks were immobilized. A limited advance was maintained only because the battered Soviet Army was still regrouping and faced fuel shortages. Without significant resistance, the Germans on 5 August captured Voroshilovsk-Stavropol, astride rail and pipeline connections between the Dagestan oil fields and Rostov. Four days later, Maikop, center of lesser though important oil fields, was taken on the Black Sea side of the Caucasian peninsula. The *First Panzer Army* continued its advance, reaching the rim of the Caucasus range, while *Fourth Panzer Army* units moved to within 113 km of the Caspian Sea on the Kalmyk Steppe. It was no longer possible for Russia to ship oil from the Dagestan fields except by barge and ship from Baku to the Caspian port of Astrakhan.

The Germans could have seriously impaired the flow of oil from Dagestan by interdicting its only remaining outlet, the Caspian Sea. Distances were relatively short. Aircraft were available. If strikes had been directed against Astrakhan or Baku, the Russians would have been denied most of their oil. Red Army operations were already affected by reduced supplies. But Hitler's thinking was clouded by the symbolism of Stalingrad, not strategic considerations. Increasingly, Hitler wanted to seize the city named for his chief adversary, the Russian leader he so despised and who had tried to achieve immortality by naming the city after himself.

He insisted the Luftwaffe continue to regard ground support as its primary objective. Only secondary consideration was given to the oil flow: "Attacks will also be made, as opportunity affords, on Astrakhan." He also specifically stated that air attacks against the "Caucasian oil fields and their refineries . . . will only be carried out if the operations of the army make them absolutely essential."

As a result, the army's demands on the Luftwaffe's resources precluded any diversion to bombing oil targets, so Russia's supplies—within easy reach—continued to flow in sufficient quantities to keep Russia's Army and Air Force supplied.

Hitler's decision to make Stalingrad the focal point of the offensive was a disastrous mistake. Eight divisions (German and Romanian) were transferred from *Army Group A* to *Army Group B*, depriving the former of a large segment of its force, which, if supplies had been funneled to it, might have reached Baku and the Dagestan oil fields within weeks.

By August 1942, the British felt sufficiently alarmed by the German drive into the Caucasus to consider withdrawing several divisions from the North African campaign against Rommel and transferring them to Iran and Iraq to halt an anticipated thrust to the Persian Gulf. It was a Hobson's choice.⁵ Since there was not enough manpower to cover both threats, the question was which was more important to defend, Cairo and the Suez Canal or the oil of the Middle East. Field Marshal Alan Francis Brooke, 1st Viscount Alanbrooke, chief of the British Imperial General Staff, wrote that, "All the motive-power at sea, on land and in the air throughout the Middle East, Indian Ocean and India was entirely dependent on the oil from Abadan. If we lost this supply, it could not be made good from American resources owing to shortage of tankers and continuous losses of these ships through submarine action. If we lost the Persian oil, we inevitably lost Egypt, command of the Indian Ocean and endangered the whole Indian-Burma situation." He added, "Cairo was seriously threatened by Rommel on the west, and any dangers on the east seemed more nebulous and distant. And yet of the two the oil was by far the more important strategic objective."⁶

No date can be pinpointed as the start of the Battle of Stalingrad, but by the end of August 1942 the offensive was underway, and the campaign in the Caucasus was relegated to a secondary military action. The original flanking action of *Army Group B* was elevated to a massive attack as Hitler's obsession with Stalingrad grew to calamitous proportions. A depleted *Army Group A*, with barely enough fuel to survive, was holding a 805-km line across the Caucasus, only 241 km from the biggest oil prize of all. However, it was threat-

⁵ According to Merriam-Webster, Thomas Hobson worked as a licensed carrier of passengers, letters, and parcels between Cambridge and London in the late sixteenth and early seventeenth centuries. He kept horses for this purpose and rented them to university students when they were not in use. The students typically requested their favorite mounts, which caused some of Hobson's horses to become overworked. To correct the situation, Hobson instituted a strict rotation system, giving each customer the choice of taking the horse nearest the stable door or none at all. This rule became known as *Hobson's choice* to mean no choice at all.

⁶ Arthur Bryant, *The Turn of the Tide, 1939–1943* (Garden City, NY: Doubleday, 1957), 357–63.

ened with being cut off unless *Army Group B* held in the north. Stalingrad thus became pivotal to the oil offensive.

Meanwhile, plans went forward to move oil-field equipment to the Caucasus. The ultimate outcome of the Russian campaign could not have been foreseen by the economic planners assembled in East Prussia only a month earlier, on 19 July 1942. Hermann Göring had called them to his advance headquarters to discuss plans for exploitation of Caucasian oil fields. If Hitler was right, and Göring believed he was, Russian sources of supply would be under German control within a few months. As economics and fuel czar, Göring wanted to know what the *Technical Oil Brigade* would need to resume production at the earliest possible time. A delivery program for key equipment had been submitted previously to include 220 drilling rigs to be delivered by the end of the year. Göring said the number of rigs should be increased to the limits of German production and material availability and that delivery schedules should be advanced. Production ministry personnel and the heads of the allocation departments drew up new figures increasing the number of rigs to 310 through 1943 and another 220 in 1944. An allocation of 750 tons of specialty steel was set aside for each of the rigs to be manufactured. The new plan still disappointed Göring, but he knew of no way to accelerate rig deliveries without severely impairing or crippling high-priority military orders.

In the meantime, nearly 100 rigs originally ordered by the Russians in exchange for oil in 1940 and conveniently unfinished until the 1941 invasion, were readied for shipment to the Caucasus. These rigs and other equipment were sent to the rail center at Breslau (now Wrocław), Poland, the assembly point for supplies to the southern Russian front. At first, it took seven days for trains to reach the Caucasian railhead at Armavir, Armenia. As engines and rolling stock became snarled in logistic logjams, supplies slowed to a trickle. It was soon taking a month for trains to make the trip from Breslau to Armavir.

One train finally made it into Caucasus on 6 November after traveling 54 days. By the end of December, Armavir had received only 10,000 tons of supplies. One-third was for use in the oil fields, the rest to handle military needs.

Most members of the *Technical Oil Brigade* had left Berlin on 16 July, and 6,000 of them were assembled at the staging center in Berdyansk, Ukraine, by

early August. A technical battalion of 350 engineers and geologists immediately moved on with troops advancing on Maikop.

The oil commandos tasted combat for the first time on 10 August when the units closed in on Maikop and ran into unexpectedly strong resistance. During the clash, 20 oil commandos were killed and 60 wounded. Two days earlier, Major Erich Will, who had played the key role in organizing the oil commandos, died in the crash of a transport plane.

Panzer units reached the nearest oil installations around Maikop on 15 August. A quick survey by combat officers concluded there was a little damage to the fields and equipment. Hitler was elated. The fruits of Maikop would be realized. Exultation turned to despair, however, when a group of expert technicians from the brigade reported that destruction was widespread and early reactivation of production was impossible. The Maikop fields, according to the detailed report submitted by a *Bergassessor* (assessor), were “as thoroughly scorched as an oil field can be.”⁷

Messengers bearing bad news were held suspect, and Gunter Schlicht, mining engineer and director of a petroleum company, was summoned to Berlin to explain his negative report. The Russians had been thorough in demolishing everything, right down to the small hand tools in the workshops, he said. Wells were packed with concrete and would be difficult to restore to production until every trace of material was removed. Extensive repair work and replacement of most of the drilling equipment and rigs was mandatory.

Restoring the oil fields would be difficult at best, but the work was made far more difficult by Russian guerrillas who infiltrated and kept blowing up installations. Travel was risky between Armavir and Maikop and outright deadly over the wood route between Maikop and the fields. No one traveled by night. The area was not considered sufficiently secure to begin even limited operations until the middle of October. Despite occasional harassment, most work was able to proceed by the middle of November. Buried mines left behind by the Russians were gradually unearthed and defused. The big-

⁷ Gunther, “The German War for Crude Oil in Europe.”

gest problem was the onset of heavy rains, which created lakes of mud. Still, Maikop bustled with repair activity and even some oil production.

Russian civilians, men and women, were pressed into service. Heavy equipment and material was hauled by hand in large gangs, replacing mechanical equipment that had not arrived. It was later found that roads and bridges could not accommodate the heavy vehicles when they did arrive. Oil field fire-fighting equipment, in many cases, had to be left far from the producing areas because it could not be driven or transported.

The civilian workforce became more important. Whole derricks were carried across the hilly terrain by hundreds of laborers using rope and logs. In exchange for their services, the Russian workers demanded food. Rations were grudgingly turned over to them when the oil commandos declared that work would have to be stopped if they could not feed the workers.

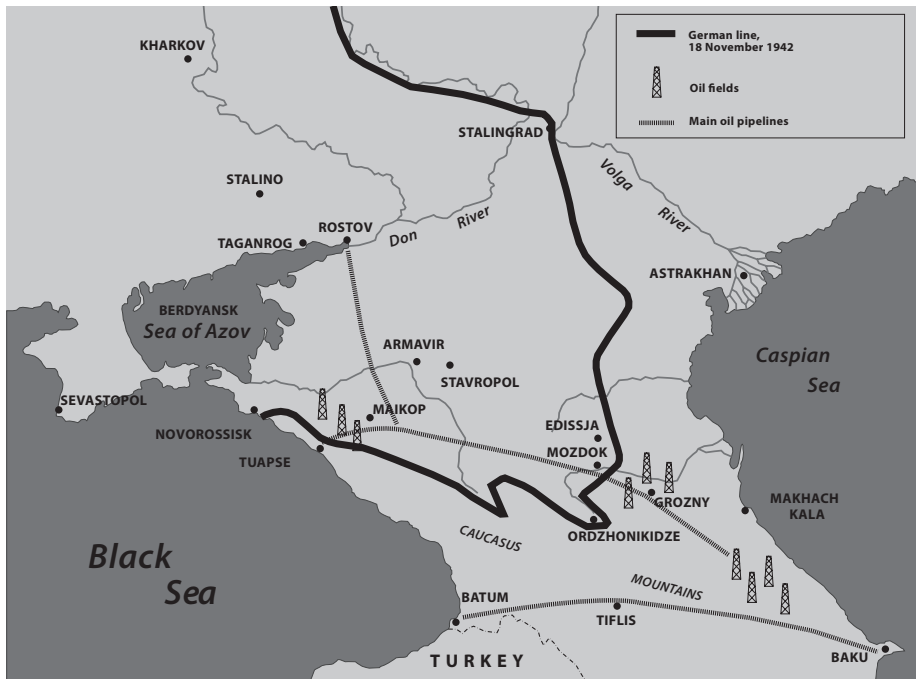
By December, oil flowed from the Maikop fields. A January 1943 report showed 13 wells in operation, producing 70 barrels a day. The output was pathetically small, but a projection of 2,000 barrels a day by April and 26,000 by the end of the year was enough to justify continuation of the brigade's work. Maikop, however, was still considered a minor prize. Grozny and the Dagestan fields were the giants yet to be captured and exploited.

The push to Grozny, 563 km southwest of Maikop, continued at a disappointing pace. The advance party of 50 engineers and 1,500 enlisted commandos left Maikop for Grozny on 24 August and began their ordeal at Edissja. Given the speed with which they had moved from Berlin to the Caucasian steppes, the expectation was that Edissja would be a temporary base at best.

It soon became apparent that the drive for Grozny and the Dagestan wells was falling apart. Growing demand for forces at Stalingrad meant a draw-down in the Caucasus. General Von Kleist said, "We could still have reached our goal if my forces had not been drawn away bit by bit to help the attack on Stalingrad."⁸ But he declared that the main cause for failing to reach the major Caucasian oil fields was a lack of fuel. By the time *Army Group A* began to be

⁸ B. H. Liddell Hart, *The Other Side of the Hill: Germany's Generals, Their Rise and Fall, with Their Own Account of Military Events, 1939–1945* (London: Cassel, 1948), 303.

Map 11. Caucasian oil fields, 1942



Courtesy of William Morrow, adapted by MCUP

drained, it had been reduced to eight fuel-short divisions at the end of a long and clogged supply line.

Meanwhile, Russia was not only determined but able to defend the Caucasus as well as Stalingrad. A force five times larger than the attacking Germans was arrayed along the mountain range. Some high ground was forfeited, including Mount Elbrus, the loftiest peak in Europe, but the Red Army held the passes and valleys. The Soviets would not yield the coasts of the Black and Caspian seas.

As the fight for Stalingrad raged in November, Göring called in the oil experts to review the situation in the Caucasus. Dr. Alfred Betz of the economics ministry and Schlicht of the oil brigade were direct and discouraging. The oil fields in German hands around Maikop were still producing but under

new attack by partisans and saboteurs. Equipment and supplies were not arriving. Rail and road transport systems had broken down and were probably beyond repair. Brigade personnel were being forced into infantry units to support frontline defensive positions.

Units at Edissja were pulled back. All oil commandos had returned to Maikop by 7 December, and within weeks it became apparent they should be withdrawn completely from the Caucasus. Orders to evacuate were issued on 18 January 1943. Maikop was reoccupied by Russian forces by the end of the month.

In a final irony, only a few days before the final orders to withdraw were received, the commandos discovered an area near Maikop producing high-grade crude that yielded gasoline in great quantity.

On 25 February 1943, the Central Planning Department in Berlin officially ended the existence of the oil brigade by erasing it from the rolls of the armed forces.

CHAPTER 12



COMMAND OF THE PACIFIC SEA-LANES

When Japan embarked upon war, there were two vulnerable spots in her thin armor. These were shipping and oil.

~ Toshikazu Kase, *Journey to the Missouri* (1950)

Our ships sailed on water, but they moved on oil, and the demand never ceased.

~ Rear Admiral Worrall R. Carter, USN (Ret),
Beans, Bullets and Black Oil (1953)

German navy vice admiral Paul H. Wenneker read the overnight cables from Berlin with a growing sense of frustration. Among them was another directive from the naval ministry instructing him to persuade the Japanese “to exert their maximum effort in attacks on U.S. merchant shipping in the Pacific . . . to concentrate on certain supply lines, with a chance of attacking tankers and transports.”¹

Wenneker knew he would have to repeat his periodic lecture to the Japanese admirals on the need for totally different strategic planning concepts. They would listen patiently and courteously, he knew, and then would respond as they had so many times in the past months: “We must conserve our submarines for attack against the U.S. fleet.”

¹ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials* (Washington, DC: Government Printing Office, 1945), Interrogation No. 70.

As the German naval attaché in Tokyo in 1943, Wenneker fully shared the concern of his naval superiors. Japan's navy was being misused and would dribble away its remaining forces in fruitless, even self-destructive operations. Midway was a debacle. Even some of his Japanese naval colleagues admitted privately that the grand design was a failure with the loss of four of the Imperial Japanese Navy's six frontline carriers and most of its trained pilots. Wenneker felt Guadalcanal was another example of "where they kept putting in their strength little by little to see it all destroyed without any benefits."²

If Japanese admirals directing the Pacific War tried to understand the longer-range implications of their actions, Wenneker felt they would switch strategy. Instead, they adhered to the doctrine that had served them so well during the early months of fighting. Germany realized that Japan's greatest contribution to the Axis would be to tie up the Americans and force them to divert as much of their military and economic potential as possible away from Europe.

Wenneker kept urging attacks on American supply lines. He did so without appearing patronizing or condescending. He understood the Japanese character, unlike many Germans in Japan who regarded their Asian allies as incomprehensible and racially inferior. This was Wenneker's second tour as naval attaché. He had observed firsthand the spectacular growth of the Imperial Japanese Navy from 1934 through 1938. After two years as commanding officer of the pocket battleship *Deutschland*, including several months of combat patrol in the North Atlantic, Wenneker returned to Tokyo in early 1940.

Eager to help bring Japan into a full Axis military partnership, Wenneker renewed his friendships among Japanese naval officers he knew from previous years, offering advice on tactics and strategy whenever he could. As a veteran of the Atlantic campaign against the British, the admiral's views were highly respected. Wenneker also managed to search out another old friend, German journalist (and unbeknownst to Wenneker, a Soviet spy) Richard Sorge.

² U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 70.

Wenneker and Sorge talked frequently about Japan's refusal to join in the war against Russia after the German invasion. Berlin did everything to encourage a Japanese attack on the Soviets in Asia, but the Japanese would not budge. They would not take any advice from the Germans on how to conduct their naval campaigns against the Allies either. Wenneker said, "The Japanese navy thought always of the U.S. carriers. They talked about how many were being built, how many were in the Pacific and that they must be sunk. . . . It was always carriers they talked about. Next, after that, they would attack battleships and lesser ships but never the merchantmen except under the most favorable circumstances."³

Wenneker was aware, for example, that specific instructions were issued to submarine commanders that they should never fire more than one torpedo at an Allied tanker or freighter, even under favorable circumstances. "Notes were repeatedly exchanged between my office and Berlin on this subject and directives from home instructed me to press the matter further," Wenneker said later. The Japanese "argued that merchant shipping could be easily replaced with the great American production capacity but that naval vessels represented the real power against which they fought and that these vessels and their trained crews were most difficult to replace and hence were the logical targets. If, therefore, they were to hazard their subs, it must be against the U.S. Navy."

The Germans, on the other hand, appreciated the extent to which the United States was mobilizing and how Japanese gains in the Pacific would be lost unless they halted the logistical avalanche that would serve as the Allied base for reconquest.

During the first year of the war, America was barely able to hold on. In every area, it was in short supply. Admiral Raymond A. Spruance later said that logistical support for the U.S. Navy was "confined to fuel" during those perilous months. Ships and planes operated with uncertain sources of supply. There were not enough tankers when the war began (only 14 for the entire Pacific fleet), and subsequent losses in the Dutch East Indies (now Indonesia)

³ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 70.

made fuel a scarce commodity. By late 1942, however, the tanker fleet was increasing rapidly, augmented by larger merchant tankers operated by the oil companies. When all East Indies oil had fallen to the Japanese, the Allies started from scratch to establish forward fuel centers to nourish future operations. Oil depots were established at Nouméa, New Caledonia; Efate, Vanuatu; and Tulagi and Guadalcanal in the Solomon Islands. Storage capacity amounted to 879,000 barrels. By the end of 1942, tankers were hauling 1.3 million barrels a month to keep fuel in the Pacific theater at adequate levels.

Much of the early oil came from the Persian Gulf, but as the war intensified, the bulk came from California and the Caribbean by commercial tankers. Shipments were made directly to combat supply areas by fleet oilers, but great quantities were also transshipped through Pearl Harbor. Twenty-eight fleet oilers hauled fuel from the Hawaiian base to U.S. Navy ships.⁴

Admiral Wenneker was unaware of specific numbers, but German intelligence reported the mounting effort by the United States to roll back the Japanese to their home islands. When he visited the East Indies and Mariana Islands in 1942 for a personal tour of occupied areas, Wenneker was aghast at what he saw and heard. The Japanese were unconcerned about a U.S. counteroffensive, while Wenneker thought early American actions were inevitable. At each stop, he heard the same sanguine attitude from the Japanese: "They said the Americans would never come, that they could not fight in the jungle and that they were not the kind of people who could stand warfare in the south."⁵

Further, the Japanese committed the monumental error of not guarding their lifelines. U.S. submarine attacks on merchant shipping, which began slowly, soon began to sever shipping links between Japan and Southeast Asia. As Wenneker said, "Most serious of all here was the sinking of tankers and hence the loss of oil from the south."⁶

⁴ RAdm Worrall Reed Carter, USN (Ret), *Beans, Bullets and Black Oil: The Story of Fleet Logistics Afloat in the Pacific during World War II* (Washington, DC: U.S. Navy, 1953), 71.

⁵ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 70.

⁶ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 70.

Expenditures of oil, as those aware of the figures knew, were far greater than planners had anticipated. After the Battle of Midway in June 1942, it became apparent that fuel loomed as a major Japanese problem. Admiral Soemu Toyoda, chief of the Imperial Navy's *Combined Fleet*, recalled the profound consequences of Midway: "Our losses there had a very serious effect on us, together with the fact that we used very much fuel at that time, more than we expected would be necessary. The effect of that fuel expenditure was felt throughout the rest of the war."⁷

Japan had miscalculated badly. Its fate rested on the ability to exploit the oil resources of Southeast Asia before stockpiles in the home islands were exhausted. To achieve that end, the sea lanes had to be controlled by the Japanese navy.

It is true that captured production in the southern areas was used by the Imperial Army and Navy directly, eliminating the need for long-distance hauling and rerouting of finished products. In Burma (now Myanmar), for example, the Japanese consumed the entire output to make its military there completely self-sufficient in fuel. The Japanese fleet drew heavily on oil refined at Palembang. About 40 percent of its considerable output was used by ships in the area. Palembang drew on the crude produced in the nearby Sumatran fields as well as some from Java that could be shipped without too much difficulty. Production from Balikpapan and Tarakan went to Singapore, one of the primary fueling bases in the area. So far as possible, bases in Rabaul and Truk were also supplied with East Indies oil. From the Japanese point of war, the more the consumption in the producing zone, the less that had to be shipped home. The practice led to some inefficient operations. Warships based in the home islands were at times sent to Singapore, Brunei, and other fuel centers for the sole purpose of refueling. They were ostensibly assigned patrol duties en route to and from these bases, and the trips were probably useful for training purposes, but the net benefit was highly questionable. An

⁷ U.S. Strategic Bombing Survey, *Oil in Japan's War* (Washington, DC: Government Printing Office, 1946), 83.

estimated 75 percent of the oil shipped back to Japan came from Sumatra and the remainder from northwest Borneo.

The situation in 1942 was greatly aided by captured oil. While facilities were being restored, the Japanese drew on 4 million barrels of fuel oil and aviation gasoline found in abandoned Allied storage tanks scattered throughout the occupation zone. The windfall was quickly depleted in a year of rapid movement of troops and ships overextended distances.

From the high point of 1942, the situation changed suddenly and radically. Within a short time, Sumatran refineries were virtually shut down for long periods. There was no way to ship the material to Japan or to perimeter supply centers, and motor gasoline and fuel oil were actually burned by the thousands of barrels. Some crude oil and even refined material were pumped back into the ground when production continued to meet the need for aviation fuel and lubricants. In refining a barrel of oil, only minor adjustments can be made to control or change the output. While aviation fuel was one of maximum priority, only 20 percent of a refinery's finished mix could be coaxed out of the crude as sufficiently high in octane for aircraft use. The rest was actually excess, but full production was required to get aviation stock. Eighty percent was lost or burned for lack of tankers to transport it for weeks and months at a time.

In postwar interviews, the Japanese and others questioned how this import-dependent nation could have fallen so short of oil-carrying tonnage. In 1938, Japan had perhaps 45 tankers. When the possibility of war became a probability, Japan pushed construction. At the time of Pearl Harbor, it had boosted its tanker fleet to about 65 ships totaling 575,000 tons. That was still a very small number considering the ambitious program to control Southeast Asia's oil and use it to fuel military operations and power home industries. Japan had relied on foreign shipping to transport most of its oil in the prewar period, buying all it could stockpile and receiving it in foreign bottoms. The stockpiling overshadowed considerations of tanker availability when tankers from other countries were no longer available. Since the foreign suppliers were almost exclusively American, British, and Dutch, the need for a secure tanker fleet should have been obvious. It was overlooked, and Japan paid a horrible price.

Of Japan's tankers, three out of every four were assigned exclusively to hauling Southeast Asian oil to the home islands. Even with an intensive tanker construction program begun in 1942 (shipbuilders had the highest possible priority among the essential war industries for materials and labor), the oiler fleet reached only 834,000 tons by November 1943. An exact figure of the actual number of tankers has not been determined, but that tonnage would translate into fewer than 100.

For the whole of 1942, Japan received 29,000 barrels a day from the occupied zone, about 40 percent of the area's total production. The figure climbed to 40,000 barrels in 1943, but it represented only 29 percent of production. The poor showing reflected an increasing loss of tankers.

In 1942, tanker losses to Allied forces totaled a mere 4,000 tons. The following year, the figure leaped to 388,000 tons, "an indication to every Japanese aware of the facts that in the race between shipbuildings and sinkings, the United States submarines were beginning to gain an advantage."⁸

American submarine commanders were ordered to go after Japanese tankers. Given a choice, they were to expend their torpedoes on them before any other targets except men-of-war above the size of destroyers. The operation was called the "Battle of the Marus," a reference to the Japanese designation *Maru*, which was applied to the names of all merchant ships. So, while the Japanese showed disdain for raiding supply ships with their submarines, the United States wisely chose the opposite course of action. By the end of the war, American submarines had sunk an estimated 110 Japanese tankers, "causing a fuel shortage that afflicted the empire with a form of creeping paralysis."⁹

A small band of Pearl Harbor-based submarines was the first to penetrate Japan's protective ring, which stretched from the Aleutians to the Indian Ocean. It was a creditable accomplishment for the group, which operated far from supply centers over immense spans of water with uncertain communications. For a long time, too, U.S. submarines operating out of Pearl Harbor had

⁸ U.S. Strategic Bombing Survey, *Oil in Japan's War*, 52.

⁹ Edward Van Der Rhoer, *Deadly Magic: A Personal Account of Communications Intelligence in World War II in the Pacific* (New York: Charles Scribner's Sons, 1978), 161.

defective torpedoes. Due to magnetic settings determined by testing off the East Coast of the United States and wholly inapplicable in the Pacific, the torpedoes tended to run at depths that carried them under, not into, their targets. The USS *Timosa* (SS 283) experienced the ultimate frustration with American torpedoes—not exploding at all. When the submarine fired nine torpedoes at a large Japanese tanker, each one slammed into its hull, but not one exploded. Fortunately, the problem was corrected.

Ironically, while the Americans had difficulties with torpedoes, the Japanese did not. Their standard version was more accurate, more powerful, and had a significantly greater range than anything in the U.S. arsenal. The Japanese torpedo, flashing through the water at 36 knots with a half-ton of explosives, was capable of hitting a target 32 km away. Still, the Japanese would not use them against American merchant ships.

When American submarines began operating in Japanese waters, they were directed to move primarily against the tankers supplying the Japanese forward bases of Rabaul, Truk, and Palau. Equally important was minelaying at key points along known routes. The USS *Grenadier* (SS 210), which sank the *Taiyo Maru*, was the first to mine Japanese shipping lanes, planting mines in the Gulf of Tonkin off the Indochinese (now Vietnamese) coast. By the end of 1942, the home waters of Japan were mined by three American submarines, which maneuvered into the approaches to Osaka and Choshi. So far as is known, the mines damaged four merchant ships and had a certain nuisance value.

Thirty-five U.S. submarines patrolled the Pacific at the end of 1942. While they are credited with the destruction of 670,000 tons of Japanese ships during the year, tankers, as we have seen, represented a small percentage of the total, a fact that may have lulled the Japanese into a false sense of fuel security. The impact on the American Navy was just the opposite and spurred added concentration on oilers. A new operation plan from Commander Submarines Pacific was issued on 24 June 1943 that further emphasized the importance of sinking tankers. Japan was adding tankers at a rate that indicated it might stay even, although it had suffered a net loss in available tankers from April through June. By September, U.S. submarines started to cut into the oil flow after total available tonnage reached 814,000. For Japan, the turnaround caused great concern.

Figure 12. American submarine officer at periscope



An American naval officer peers through the periscope of his submarine, 1942. Highlighting the United States' emphasis on attacking Japan's merchant shipping, U.S. submariners were instructed to target enemy tankers above all other warships smaller than a destroyer.

National Archives and Records Administration

During the first three months of 1944, tanker losses totaled 228,000 tons, almost equal to all oil destruction in the first two years of the war. Japan pushed its shipbuilding program to the limit to offset losses. In order to gain scrap iron, factories producing consumer goods were torn down except those that could be converted to munitions plants. A program to build wooden ships began. They turned out to be easy prey because of their slow speed, requiring 60 days to make the voyage from Japan to Singapore. Despite its efforts to bolster ship construction, Japan had only 5.2 million tons available

in September, 1 million short of what was required to run its economic infrastructure and fight a war.

Aircraft production was affected by the shortage of shipping facilities. Only 2,000 planes were built in 1943, half the number necessary to stem the tide of military reversals. "Increased imports of raw material, particularly oil and bauxite were needed, and this required more shipping rather than less."¹⁰ Kenzo Aoki, a retired Tokyo architect, was sent to Kofu, west of the Japanese capital, to build an aircraft factory and airport. By the war's end, only three planes had used the airport.¹¹

Japan's preoccupation with offensive actions to the neglect of defensive operations was manifest in many ways. There was little in antisubmarine training. Few ships were built for a defense against underwater predators. Its escort program appeared to be more of an afterthought until the war was several months old. The *First Convoy Escort Fleet* was established in July 1942 with headquarters on Formosa (now Taiwan). An auxiliary aircraft carrier, 12 destroyers, 100 patrol torpedo boats, and the few subchasers in service were assigned to convoy protections augmented by 100 aircraft assigned to patrol duty. Some merchant freighters were converted to convoy duty. Four vessels were built specifically as escorts in 1943. Another 40 of the frigates, called *kai-bokans* (defense ship), were ordered that same year.

The service did not work well, however. There was no overall central authority to specify escort procedures, determine routes, or move ships and planes to meet threats to shipping. The Formosa-based force existed more on paper than on the sea. The antisubmarine force wanted nine times the number of kaibokans scheduled in 1943. As the U.S. Strategic Bombing Survey concluded in its postwar study, "Japan's failure in 1942 to initiate a program of escort vessel protection and to organize convoy protection along efficient lines can only be explained by a lack of foresight or great overconfidence."¹²

¹⁰ Stephen W. Roskill, *White Ensign: The British Navy at War, 1939–1945* (Annapolis, MD: Naval Institute Press, 1960), 318.

¹¹ Kenzo Aoki, interview with Joe Diele, Tokyo, 1985.

¹² U.S. Strategic Bombing Survey, *The Campaigns of the Pacific War* (Washington, DC: Government Printing Office, 1946), 378.

The Battle of the Bismarck Sea in March 1943 was the first application of airpower to break the Japanese supply chain. U.S. Army general Douglas MacArthur called it the most decisive aerial engagement of the war in his operational theater. It established air superiority and permitted Allied domination over the shipping lanes.

The Japanese also painfully learned the need for land-based protective cover. To consolidate its position on New Guinea, Japan tried to move 7,000 troops from Rabaul to Lae on the Huon Gulf opposite New Britain. Eight transports received an uncharacteristically large escort force of eight destroyers. On the morning of 2 March, two dozen American Consolidated B-24 Liberators and Boeing B-17 Flying Fortresses attacked the convoy, destroying four of the transports. Continuing low- and medium-altitude strikes by American and Australian planes during the next two days further crippled the invasion force. U.S. Navy patrol torpedo boats joined the murderous assault. In the end, all the transports, totaling 30,000 tons, and four of the destroyers were sunk. Only a thousand Japanese actually reached Lae. Three times that number were lost at sea. A few made it back to Rabaul aboard rescue vessels.

The immediate consequence of the Battle of the Bismarck Sea was that Japanese ships had to avoid land-based aircraft while also fighting off a growing submarine threat. It was clear the Japanese needed a better-coordinated program as the tempo of the war quickened throughout the southwest Pacific. Radar-equipped Allied planes were harassing Japanese ships in night attacks. Long-range bombers could reach vessels plying the Chinese and Indochinese coasts from Saigon (now Ho Chi Minh City) to Shanghai.

Tanker losses mounted at an incredible rate. The 12-month total through the spring of 1944 was 388,000 tons, or two-thirds of the tanker tonnage Japan had had at the beginning of the war. New additions did not keep pace.

Less oil from Southeast Asia got back to Japan. Before June 1943, an average of 51,000 barrels a day reached the home islands. Tanker losses reduced deliveries to 38,000 barrels by October. Japan, it will be recalled, had counted on fighting the war mostly with stockpiled oil for the first two years. After that, it would have signed a truce affirming Japan's oil conquests and withdrawn from the Philippines. That was not to be. Meanwhile, more fuel than

anticipated continued to be used. Domestic production of crude and the failed synthetic program were negatives. Most importantly, oil was not flowing from Southeast Asia at a rate to keep the machinery of war going.

Prospects were not bright. Japan's refineries in 1943 operated at 31 percent capacity, a reflection of dwindling crude supplies. Japan was reduced to a mere 2.4-million-barrel crude oil stockpile, one-tenth of its prewar hoard. Shortages loomed. Defensive warfare, whether Japan liked it or not, was ordained by circumstances.

The convoy was improved. A *Grand Escort Fleet* was created in November 1943 with the sole purpose of protecting oilers and freighters in the war zones. More aircraft carriers were assigned convoy duty. A string of air bases was established along the coast of the Asian mainland and occupied islands to give the convoys an umbrella of protection.

It was too little, too late. Too much reliance was placed on naval and air bases at Rabaul and Truk when they were increasingly cut off from fuel. As the U.S. Strategic Bombing Survey noted:

The lack of oil storage capacity sufficient to sustain fleet operations from these bases required Japanese tankers to remain in locations subject to air attack. United States submarines were increasing in number and were remaining longer in the operating areas as their bases were advanced. United States carriers were increasing in number and soon would reach a figure which permitted frequent employment of carrier task forces on anti-shipping strikes. New developments and production of American radar and sonar equipment were widening the gap between the effectiveness of the Japanese defense and the power of the United States offense. Japan had fallen behind in ability to protect her shipping and her position was rapidly becoming worse.¹³

How much worse was evident by early 1944, when an American naval task force was sent to attack Truk. An awesome group of nine carriers with hundreds of aircraft and six battleships under Vice Admiral Spruance pounded

¹³ U.S. Strategic Bombing Survey, *The Campaigns of the Pacific War*, 380.

the island's installations in round-the-clock operations on 17 and 18 February. Of 186,000 tons of Japanese shipping destroyed, 52,000 tons was in tankers. The same ships and planes struck other bases in the Caroline Islands a few weeks later, battering Palau, Yap, Ulithi, and Woleai. More tankers were lost. Also in February, U.S. submarines in other areas of the Pacific added to the tanker toll, sinking another 48,000 tons. Japan would never recover from those crippling losses. All future Japanese naval operations were limited because of a lack of fuel. Imperial Navy admiral Soemu Toyoda said, "By the time of the Saipan operation, the greatest hindrance to the drafting of the operations plans was the fact that we did not have sufficient tankers to support it."¹⁴

Producing facilities in the Indies were also struck by American forces. Balikpapan was the prime target. Despite the shipping difficulties, about 90 percent of the oil consumed in Japan itself, by then 74,000 barrels a day, was coming from Borneo's fields and refineries. U.S. Fifth Air Force B-24 bombers first raided Balikpapan in August 1943. By 1944, the missions were routine. In a further effort to stop the flow of oil out of Balikpapan, B-24s dropped mines in the port's channel waters. Royal Australian Air Force Consolidated PBV Catalina flying boats out of Darwin joined the operation. At the end of 1944, Balikpapan was shut down by the Japanese, the most damaging admission that they had lost the Battle of the Marus.

As successful Allied island-hopping tightened the noose around Japan, new bases permitted more concerted attacks over shorter distances. Once Makin was taken, for example, short-range fighter-bombers were able to strafe and dive-bomb oil facilities on Jaluit, the largest of the Marshall Islands and once a prime supplier to Japanese ships. Rear Admiral Akira Matsuzaki, chief of staff of the *Southern Expeditionary Fleet* felt that beginning in 1944, "the destruction of tankers and the delay in oil shipments was particularly serious."

To hasten the reconquest of Burma, U.S. aircraft concentrated on Yenangyaung. On 2 January 1944, the oil facility, which provided all the fuel for Japanese air operations in Burma and for the fleet in the Bay of Bengal, was hit by 56 planes. The following day, another 48 planes blasted the refinery and

¹⁴ U.S. Strategic Bombing Survey, *Oil in Japan's War*, 53.

oil tanks. Although fighting in the area continued for several months, the fuel losses at Yenangyaung hastened the crossing of the Irrawaddy River by the British and Indian troops to retake the oil center.

Wherever the Japanese turned, they saw their oil gains disappearing under the seas, burning in dwindling numbers of storage tanks, or shut-in because no transportation was available. Fuel crisis after crisis buried Imperial forces in defeat, and emergency measures to correct the problem were of little avail.

In a frantic effort to solve the fuel-supply problem, cargo ships and freighters of every size were rushed into service hauling oil. Even fishing vessels were diverted. Drums filled decks and holds. Those ships with containers lashed topside were vulnerable to any shell hit, sparking explosions and fires during attacks. Tankers that still sailed were overloaded beyond safety margins. Oil-burning ships were taken off routes where coal was available, mostly in home waters and in shipping between Japan and Korea and Manchuria, and were replaced by coal-fired vessels. In 1944, Japanese officials decided to build smaller tankers in the belief they would be able to sneak through the Allied naval and air gauntlet.

A most ingenious scheme was employed in bringing oil from the East Indies to Singapore. Enormous rubber bags that held up to 500 barrels of oil were towed by tugs. The procedure had to be abandoned when aviation gasoline, which constituted the bulk of the loads, reacted chemically and eroded the rubber. Even oil that made it to Singapore could be unloaded only with extreme difficulty.

The tankers and other types of ships still left to haul oil began taking longer but safer routes, which led to costly delays in getting oil to distant outposts. No route, however circuitous, was secure. Tankers started to sail only at night, hugging coasts when possible and seeking havens for daylight protection. When a modicum of air support was available, the convoys sailed only during daylight hours.

Back in Tokyo, Admiral Wenneker had watched the destruction of Japanese shipping with dismay even though he and the German naval ministry had been right in urging the Imperial Japanese Navy to change its strategy. By 1944, his tour of duty changed. He was designated commander in chief

of German naval forces in the Indian and Pacific oceans. It was a small force to be commanded by an officer of such high rank, but it put Wenneker in a better position to coordinate Axis naval activities in the Pacific theater.

Also under him were three merchant raiders that operated in Asian waters. One of these was the *Atlantis*, which seized the Norwegian tanker *Ole Jacob*. It was Wenneker who arranged to exchange the aviation fuel on board *Ole Jacob* with the Japanese for bunker fuel for his German ships.

On another occasion, Wenneker persuaded the naval ministry to send a German U-boat to Kure where it might serve as a model for Japanese submarine construction. To Wenneker's disappointment, the Japanese thought it too complicated to build. He later arranged for a Japanese crew to train on Nazi U-boats operating in the North Atlantic, but all were killed while attempting to return to Japan by submarine.

Initially, the Japanese obligingly refueled German U-boats in Singapore. But as the oil situation deteriorated, Wenneker was informed that special conditions would be imposed. U-boats calling at Singapore were required to carry oil to Japan as a prerequisite for further deliveries. Fully loaded submarines sailed to Kobe, where whatever fuel remained was pumped out of their tanks. Sufficient supplies were then put on board for the return trip to Singapore, including markedly inferior fuel. U-boat captains complained to Wenneker that they sailed in constant dread that the low-grade diesel would foul their engines. Since many Japanese submarines were lost or simply unaccounted for while on combat patrols without precise knowledge of their difficulties, it is not known if poor quality fuel ultimately did lead to operation disasters. The U-boat skippers were equally concerned that the Japanese estimates of the fuel required for passage to Singapore would be insufficient, leaving them stranded in unsafe waters.

Admiral Wenneker pleaded for a better system. As with most of his concerns in Japan during the course of the war, his arguments fell on deaf ears.

CHAPTER 13



THE DEFEAT OF ROMMEL

The outcome of the battle will depend upon the delivery of this fuel at the proper time.

**~ Field Marshal Erwin Rommel, 27 August 1942,
prior to the Battle of Alam Haifa**

You can begin the battle, Field Marshal, the fuel is already on the way.

**~ Marshal of Italy Ugo Cavallero, 27 August 1942,
prior to the Battle of Alam Haifa**

Draw a straight line from the southern tip of Sicily to the Libyan port of Tripoli, and it will almost bisect Malta. The island, with its soft, warm winds of spring and fall and a hot summer sun that boils the blood, lies nearly one-quarter of the way along that line. It sits astride the main shipping lanes of the Mediterranean, from Gibraltar to Suez, from Europe to North Africa. During World War II, Malta's strategic location gave its possessor an incalculable advantage. Its air bases and ship docks provided offensive strength and defensive cover over the central Mediterranean. Planes and ships from Malta easily reached the coasts of two continents. The fortunes of war turned on Malta. The fate of Rommel's *Afrika Korps* was inversely proportional to Britain's ability to hold and use the island.

For two years after Hitler invaded Poland, he and Mussolini held the upper hand in the Mediterranean. Their siege of strategic Malta began on 10 January 1941, and in the next year and a half they battered and bloodied the island and the ships trying to reach it. It was an epic fight, both of nerves and

military forces, and although primarily a British show, the outcome was very much an Allied concern until the Mediterranean was a safe Allied waterway.

"The idea was to keep it in our [Allied] hands so we could control to the extent possible that part of the Mediterranean," said retired Army lieutenant general Russell L. Vittrup, who early in the war as a lieutenant colonel served as an assistant secretary to the American and British Combined Chiefs of Staff. Vittrup recalled that Malta was a worrisome item on the agenda because supplying the island and its garrison was a hazardous and expensive operation.¹

"Malta was just off the heel of Italy," said Vittrup in describing the Axis advantage. "For them, it was like shooting fish in a rain barrel as far as our surface traffic was concerned."²

But Hitler and Mussolini never brought Malta to its knees. Almost, but not quite. Month after month, the beleaguered island survived repeated air attacks. For a protracted time, the threat of an invasion hung over Malta, creating daily apprehension and fear. But the landings never came, and to this day it is puzzling why Hitler chose to invade the island of Crete farther east rather than Malta. Malta would have been easier. It does not have Crete's rugged terrain, and it is smaller. Crete, unlike Malta, was never of strategic importance. Hitler did, however, almost starve Malta with his air attacks and interdiction of supply ships. Finally, with its survival as an Allied base hanging by a thread, the British mounted Operation Pedestal (August 1942), by far the largest wartime convoy dispatched to Malta; its escort, in turn, was the most powerful ever provided for the run.

The 14 merchant ships of Operation Pedestal included the SS *Ohio* (1940), an American tanker manned by British officers and crew, which was filled to capacity with 15,000 tons of sorely needed oil.³ The merchant ships rendezvoused off the River Clyde in the British Isles on 3 August 1942, and a week

¹ Interview with LGen Russel L. Vittrup, USA (Ret), Alexandria, VA, November 1985, hereafter Vittrup interview.

² Vittrup interview.

³ Joseph Attard, *The Battle of Malta* (London: Hamlyn Paperbacks, 1982). Additional information on the siege of Malta can be found in Stephen W. Roskill, *White Ensign: The British Navy at War, 1939–1945* (Annapolis, MD: Naval Institute Press, 1960).

later, escorted by 4 aircraft carriers, 2 battleships, 7 cruisers, and 24 destroyers, they slipped through the Strait of Gibraltar in a thick fog.

The first enemy contact came on 11 August as the convoy chopped through the waters of the western Mediterranean. Several air attacks were beaten off, but the old carrier HMS *Eagle* (56) was sunk by a German U-boat. The next day, when the ships came within range of Axis-controlled Sardinian airfields, an all-out enemy effort began. By nightfall, two carriers, HMS *Victorious* (R 38) and HMS *Indomitable* (92), had been damaged by air attacks, and three ships, including the *Ohio*, had each taken one torpedo from German or Italian submarines. Next, enemy aircraft sank two merchant ships. Hugging the Tunisian coast in the early hours of 13 August, four more merchant ships were sunk by torpedoes fired from enemy motor torpedo boats. As Vittrup said, it was like shooting fish in a rain barrel.

The convoy, out of formation and in disarray but still moving toward Malta, was now within range of enemy forces from Sicily and Pantelleria. During a heavy dive-bomber attack, a Stuka manned by an Italian crew crashed into the *Ohio*. Still out of range of protective covering by British Supermarine Spitfires from Malta, the tanker dropped farther back, limping and exposed. Meanwhile, another merchant ship was sunk, and additional ships were severely damaged.

One by one, the convoy's ships were losing the battle to stay afloat. The dwindling number of survivors never lost sight of their ultimate goal of reaching Malta, however. Despite the pounding, they continued to steam toward the island, and on the afternoon of 13 August, three merchant ships entered the safety of Malta's Grand Harbour to cheering crowds, and later that evening, a fourth, the MV *Brisbane Star*, straggled into port, damaged but proud.

At sea, the drama continued. The *Ohio* was hit again at dusk in still another air attack. Italian records indicate the attacking planes thought the tanker was an aircraft carrier and that it was probably sunk. It is difficult to understand how the *Ohio*, except for the grace of God, stayed afloat. Filled to the brim with flammable oil, it had been torpedoed and hit by five bombs and a crashing plane. Its steering gear was smashed, and it was afire. Totally disabled and decks awash, it was kept afloat by two cables held fast on port and

starboard by the destroyers HMS *Penn* (G 77) and HMS *Bramham* (L 51). Axis forces had only to pounce on it again to sink it.

With the jaws of their crews champing for the kill, four Italian cruisers, eight destroyers, and several Italian CANT Z.501 Gabbiano antisubmarine seaplanes emerged from the Lipari Islands and headed south through the Strait of Messina toward the helpless oiler. Nothing stood in their way except the British submarine HMS *Unbroken* (P 42). On the impulse of its captain, Lieutenant Commander Alastair C. G. Mars, *Unbroken* had moved from its assigned position off the Cape of Milazzo to the deep waters of the Lipari Islands. It was a capricious act, bordering on insubordination on the part of Mars, but it was also a bit of divine guidance. The *Unbroken* intercepted the Italians and severely damaged two cruisers. Ordinarily, the rest of the Italian force would have been expected to speed on, but in a stroke of fate and bad judgment the Italian commander stopped their entire force for eight hours to chase the British submarine. It was just enough time for the *Ohio*, barely afloat, to slip into Grand Harbour with its oil and save Malta for the Allies.

Had Malta been neutralized by the Axis in 1941, Rommel might have driven to the Nile. Instead, the Germans and Italians lost more than a quarter million tons of North African convoy shipping during the last six months of that year. Ninety percent of the losses were on loaded southbound traffic out of Italy. More than one-half the losses were inflicted by British aircraft, the overwhelming majority of them based on Malta. Island-based warships also contributed mightily to the destruction of the Axis convoys, easily intercepting the slower merchantships from the proximity of Grand Harbour, where they could be refueled and replenished.

Rommel's fortunes were reversed in early 1942, and when he was in a position to hurl his panzers against the British, Malta again played a pivotal role. At the beginning of the year, the *Afrika Korps* had ended its retreat at Brega (a.k.a. Marsa al-Brega), deep inside Libya. Now, it was ready to advance again. The British, like the Germans, had outrun their supplies along an extended coastal route and were drained of materiel to push Rommel farther back. At the same time, Japan's entry into the war and its early lightning victories forced the British to transfer part of their North African force to

Southeast Asia. And Malta, most importantly, was hobbled as a base because of its supply shortages.

Hitler sent 26 U-boats into the Mediterranean, declaring it a decisive sphere toward determining the outcome of the war. An entire Luftwaffe air fleet was pulled out of Russia and sent to Sicily. Soon, 600 German fighters and bombers would command the skies over the crucial sea lanes. But the struggle for supremacy in the central Mediterranean “reached its climax with the attempted elimination of Malta as a British naval and air base. There was no alternative: Either Malta must fall or the German Afrika Korps was lost.”⁴

With Malta’s airfields and harbor installations pounded mercilessly by the Sicily-based Luftwaffe, Axis convoys were reaching Tripoli intact from late December 1941 through February 1942. In January, fuel-starved German air units in North Africa received 16,000 barrels of aviation gasoline and were able to resume normal operations in support of Rommel’s panzers. Tanks were also being refueled regularly as cargo vessels of all kinds made their way safely into the Libyan port. Rommel’s chief of staff, Colonel Fritz Bayerlein, described the steady flow of fuel and other supplies as comparable to “a victory in battle.”⁵

On 21 January, the Desert Fox was ready to roll again. Three German columns began advancing eastward under a canopy of fighter protection. Rommel’s forward progress and sufficient supply situation were directly related to the freedom enjoyed by the growing number of Axis convoys to North Africa, which in turn was proportional to the effective neutralization of Malta.

The *Afrika Korps* raced across the Libyan desert with the kind of boldness and *éclat* that would make Rommel a legend. Some unit commanders, characteristically, moved faster than their supply columns:

⁴ Cajus Bekker, *Hitler’s Naval War*, trans. Frank Ziegler (Garden City, NY: Doubleday, 1974), 249–52.

⁵ B. H. Liddell Hart, ed., *The Rommel Papers* (Cambridge, MA: Da Capo Press, 1982), 180.

We were not entirely happy about our fuel position. Yet one young officer, who said to Rommel, “Herr General, we need more fuel,” received the brisk answer, “Well, go and get it from the British.”⁶

That is just what the Germans did. The *15th Panzer Division* captured the British supply depot at Msus (a.k.a. Zāwiyat Masūs) after a quick 24-km-per-hour advance across the desert. The tanks filled up with fuel as they had done a year earlier when the *15th Panzer* first overran Msus. This time there was less booty, but every ounce helped. By the end of January, Rommel had retaken Benghazi with its huge British supply cache, including enough fuel to keep his panzers filled for days. The British, meanwhile, retreated to a line west of Tobruk.

Rommel enjoyed the luxury of his captured fuel supplies. He now had 10 divisions, 3 German and 7 Italian, one-half of which were armored or mechanized. The force required 100,000 tons of supplies each month. Fuel needs were estimated at one-third of that amount, or about 250,000 barrels, approximately 5 percent of all the oil, crude and synthetic, available to Hitler at the time.

Despite the captured stock and recent deliveries, Rommel remained cautious. His forces continued to scrimp, knowing that fuel from home was also uncertain. Trucks to deliver the gasoline from the supply hubs of Tripoli and Benghazi were also short of needs, and Rommel asked for 8,000 additional heavy-duty vehicles to travel the delivery routes from the two ports. He was bluntly turned down by the German High Command, which informed him there were only 14,000 trucks to service the entire Nazi force on the Russian front.

If expectations and demands exceeded deliveries, it was because fuel and other material, like the trucks, simply were not available and not because Axis convoys were not reaching North Africa safely. In March 1942, 93 percent of the cargoes reached Axis ports. The figure climbed to 99 percent the following month as convoys sailed virtually unmolested.

⁶ Heinz W. Schmidt, *With Rommel in the Desert* (London: George C. Harrap, 1951), 125–26.

General Albert Kesselring's *Second Air Fleet* pounded Malta, assuring Axis ships safe passage. Two thousand tons of bombs rained down on the island in March, another 7,000 in April. The tonnage was greater than had been unleashed against all of Britain at the height of the German air offensive in September 1940. By the end of April, the Luftwaffe could claim, "the naval and air bases of Malta were put completely out of action." Indeed, "Malta's air fields had been reduced to deserts, the quays and dockyards to wreckage and the warships driven out."⁷

The British tried to ship 26,000 tons of supplies from Alexandria to Malta in March. Only 5,000 reached Malta, barely enough to permit a breath of life. Malta was ripe for the taking, and German officers pressed for its capture. As Vice Admiral Kurt Assmann, chief of the German Naval Historical Department, later said, "Had the Italians been Japanese they would have opened their war on the 10th of June, 1940, by doing a Pearl Harbor on Malta, which at the time was merely a defense base."⁸ Propitious opportunities presented themselves again in 1941, and seizure of the island in 1942 was never more inviting.

The German naval staff urgently called for the "final elimination" of Malta that spring. Proposals for a combined sea and air assault were prepared and readied for execution. Italy's top officers pleaded for such an operation, but they eventually provided a rationale for a fatal delay.

Italy's military commanders convinced Mussolini that it would take three months to make the necessary preparations for taking the island. That would have meant mounting the invasion sometime in late summer or early fall. Hitler, focusing on the more immediate successes in North Africa and Russia, agreed to the delay. What made the delay exasperating to advocates of the action was that Hitler and Mussolini had properly agreed on an invasion. At a meeting in Berchtesgaden, Germany, in late April, the Axis leaders laid out the following:

⁷ Cajus Bekker, *The Luftwaffe War Diaries: The German Air Force in World War II*, trans. Frank Ziegler (Garden City, NY: Doubleday, 1968), 239.

⁸ Paul Carell, *The Foxes of the Desert*, trans. Mervyn Savill (New York: E. P. Dutton, 1960), 108–9.

First, armored forces in North Africa to open attack with effect from end of May 1942. After capture of Tobruk, halt to be made on Egyptian frontier. Second, landing on Malta (code named HERCULES) to be carried out in mid-July or at latest August 1942, with objective to safeguard supplies for further offensive by Rommel to Cairo and the Suez Canal.⁹

By the end of May, Rommel was ready for his “decisive” offensive. His supply situation had never been better. From February until May, fuel was stockpiled as tankers unloaded a daily average of 17,000 barrels, more than double the normal day’s combat requirement. His mechanized forces, spearheaded by 560 tanks, would start off with reserves expected to last several weeks. Even the expanded Luftwaffe would go into battle fully supplied and with the expectation of sufficient refueling during intensive combat. More than 25,000 barrels of aviation fuel had been motored to the most advanced forward bases. With no concern about fuel, and a better than two-to-one numerical superiority over the British, the Germans expected to command the skies over the desert.

Panzer Army Africa attacked on 26 May from positions below the southern tip of the Gulf of Sidra. The entire front erupted in an assault of wheeling armor as swastika-marked planes swept low in murderous runs against Allied positions.

The immediate objective was to break through the Gazala and Bir Hakeim defenses and race to Tobruk. Rommel’s orders were to advance as far as the Egyptian border, if possible, but to terminate all operations in any event by 20 June. The stipulated date was to accommodate the Luftwaffe so that its planes could be redeployed for the capture of Malta.

Tobruk fell on 21 June with Rommel’s forces less than a 160 km from the Egyptian frontier. Although not matching Berlin’s earlier optimistic projection for penetration, the panzers plunged ahead. No one seemed concerned that the orders for halting on 20 June were being ignored. Rommel was directed to push on to Cairo as fast as possible, which suited him.

⁹ Bekker, *Hitler’s Naval War*, 253.

The Berchtesgaden plan had been overtaken by events. Rommel's panzers were advancing rapidly at the same time Field Marshal Wilhelm List's *Army Group A* in the Soviet Union was knifing through the Crimea, and capture of the Caucasian oil fields seemed likely. The linkup of the two German generals from opposite directions seemed attainable.

An exuberant Hitler now placed the Middle East at a priority level he had never accorded the region before. It became increasingly a key component of a global strategy culminating with the Third Reich holding power on three continents. The Nazi leader became inordinately enthusiastic about Rommel's chances of achieving a breakthrough to Baghdad itself. Hitler declared, "Destiny has offered us a chance which will never occur twice in the same theater of war."¹⁰

Though concerned about keeping his convoy pipeline moving, Rommel had no wish to halt at the Egyptian border and wait for Malta to fall. He, of course, was the most convincing of the proponents of an all-out drive. He felt, as Hitler did, the time was ripe. The British Eighth Army was weak and reeling. German supplies were seemingly adequate.

Rommel wrote: "I knew that the fall of Tobruk and the collapse of the Eighth Army was the one moment in the African war when the road to Alexandria lay open and virtually undefended and my staff and I would have been fools not to have gone all out to seize this unique opportunity."¹¹

General Kesselring, who was now the overall Mediterranean theater commander, argued for the invasion of Malta first, but he lost the decision to Hitler.¹² Hitler's resolution to permit Rommel to break for the Nile before Malta was under Axis domination was a major blunder. The German chance to take the strategic island never came again. Eight weeks later, Operation Pedestal

¹⁰ Howard M. Sachar, *Europe Leaves the Middle East, 1936–1954* (New York: Knopf, 1972), 246.

¹¹ Liddell Hart, *The Rommel Papers*, 261.

¹² The primary sources for the Malta decisions are Frederick W. von Mellenthin, *Panzer Battles: A Study of the Employment of Armor in the Second World War*, trans. H. Betzler (Norman: University of Oklahoma Press, 1956); and Walter Warlimont, "The Decision in the Mediterranean," in Hans-Adolf Jacobsen and Jürgen Rohwer, eds., *Decisive Battles of World War II: The German View*, trans. Edward Fitzgerald (New York: Putnam, 1965).

broke the Axis blockade forever, and signs of an impending Axis supply disaster were already percolating in the desert of North Africa.

It was not Rommel's tanks but the aircraft of the Luftwaffe that first experienced fuel shortages. The initial thrust to Tobruk saw German fighters and dive bombers flying up to 350 sorties daily in support of the ground forces. That kind of operational position could not be sustained: "The heavy and prolonged scale of effort during the initial three weeks had resulted in a consumption [of fuel] far greater than had been anticipated. The first result of this was that by June 15th the prospect of an exhaustion of supplies before the end of that month had become imminent."¹³

Foregoing the kind of air support he had enjoyed to reach Tobruk, Rommel pressed eastward. Even though 12,000 barrels of fuel were captured from the British when Tobruk fell, Rommel exposed himself to the same fuel shortages that had crippled the Luftwaffe.

Already, farther back in the supply line, the Italians no longer had enough fuel for their ships hauling oil across the Mediterranean. In June, the Italians had only enough fuel for one in three ships used on the supply routes and, in any event, there was not enough fuel in continental storage tanks to load aboard idled ships and tankers.

The first slowdown of the panzers came on 24 June when Rommel was advancing with a column of the *90th Light Division*.¹⁴ Hardest hit that day was the *15th Panzer Division*, which had to halt when it expended all its fuel. The following day, tank commanders were able to continue the action with captured British supplies, but units increasingly reported depleted fuel conditions. Two days later, the *21st* and *15th Panzer Divisions* were reduced to 8,000 barrels between them. That meant the bulk of the German armor would be completely dry within two days.¹⁵

¹³ Cyril March, ed., *The Rise and Fall of the German Air Force, 1933–1945* (London: Royal Air Force Historical Branch, Her Majesty's Stationery Office, 1948; repr. New York: St. Martin's Press, 1983).

¹⁴ Liddell Hart, *The Rommel Papers*, 235.

¹⁵ Denis Richards and Hilary St. George Saunders, *The Royal Air Force, 1939–45*, vol. 2, *The Fight Avails* (London: Her Majesty's Stationary Office, 1954), 213.

From this point in the North African campaign, “fuel supplies were the vital factor.”¹⁶ Kesselring remarked that he was reduced to acting as a mere supply officer. Although unappreciated by Rommel, Kesselring was an energetic cutter of red tape to get the panzers the fuel they required. Although he may have been guilty of “criminal optimism,” as many German officers charged after the war, Kesselring’s promises of fuel that was never delivered were the result of fuel shortages endemic by now through all of the Axis theaters of operation. Promises to Kesselring were themselves unfulfilled, and the entire Mediterranean chain of command was hanging on hope.

Fuel-supply problems were nearly insuperable. July was the month of impending disaster for Rommel. According to his chief of staff, Colonel Bayerlein, the “flow of supplies from across the Mediterranean diminished to an average total of 6,000 tons a month, or approximately one-fifth of our normal requirements. Three-quarters of the supply ships that set out were sunk by the Royal Air Force or the Royal Navy.”¹⁷

Failure to capture Malta caused the heavy shipping losses. With the success of Operation Pedestal, the British were able to step up their attacks on Axis convoys, and by late August they had destroyed 20,000 of the 71,000 tons of supplies destined for North Africa. Rommel’s forces, meanwhile, were using twice as much fuel as was being delivered, and only a complete drawdown of reserves and captured stocks kept their tanks moving.

Rommel estimated his gasoline needs for August at 255,000 barrels. He had only 68,000 at the beginning of the month. Sharp reductions in operations stretched the supplies, but the situation remained precarious. In the four-day Battle of Alam al-Halfa at the end of the month, three German panzer divisions consumed 85,000 barrels. The Desert Fox had to call off the attack in early September when advised that each of his units was reduced to a single “fuel unit,” the amount necessary to advance 100 km under normal conditions—and far less in the desert.

¹⁶ March, *The Rise and Fall of the German Air Force*, 143.

¹⁷ Carell, *The Foxes of the Desert*, 98.

It was the beginning of the end for Rommel. He called his supply situation “disastrous.” Kesselring concurred but heaped blame on Rommel. He called Rommel a “lout” for wasting precious fuel without achieving positive results. Still, Kesselring promised additional fuel supplies, including more deliveries to Tobruk, and should the ships be sunk en route, he made plans to fly in 4,000 barrels daily. Italian marshal Ugo Cavallero also kept promising new tanker deliveries, telling Rommel that the oil carriers would be protected by heavy escorts.

As a result, shipments were increased in September and October, but Rommel never again was to receive enough fuel to sustain offensive operations. As Rommel wrote after Alam al-Haifa: “We were permanently short of fuel.”¹⁸

Rommel oversimplified the reasons for his supply difficulties. He appreciated only the fact that his offensive bogged down when fuel was no longer available, and he instinctively lashed out at his superiors. “If success depended, as in times gone by, on the strength and will of my men and their officers, then we would have overrun Alamein,” he wrote. “But our sources of supply had dried up—thanks to the idleness and muddle of the supply authorities on the mainland.”¹⁹

Rommel began the crucial fight at El Alamein hopelessly ill-supplied. His panzers had only three “fuel units,” or one-tenth of what he felt was minimal. This apportioning of fuel per vehicle was the more distressing since the gasoline was actually spread throughout the theater, much of it at rear depots with no certainty that the material would ever reach the front along the perilous route of supply.

In addition, Alexandria, Rommel’s objective, was 89 km beyond the front along an indirect and obstructed line. By now, supplies of fuel were received at Tobruk on a sporadic basis, and the 531-km rail line from the small port to a point closest to El Alamein was flooded. Engines were also in short supply, and temporary breakdowns became permanently disabling handicaps. Only a

¹⁸ Liddell Hart, *The Rommel Papers*, 298.

¹⁹ *Congressional Record: Proceedings and Debates of the 83rd Congress, 1st Session*, vol. 99, pt. 11 (Washington, DC: Government Printing Office, 1953), A3429.

Map 13. Axis supply routes to North Africa



Courtesy of William Morrow, adapted by MCUP

trickle of fuel was being forwarded to the front by trucks constantly under attack from Allied aircraft.

Admiral Eberhard Weichold, who served as the German naval liaison officer with the Italians, stated: "If insufficient supplies reached the front, this was due above all to the deficiencies in the motor transport system of the Afrika Korps, a service which had been the weak point in the Korps' organization from the beginning. With the development of land supply routes now extraordinarily long, such a deficiency was graver than ever."²⁰

²⁰ Marc' Antonio Bragadin, *The Italian Navy in World War II*, trans. Gale Hoffman (Annapolis, MD: Naval Institute Press, 1957), 198.

Rommel's land transport predicament was eased somewhat by the capture of British trucks. Through the summer, up to 85 percent of the vehicles supplying the Axis forces were taken from the Allies. When the large amount of fuel and other supplies captured from the British are taken into account, the *Afrika Korps* can truly be said to have been a scavenger force.

Rommel's combat needs were then about 9,000 barrels a day. From July through October, his forces received an average of only 6,400 barrels. The amount was almost identical to the pre-Tobruk deliveries, but the period from February through June was one of consolidation and was devoid of large force movement. Once combat began in earnest, stockpiled supplies were consumed quickly. Shortly before the Second Battle of El Alamein (23 October–11 November 1942) began, a limited amount of fuel remained in Benghazi, but there was no way to transport it to Rommel's tanks.

Because fuel only trickled in on the depleted supply chain, it is easy to conclude the fault lay in his final transport segment, as Admiral Weichold insisted. That conclusion overlooks more basic factors.

When Italy entered the war, it possessed 1.75 million tons of shipping in the Mediterranean. By the end of 1942, 72 percent had been sunk. Even though the Germans added tonnage, and a few new ships were constructed, the Axis ended up with a net loss of a quarter of its original cargo fleet. The actual need was for approximately 3 million tons to maintain a continuous flow of supplies to Italian and German forces in North Africa. Shipping available to the Axis was thus about half of the actual requirements. Italian Navy ships hauled fuel as cargo, but Italian men-of-war themselves were rendered immobile because of a lack of fuel to power them. Two cruisers and a destroyer squadron, in a notable example, were stranded in Tripoli in late June because their fuel tanks were empty. Similar shortages began forcing more and more ships to stay in port.²¹

None of Italy's battleships engaged in combat operations after June. It reached a point where the Italian Navy "had to base its every movement, not

²¹ Frederick William Deakin, *The Brutal Friendship: Mussolini, Hitler, and the Fall of Italian Fascism* (London: Weindenfeld and Nicolson, 1962), 22.

on the situation at sea nor on its operational capacities as to ships and fire-power, but rather on day-to-day availability of fuel.”²²

Many of the convoys to Libya during the summer fighting were fueled with oil pumped out of the near-empty tanks of the men-of-war. “The life’s blood of the combat ships was the only remaining source of fuel oil for the supply ships.”²³

The Germans and Romanians, from whom the Italians received their oil, delivered 1 million barrels of fuel oil to the Italians in late June and early July. That exhausted the remaining reserves available to the Axis anywhere. It was nonetheless a life-extending injection. A postwar British study, based on German documents and interviews with top-level Axis officers, made this significant observation: “It was now that the failure to eliminate Malta earlier in the year began to reveal its consequences, and the absence of any further air assault on the island during this period enabled effective use to be made of British air and naval forces against the Axis sea routes, resulting in very heavy shipping losses.”²⁴

In the first seven months of 1942 in the Mediterranean, the Axis lost 90 ships comprising 175,000 tons compared with 174 totaling 320,000 tons during August and September. Ultra intercepts proved invaluable. No Libya-bound ship left port without the British knowing. Royal Air Force (RAF) scout planes would be sent to intercept points and supposedly “discover” Italian and German ships in order to provide a logical reason for sinkings occurring with almost routine predictability. Late August and early September marked a period of maximum destruction. Eight tankers and a cargo ship carrying fuel in containers were lost in eight days. Six were sunk by Malta-based aircraft.

News of the sinkings plunged Axis leaders into despair. When informed of the loss of two of the tankers, Italian foreign minister Galeazzo Ciano wrote in his diary, “Rommel is halted in Egypt because of a lack of fuel.”²⁵

²² Bragadin, *The Italian Navy in World War II*, 194.

²³ Bragadin, *The Italian Navy in World War II*, 192.

²⁴ March, *The Rise and Fall of the German Air Force*, 143.

²⁵ Richards and Saunders, *The Fight Avails*, 230.

Hitler, as was his wont in the solution of problems, believed he could rely on a miraculous craft to supply Rommel. He promised the Desert Fox a fleet of "Siebel ferries," a vessel supposedly immune to aerial or surface attack.²⁶ That this was another führer fantasy, another empty promise, was inescapable to Rommel.²⁷

Rommel advised the German High Command that his minimum supply needs would be 30,000 tons in September and 35,000 in October. He stated categorically, "It would only be possible to guarantee a successful defense if these requirements were met."²⁸ They were not. By 17 October, Rommel's forces had only a nine-day supply of fuel. The hand-to-mouth existence continued. Although Rommel pushed his panzers as far as possible, he realized the situation was hopeless.²⁹

Rommel tried to secure additional supplies by demanding that all submarines and destroyers in the Italian Navy be pressed into service as transports for fuel and ammunition.³⁰ All available ships and auxiliaries were mobilized to provide emergency relief for Rommel, but 44 percent of the fuel and other cargo shipped to him in October was sunk. Two-thirds of the tonnage lost was fuel. Most ships that survived discharged their cargoes at Benghazi, where there was little hope of forwarding the material 965 km to the front since any Axis movement along the coast by truck or train was likely to be intercepted by Allied planes.

Even though the Luftwaffe had 290 planes (mostly fighters and dive bombers) based in Egypt at the time, there was practically no aviation fuel. Colonel Bayerlein observed, "The shortage of fuel for our tanks and the crushing superiority of the Royal Air Force ruled out the possibility of winning such a battle." General Wilhelm Josef Ritter von Thoma, who temporarily replaced Rommel as Axis commander in North Africa just before the big

²⁶ The term *Siebel ferry* refers to a shallow-draft catamaran landing craft operated by Germany's Wehrmacht.

²⁷ Carell, *The Foxes of the Desert*, 102.

²⁸ Ronald Lewin, *Rommel as Military Commander* (New York: Ballantine, 1970), 207.

²⁹ Lewin, *Rommel as Military Commander*, 207.

³⁰ Carell, *The Foxes of the Desert*, 108.

British advance, said, “Only limited movement and only local counterattacks by our panzer units were permitted because of the fuel situation.”³¹

Similar curtailments were being experienced at exactly the same time by other German generals in Russia, which was regarded as the principal war zone. To sustain operations against the Soviets and fight the combined land, sea, and air war in the Mediterranean and North Africa was beyond the Axis reach, however fuel was allocated.

The Nazi scramble for crude oil and synthetics in 1942 was intense. More and more, the Axis suffered setbacks due to fuel shortages. New synthetic plants permitted the Germans to boost output of all ersatz fuels by 18 percent in 1942 over the previous year. Crude oil production could be raised only 7 percent, and the combined production in 1942 of 140,000 barrels a day was far below Hitler’s need and certainly not enough to supply Italy as well. Romania was expected to make up the difference, but it would no longer do so. Although Romanian crude production remained constant, 1942 exports to Germany and Italy slipped 17 percent below those of 1941 to 60,000 barrels a day from 80,000 as Romanian internal consumption rose. Though allied with Germany and Italy, Romanian leaders were unwilling to sacrifice their own supplies though the Nazis literally begged for oil.

This telegram from General Wilhelm Keitel to Romanian premier Ion Antonescu in October 1942 attests to the depth of concern:

In the name of the Führer I approach Your Excellency with a request for your personal intervention in the matter of accelerating as far as possible the delivery of the maximum quantity of fuel to the Italian fleet, which is absolutely essential to the latter for the continuance of military operations in the Mediterranean. The absence and lack of all means of transport for further operations have resulted in a critical situation in North Africa, and the transport of supplies depends entirely on the delivery of adequate quantities of fuel. I beg Your Excellency to increase to the maximum degree these deliveries of fuel to Italy which are exclusively reserved for supplying the fleet called

³¹ Carell, *The Foxes of the Desert*, 104.

upon to maintain important positions in the Mediterranean for the purpose of joint warfare.³²

Antonescu's reply was a curt no. He said Romania could spare no more oil, and he held out no hope its position would change. Hitler reproachfully told Antonescu when they met at Berchtesgaden months later that North Africa was lost "due to lack of oil supplies."³³

British general Bernard L. Montgomery was fully aware of his enemy's fuel plight when he drew up plans for the clash at El Alamein. He orchestrated the Eighth Army to deliver the knockout blow in late October 1943. First, however, as part of his deception, a fake pipeline was laid from Alexandria. The progress was purposely slow so that German reconnaissance aircraft could report how little was being laid and lead Axis officials to conclude another month would be necessary before the pipeline was finished. Rommel may have been lured into the trap, for he was in Germany pleading for more fuel from Hitler and his High Command when Montgomery attacked on 23 October.

Three days later, the outcome of the Second Battle of El Alamein may have been sealed. A vital Axis convoy consisting of the tanker *Proserpina* carrying 25,000 barrels of fuel and two general cargo ships with 12,000 barrels in containers approached Tobruk accompanied by four Italian destroyers. Although British aircraft attacked the convoy near Benghazi and again outside Derna, the ships made it to within sight of Tobruk by clinging to the coast. There, on the heights overlooking the bomb-scarred harbor, high German officers cheered when the ships approached, knowing survival of the Axis forces depended on the precious fuel aboard. At dusk, a flight of RAF Vickers Wellington bombers of the 201st Group Cairo roared over the convoy. As the Germans watched in stunned silence, bombs rained down on the cargo vessels. The larger merchant ship exploded in a ball of fire, sending debris over

³² International Military Tribunal, *Trial of the Major War Criminals before the International Military Tribunal, Nuremberg, 14 November 1945–1 October 1946*, vol. 7, *Proceedings*, 5 February 1946–19 February 1946 (Nuremberg, Germany, 1947), 324–25.

³³ Deakin, *The Brutal Friendship*, 138.

Figure 13. Gen Montgomery in North Africa



Gen Bernard L. Montgomery, commanding the British Eighth Army in Egypt, November 1942. Montgomery was fully aware of the Germans' fuel shortages throughout North Africa when he began the Second Battle of El Alamein on 23 October.
National Archives and Records Administration

the harbor approach and covering the convoy in dense black smoke. As the thick cloud dissipated, *Proserpina* could be seen blazing from stern to stern. The smaller cargo ships simply disappeared. The German officers witnessed “not merely the end of the convoy, but Rommel’s last hope for victory.”³⁴

³⁴ Richards and Saunders, *The Fight Avails*, 239–41.

Table 13. Axis sea shipments and losses to North Africa, 1942

	General cargo and fuel loads dispatched (in tons)	Ships sunk	Loads received (in tons)		Percent total cargo sunk
June	41,445	6	General cargo	26,759	22
			Fuel	5,568	
July	97,330	7	General cargo	67,590	6
			Fuel	23,901	
August	77,097	12	General cargo	29,155	33
			Fuel	22,500	
September	96,533	11	General cargo	46,165	20
			Fuel	31,061	
October	81,603	17	General cargo	33,390	44
			Fuel	12,308	
November	86,130	17	General cargo	42,005	26
			Fuel	21,731	
December	12,814	33	General cargo	4,903	52
			Fuel	2,058	

Basic data from F. H. Hinsley et. al, *British Intelligence in the Second World War*, vol. 2 (New York: Cambridge University Press, 1981), 422. Includes Italian and German merchant ships over 500 tons.
Courtesy of William Morrow, adapted by MCUP

As Rommel said after the Second Battle of El Alamein was lost, “We could attempt no operation with our remaining armor and motorized forces because of the fuel shortage; every drop that reached us had to be used for getting our troops out.”³⁵

³⁵ Liddell Hart, *The Rommel Papers*, 261.

CHAPTER 14

THE ALLIED OIL OFFENSIVE

The synthetic oil plants are the worst possible place they could hit us. With them stands or falls our very ability to fight this war. After all, if the synthetic fuel plants are effectively attacked, not only our aircraft but the tanks and submarines will also come to a standstill.

**~ Field Marshal Erhard Milch,
German director of air armament, 22 April 1943**

The raids of the Allied air fleets on the German fuel supply installations were the most important of the combined factors which brought about the collapse of Germany.

**~ General Adolf Galland, commander,
German fighter force**

There were 28 of them, none with a military background. Most were lawyers and scholars just starting their careers when the United States entered the war. Through quirk or circumstance, they found themselves holding the keys to Ultra, the Allies' most precious held secret. When the men were brought into the select circle of secrecy, they were informed they "would be shot at sunrise for divulging that secret."¹

British intelligence had been reading German radio traffic since 1939, plucking transmissions out of the air and deciphering the Enigma ma-

¹ Interview with Justice Lewis F. Powell Jr., 2 June 1985.

chine's codes with extraordinary benefit. In late 1943, American officers were brought in to share the secrets fully under the Ultra security classification. Each of the 28 American officers was first trained at Bletchley Park, Ultra's nerve center outside London. They learned how the intercepts were made and were instructed on the way the contents could be used without tipping off the Germans to the fact that their top code had been broken years earlier by the Poles and secretly passed on to British intelligence.

Lewis F. Powell Jr., was one of the handpicked few. Later, he would become a justice of the United States Supreme Court, but his job then was to be the Special Branch Ultra representative to the U.S. Strategic Air Forces. An Army Air Forces major, Powell digested and integrated Ultra material into daily intelligence guides for the American bombing effort in Europe.

Headquarters for the bomber force was in Bushy Park, a short distance from General Dwight D. Eisenhower's command center. The thousand-acre royal domain south of London was a public park in peacetime. In 1944, amid the towering chestnut and whitethorn trees squatted temporary military structures, heavily camouflaged and ringed by high fences. From these buildings flowed orders for the liberation of Europe.

In the days before D-Day, Bushy Park's pastoral serenity was totally obliterated in a frenzy of khaki. During mid-May, it was a new bomber offensive that was of greatest concern to Major General Carl A. Spaatz, commander of the U.S. Strategic Air Forces in Europe. His Boeing B-17 Flying Fortresses and Consolidated B-24 Liberators had tacitly launched an all-out drive against Germany's synthetic oil industry.

Each morning, Major (later Colonel) Powell rode his bicycle to Bushy Park from the private home of an elderly widower in Teddington, where he was billeted. Ultra's secrets, deciphered and translated in Hut 6 at Bletchley, awaited Powell when he arrived at Spaatz's headquarters. On the morning of 13 May 1944, an Ultra intercept came into Bushy Park that amply confirmed the wisdom of the oil offensive.

Powell said, "As soon as we started hitting the synthetic plants, we knew from ULTRA that they began moving flak batteries and repair people." That information was invaluable.

The key intercept had been sent the day before from the Luftwaffe operations staff in Berlin to Luftflotte 3 (Air Fleet 3), which was responsible for the defense of Nazi-occupied Europe:

1. In accordance with the above reference Luftflotten 1 and 6 were to give up to Luftflotte 3 a mixed flak detachment with a total of 5 heavy and 4 light or medium batteries. Their dispatch to Luftflotte 3 is canceled. The detachment will be placed at disposal of Luftflotte Reich to reinforce the flak protection of the hydrogenation plants. They will be brought up to and operated at Troglitz near Zeitz [Germany].
2. On arrival at their destination the detachment will be subordinated in every respect to Luftflotte Reich.
3. Accordingly, air staff QMG [quartermaster general] is requested to reroute the transports.
4. In order further to reinforce the hydrogenation plants the following forces [operating?] on the [protection of?] the air force arms industry have been released: 4 heavy flak batteries operating at Oschersleben, 2 operating at Wiener Neustadt, and 2 at Leipzig-Erla. These flak batteries are to be employed so that Politz [oil plant] is reinforced with 8 heavy batteries and Blechhammer [synthetic oil plant] with 2 further heavy flak batteries.
5. Luftflotte Reich will report arrival and readiness to fire the batteries in their operations locations.

To other than an intelligence officer, the information may have seemed of minor significance. But the 13 May intercept showed intense German concern with the air strikes against the synthetic fuel plants. To remove flak batteries from occupied Europe, which was expecting the Allied invasion momentarily, clearly indicated to Powell and others the severe damage Allied bombing was causing to the oil plants.

An American postwar study concluded that the Ultra intercept was “one of the most decisive and timely pieces of intelligence received in this war.”²

² U.S. Army Air Forces, *ULTRA and the History of the U.S. Army Air Force vs. the German Air Force*, repr. of report prepared 25 September 1945 (Frederick, MD: University Publications of America, 1980), 99.

Interpretation of the cable indicated that besides slowing synthetic fuel production, other sectors would suffer by the withdrawal of antiaircraft batteries, including two of the air armies operating in Russia; the fighter production centers at Oschersleben, Wiener Neustadt, and Leipzig-Erla; and others where weakened defenses might prove troublesome when the Allies made their landing on the continent.

German defense was given the highest priority and “ratified the assertions of the most ardent advocates of the oil program in terms of unquestionable authenticity. Henceforward oil attack became a vital if not a formal part of all American air activity, and the ensuing months were to see the Royal Air Force (RAF) itself join in the drive with significant contributions.”³

When Allied strategists broadly agreed on a campaign to destroy Germany’s synthetic oil sources in early 1944, it was a policy that the British had first formulated seven years before. In the intervening years, however, the RAF did not have the equipment for such precise bombing and consequently developed other tactics. The Americans were the first to develop and practice precision bombing, and the British eventually were able to undertake such missions. When the air offensive against synthetic oil facilities commenced in 1944, it was based on the premise first stated by the RAF in 1937 that the German oil plants were “extremely vulnerable targets” whose destruction “might well bring to a standstill the armed forces of Germany.”⁴

Until 1944, oil as a priority target was constantly reviewed. There were periods when it was elevated to the top of the list only to be dropped again to a lower level. Numerous reasons existed once the shooting began, chief among them more exigent demands for the bombers and the inability of the RAF to destroy the synthetic facilities efficiently and without incurring unacceptable losses. It was the U.S. Strategic Air Forces that finally pressed for and demonstrated the viability of such strikes when the British had given up on achieving what they had previously deemed so important to their war ef-

³ U.S. Army Air Forces, *ULTRA and the History of the U.S. Army Air Force vs. the German Air Force*, 98–99.

⁴ Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, 1939–1945*, vol. 1, *Preparation* (London: Her Majesty’s Stationary Office, 1961), 103–4.

fort. While RAF Bomber Command eventually joined in the oil bombing offensive, its persistent opposition to such attacks from 1942 on frustrated an effort that eventually shortened the war and saved countless lives. It is ironic that the British appreciated the strategic implications of cutting off Germany's synthetic supplies in its prewar planning and the early years of the conflict but Bomber Command balked at such operations in the following years to the detriment of the Allied effort. Frustration and self-deception were at the roots of the negative attitude that permeated Bomber Command's thinking. An originally sound policy failed because its basic validity was called into question when it could not be executed. That was Bomber Command's mistake. A review of how strategic bombing policy developed and eventually targeted oil facilities in Germany is important in understanding this notable phase of the war.

Britain's air war strategy if hostilities began was first outlined on 1 October 1937, when the Air Ministry accepted a master blueprint for action drawn up by the RAF. Called W. A. (Western Action) Plans, they spelled out objectives and targets to be carried out by various commands. The first definitive listing of priorities was issued the following year, with top priority going to destruction of the German armed forces and aircraft plants; military transportation; and "the German War Industry, including the supply of oil, with priority to that in the Ruhr, Rhineland and Saar."⁵

On the day before Germany invaded Poland, the British Cabinet approved overall bombing policy and strategy. Should war be declared, which it was two days later, the RAF was instructed to "attack those objectives, such as oil plants, which were most vital to the enemy effort, even if civilians suffered in the process. But if Germany confined her air offensive to purely military targets, our bombers would restrict their bombing."⁶

Restricted bombing was initially used by both sides. The first RAF bomber attack, on 4 September 1939, was directed against German naval bases in the North Sea. Nothing could have demonstrated more vividly the inadequa-

⁵ Webster and Frankland, *Preparation*, 94.

⁶ Denis Richards and Hilary St. George Saunders, *The Royal Air Force, 1939–45*, vol. 1, *The Fight at Odds* (London: Her Majesty's Stationary Office, 1953), 41–42.

cies of the crews, their aircraft, and their equipment. Of the 29 bombers sent out that day, only 8 reached their targets. Seven were shot down en route, 3 mistakenly attacked Royal Navy ships in the North Sea, 1 bombed the wrong country (Denmark), and 10 failed to locate their targets and returned home with bomb bays full.

Britain was not yet prepared to deliver bombs on distant targets with any degree of precision. This was a blow to the commander of the bomber force, Air Marshal Sir Charles Frederick Algernon Portal. He was an advocate of bombing oil targets, but it was apparent that the wish was beyond reality. Even when unrestricted aerial bombardment was begun by the two sides and oil targets became fair game, there was no practical way to attack them. Two immediate means were considered—give bombers full fighter protection, which eventually was to be the American solution, or bomb by night. Losses might be reduced by such methods, but neither contributed to finding a way to deliver bombs on target. A false feeling developed that heavy loads alone without precision drops would render enough damage to targets.

Distance to targets was also a restraint. In 1940, the RAF did not have fighters with a range capable of accompanying bombers on long missions, a problem identical to that faced by Germany during the Blitz. Night bombing was the only viable option open to Bomber Command. In June, therefore, new directives were issued for night attacks on Germany, with oil installations as primary targets. The Air Staff directed Portal to begin such raids, noting that “recent investigation has led to the conclusion that, if the immediate oil resources available to Germany can be reduced within the next two or three months by from 300,000 to 500,000 tons, the enemy’s position in August of this year should become extremely critical.”⁷

It was still assumed that pilots could find their oil targets at night with only the benefit of moonlight. In actual practice, few bombers ever reached the synthetic plants. Most aborted their missions and dropped bombs on al-

⁷ Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, 1939–1945*, vol. 4, *Annexes and Appendices* (London: Her Majesty’s Stationary Office, 1961), 113.

ternate targets. Locating the oil facilities was difficult at best. In the Ruhr, industrial smog was so common the job was particularly difficult.

Crews that thought they had dropped their bombs on oil targets tended to magnify results. Observed explosions and ground fires became exaggerated evidence of destruction. The crews were further misled by the German deception of lighting decoy fires at safe distances from the synthetic plants. Crews' hyperbolic reports led to erroneous conclusions on the efficacy of night bombing, and those conclusions were readily accepted.

Further concentrated attacks on the oil industry were planned when France fell and priorities changed. The prospect of a German invasion placed greater emphasis on attacking the Nazi aircraft industry and transportation to the French coast. Once the Battle of Britain was won and Hitler called off the projected cross-Channel attack, oil again went to the top of the priority list.

During the final three months of 1940, about 400 sorties were flown against synthetic oil plants. That was less than 10 percent of the total Bomber Command missions, since flights against them were still restricted to moonlit nights. Still, the British War Cabinet was told this effort was yielding enormous benefit. A December report stated that the oil raids had reduced Germany's synthetic production by 15 percent. In fact, production at the hydrogenation plants actually increased during the last half of 1940 to 43,000 barrels a day from 36,000, as revealed by German records.⁸

Clinging to erroneous data, the British believed they were on the verge of a strategic victory. By extrapolation, Bomber Command's missions and bomb loads could be increased to predictable levels of success. If 539 tons of bombs, the amount dropped on the synthetic plants from October to December, caused a 15 percent reduction in synthetic output, then a sevenfold increase in tonnage would totally destroy Germany's capacity to produce hydrogenated fuel. It seemed too good to be true, and it was.

⁸ U.S. Strategic Bombing Survey, *Oil Division Final Report* (Washington, DC: Government Printing Office, 1947), 88.

Orders for the knockout blow were issued on 15 January 1941. Bomber Command was told: "The sole primary aim of your bomber offensive, until further notice, should be the destruction of the German synthetic oil plants."

Particularly severe winter weather intervened immediately to make bombing runs more difficult. By the end of February, only 221 sorties were flown in the new effort against oil targets. That was half the number flown during the last three months of 1940 when synthetic plants were not the "sole" aim of Britain's strategic bombing force. Since economic warfare experts had calculated that 3,400 sorties would be necessary to cripple Germany's oil supplies, the campaign was fizzling.

It was also becoming apparent that previous claims of damage were grossly distorted. Aerial reconnaissance grew more sophisticated, and better evidence of actual destruction was available. One particular set of photographs revealed the limited results of a massive raid. Two synthetic plants at Gelsenkirchen, in the Ruhr valley, were attacked by 296 aircraft that dropped 253 tons of high-explosive bombs plus incendiaries. Photographic analysis showed neither plant suffered significant damage. Oil bombing was predicated on the belief that half the attacking aircraft would reach their targets and that a synthetic facility could be knocked out of action for four months if struck by two tons of bombs. The evidence of Gelsenkirchen was that too much faith was being placed in the navigational and bombardment skills of RAF crews.

Prime Minister Winston Churchill and his science advisor, Frederick Alexander Lindemann, Lord Cherwell, were among the first to doubt that bombers could deprive Germany of its strategic war-making potential. A special review was ordered, and 600 photographs taken on missions and all operational records were studied. The results were shattering. Only one-third of the aircraft dropped bombs within 8 km of their targets. Plants in the highly concentrated Ruhr industrial center were four times more difficult to locate than targets in other parts of the Reich. An undetermined but large percentage of bomb loads were dropped harmlessly in open country.

Also, the raids had been mostly of the short-range type directed primarily against targets located in the Ruhr valley petrochemical complex. The big synthetic plants around Leipzig, in Prussia, and in Poland remained safe from

repeated attacks because of their distant location and the vulnerability of the unescorted bombers to Luftwaffe fighter planes.

Oil was dropped as the top priority target, and Bomber Command diverted planes to the Battle of the Atlantic. British attempts to concentrate on Germany's oil supply ended. Costly efforts had gained little.

It was the appointment of Sir Arthur Travers Harris as the head of Bomber Command that sealed the switch in British strategy from designated targets to blanket area-wide destruction. Harris took over on 22 February 1942 and commanded the British bomber force until the end of the war, when he moved to South Africa. A strong-willed autocrat of firmly fixed opinions, Harris viewed raids against oil plants, ball-bearing factories, and the like as "panacea targets." On oil targets, he was specific: "We spent . . . the best part of a year in attempting to destroy Germany's synthetic petrol sources on the assurance that the German fuel situation was utterly precarious. On top of that assurance the Germans opened and waged the most extensive war of movement in Russia that the world has ever seen."⁹

Only after the United States joined the European bombing campaign was targeting of synthetic fuel plants revived as a desirable course of action, this time by the Americans. Formal agreement was reached in September 1942 that British planes would bomb Germany by night and U.S. planes would bomb by day. Four months later at the Casablanca Conference (12–23 January 1943), Franklin D. Roosevelt and Churchill approved a joint bombing strategy and generally laid out target priorities. Their overall directive was then narrowed to specific objectives, namely German submarine construction yards, aircraft production plants, and ball-bearing factories. Oil facilities and transportation targets were dropped from the priority list.

As the American bomber fleet grew, however, U.S. staff personnel revised the idea of hitting oil targets despite British objections. The so-called Eaker Plan, named for Lieutenant General Ira C. Eaker, commander of the Eighth Air Force, specifically reinstated oil as one of the four highest priority targets whose destruction would "fatally weaken" the German war effort, along with

⁹ Webster and Frankland, *Annexes and Appendices*, 66.

the three objectives designated after Casablanca. The American appreciation of oil went beyond synthetic plants to the Ploesti facilities in Romania. The Eaker Plan envisioned air attacks from southern Europe and Africa on the German-held crude oil fields and refineries.

By this time, however, given the relative immunity of the synthetic plants, Nazi ersatz fuel was replacing Romanian oil as the main supply source to run the Axis military machine. In 1941, Romania supplied about 77,000 barrels a day to Germany and Italy while Germany produced 68,000 barrels of synthetics. By 1943, the German plants had increased their output to 97,000 barrels while Romanian deliveries to its Axis partners had dropped to 60,000.¹⁰

The decline in Romanian deliveries was due to Romanians keeping more oil for themselves and the simple depletion of once-rich reservoirs. Technically, crude production at Ploesti (now Ploiești) reached a peak in 1936. Even though the Germans and Romanians deepened and attempted to revitalize old wells, the efforts did little more than avoid even steeper declines.¹¹

Though American historians have written extensively about the Ploesti raids in 1942 and 1943, these attacks were of marginal strategic value. Full field production was maintained even after the heaviest attacks, and the refineries were shut down only briefly. The Americans, as the British before them, were dazzled by pyrotechnics, and the enormous blazes and explosions misled them and their superiors into believing destruction was near total.

American air crews displayed extraordinary courage in the raids, but the Germans placed more anti-aircraft batteries around the Romanian facilities than any other area except Berlin. These defenses inflicted heavy damage on the U.S. planes that attacked Ploesti in the first massive raid on 1 August 1943. Of the 177 Liberators sent to Ploesti, 54 were shot down. The raid cost 532 lives. The destruction was facilitated by what has been called the Luftwaffe's "greatest achievement" of the war in codebreaking, the decipherment of U.S.

¹⁰ "Axis Oil as a Factor in the German War Effort," Report by the Technical Subcommittee on Axis Oil, 8 March 1946.

¹¹ A. E. Gunther, "Failure in Rumania," *Petroleum Times*, 17 January 1948.

messages that tipped off the Germans to the raid and permitted them to take away the element of surprise.¹²

It was not until August 1944 that Ploesti was subjected to serious damage. By then, the facilities were virtually abandoned, and they fell to Russian ground forces at the end of the month.

In early 1944, while the Allies still vacillated on oil bombing policy, the Germans increasingly feared Allied air forces would subject the synthetic plants to attack. Field Marshal Erhard Milch's belief that the German military would come to a standstill was shared by others aware of the Reich's growing dependence on the plants. On the Allied side, it was time to draw back and assess the past in formulating a policy for the future.

Through the end of 1943, about 330,000 tons of bombs had been dropped on Germany by the British Bomber Command and the U.S. Eighth Air Force, and Germany's war production had been little affected. It was a crushing conclusion, since the Allied assumption had been that the cumulative destruction would at least reduce strategic production. In fact, postwar reviews of German records show that virtually all of the Allied estimates of German industrial output were understated.

A few examples bear witness to the limited results of Allied bombing. A total of 39,400 German aircraft (mostly fighters) were built in 1942 and 1943, almost double the rate of the previous war years. Nazi submarine construction was also twice what it had been before the big bombing campaign began. Panzer production soared 415 percent above the early 1942 levels. Weapons and ammunition output for the same periods climbed 280 percent.

In February 1944, with the D-Day invasion of France only a few months away, a resurgence of interest in oil bombing developed among American air and economic warfare staffs in London and Washington. It was noted that only 1 percent of the raids conducted from 1939 through 1943 were directed against oil targets. During those years, German plants producing war armaments had been widely dispersed, and many had been relocated under-

¹² David Kahn, *The Codebreakers: The Story of Secret Writing* (New York: Macmillan, 1967), 464.

Figure 14. Boeing B-17 Flying Fortress bomber over Germany



A U.S. Army Air Forces Boeing B-17 Flying Fortress bomber conducts an air raid over Germany, 1943. The American bomber command prioritized the destruction of German oil targets to eliminate the enemy's ability to continue the war.

National Archives and Records Administration

ground. Synthetic fuel plants, on the other hand, were above ground, and the large ones were relatively few in number—28. If the oil facilities could be destroyed while the multitude of armament plants seemed beyond destruction, fuel could be cut off for the German planes and tanks being built.

Most importantly, American bombers were now in a position to fly missions deep into Germany escorted all the way by North American P-51

Mustang fighters. The Luftwaffe was enjoying a resurgence with a formidable buildup noted by an Eighth Air Force intelligence summary, which made clear that unless something were done to neutralize the enemy fighters, the entire strategic bombing program would be threatened. Not only were new and better fighters being produced, but the Germans were also transferring large numbers from the Russian front to fight in the west.

Allied analysts concluded that German fighters would defend the synthetic plants vigorously, but they expected the Mustangs to dominate. Dogfights flushing out the Messerschmitt Bf 109s and Focke-Wulf Fw Würger (Butcherbird) 190s, which would feel a progressively severe fuel pinch while being diminished in numbers, would permit Allied air superiority by D-Day. This line of reasoning was adopted enthusiastically by General Spaatz, who concluded that “a strategic attack on enemy oil would contribute more to the success of [Operation] OVERLORD than any other type of campaign within the capabilities of the heavy bomber forces.”¹³

Despite the arguments advanced by Spaatz and his staff, bombing strategy continued to be fashioned on the more immediate needs of the Allies to maintain and expand their toehold in France after D-Day. The Axis transportation system had to be disrupted. That, in turn, required domination of the skies through destruction of the German fighter force. On 13 February, the Combined Chiefs of Staff directed Allied bombers to accord highest priority to attacks on the transportation network in France and the reduction of German air power. As Eisenhower said, “There is no other way in which this tremendous air force can help us during the preparatory period to get ashore and stay there.”¹⁴ Oil targets were not considered “sufficiently immediate” to aid the Allied invasion.

Spaatz, however, was unrelenting. He kept mustering more arguments for an all-out attack on the synthetic plants and the oil fields of eastern Europe.

¹³ Wesley F. Craven and James L. Cate, *The U.S. Army Air Forces in World War II: Mission Accomplished*, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945* (Chicago, IL: University of Chicago Press, 1951), 173.

¹⁴ Supreme Headquarters Allied Expeditionary Force, SGS 373.24 Military Objectives for Aerial Bombardment, I. Eisenhower to Marshall, 29 April 1944, Eisenhower personal file.

His “persistent and obstinate advocacy” of the oil plan finally won him some converts, notably Eisenhower.¹⁵ While knocking out the German fighter force directly remained the key objective, Eisenhower and other key commanders came to view oil and transportation facilities as “complementary target systems,” the destruction of which would assist in the invasion proper while fulfilling the longer range strategic objective of rendering Germany economically and militarily impotent.

Oil targets were gradually included in bombing orders under a loose interpretation of secondary target selection. The big breakthrough came on 19 April when Eisenhower gave Spaatz permission to carry out two experimental raids on oil plants, but the directive clearly stated that the raids were primarily to lure German fighters protecting the installations into combat. Spaatz readied his Eighth Air Force bombers for a concentrated attack on the biggest synthetic plants, then waited for more than three weeks for the weather to clear. Finally, on 12 May, American bombers launched “what was to become their most rewarding campaign in the strategic air war, the destruction of enemy oil production.”¹⁶

On that day, a force of 935 Flying Fortresses and Liberators attacked oil facilities at Zwickau, Leuna, Brüx (now Most), Lützenkendorf, and Böhlen deep inside of the Reich. Forty-six bombers and 10 American and British fighters were lost. About 50 German planes defending the plants were destroyed and, above all, the blow to oil production installations was unexpectedly great. Every one of the facilities was damaged. Nearly half of the plants were forced to halt production, some totally for periods of weeks.

For 12 May was a date that Albert Speer, German minister of armaments and munitions, said he would never forget. “On that day the technological war was decided,” he reflected after the fighting. “Until then we had managed to produce approximately as many weapons as the armed forces needed. But with the attack . . . of the American Eighth Air Force upon several fuel plants in central and eastern Germany, a new era in the air war began.

¹⁵ Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, 1939–1945*, vol. 3, *Victory* (London: Her Majesty’s Stationary Office, 1961), 33.

¹⁶ Craven and Cate, *Europe: Argument to V-E Day*, 172.

It meant the end of German armaments production." Speer believed that the oil bombings made it impossible to use the planes and tanks that were being built. He concluded, "the loss of fuel had, in my opinion, therefore, a more decisive effect on the course of the war than the difficulties in armaments and communications."¹⁷

A measure of the impact was revealed to the Allies through the Ultra intercepts, but the full dimensions of the supply horrors visited on the Germans was not appreciated until the end of the war. Still, once the oil raids began there was mounting evidence the raids were shortening the war.

The Mustangs outfought the German air force. General Adolf Galland, chief of the German fighter forces, praised the American tactics. "We were forced by Göring and our High Command to fight defensively as fighters," he recounted. "This is a mistake in itself. A fighter was to fight offensively and this was done by the Americans more and more. We were attacked when we were rolling, taxiing out . . . we were attacked in assembling, in making altitude. We couldn't get up to make big formations. When the Americans realized this, then they were extremely successful."¹⁸

More oil targets were attacked through the spring and summer with the British now joining in the raids, mostly at night but sometimes even during daylight hours. As it turned out, the RAF attacks were more damaging than the American raids because the British crews became increasingly proficient at precision bombing and their larger 4- and 6-ton blockbuster bombs inflicted more permanent damage than the smaller bombs dropped by the Americans.

From May through September 1944, a total of 65 U.S. and 33 British raids were flown against oil targets. In all, 36,300 tons of bombs were dropped. About 20 percent of the bombs were estimated to have scored direct hits on production facilities. The results were extraordinary. In March 1944, the peak month for German synthetic production during the entire war, output was 132,800 barrels daily. By September, production was reduced to only 18,500

¹⁷ Albert Speer, *Inside the Third Reich* (New York: Macmillan, 1981), 346; and Webster and Frankland, *Victory*, 239–40.

¹⁸ Statement by Gen Adolf Galland, LW (Ret), Virginia Bader Aviation Symposium, Alexandria, VA, 2 November 1985, hereafter Galland statement.

barrels daily. Aviation gasoline production fell during the same period from 50,000 barrels daily to fewer than 2,500.¹⁹

Not surprisingly, the Luftwaffe collapsed as a fighting force. There was only one-tenth enough fuel for its planes by the fall of 1944 even when stock-piled gasoline was made available. It was a cycle that proved fatal. "Without fighter planes to protect the oil plants, Allied raids could penetrate [oil facility] defenses in greater number, thereby reducing the production of aviation fuel for the Luftwaffe."²⁰

Elaborate though futile measures were taken to protect the synthetic plants. A commissioner general was named to keep the oil industry afloat. He was Edmund Geilenberg, and he was given almost absolute power to requisition material and draw upon remaining available manpower to keep the plants going. Decoy plants were constructed. Real plants were camouflaged and screened in smoke when Allied bombers approached. All was to no avail.

General Galland knew more than any German how the fighter force was systematically knocked out of the war. He still had enough aircraft, but not enough fuel, which led him to conclude:

The most successful operation of the entire Allied strategical air warfare was against the German fuel supply. This was actually the fatal blow for the Luftwaffe! Looking back, it is difficult to understand why the Allies started this undertaking so late, after they had suffered such heavy losses in other operations . . . As early as June 1944, the month the invasion started, we felt very badly the effects of the consolidated offensive. Fuel production suddenly sank so low that it could no longer satisfy the urgent demands . . . by applying the strictest economy measures and by using the reserves of the OKW [Oberkommando der Wehrmacht], it was possible to continue the fuel supply to the army during the summer months of 1944. Yet, from September on,

¹⁹ U.S. Strategic Bombing Survey, *Oil Division Final Report*, 24; and U.S. Strategic Bombing Survey, *Effects of Strategic Bombing on the German War Economy* (Washington, DC: Government Printing Office, 1945), 79.

²⁰ Arnold Krammer, "Fueling the Third Reich," *Technology and Culture* 19, no. 3 (July 1978): 418, <https://doi.org/10.2307/3103372>.

the shortage of fuel was unbearable. The Luftwaffe was the first to be hit by this shortage. Instead of the minimum of 160,000 tons monthly, only 30,000 tons of aviation fuel could be allotted. Air operations were thereby made virtually impossible.²¹

Galland recalled that as a conservation measure, cows and horses were used to tow aircraft from hangars to runways.²²

Speer found the same situation with the ground forces. Visiting the German *Tenth Army* in late October 1944, he knew how desperately the military needed fuel, but nothing made it more dramatic than “encountering a column of a hundred and fifty trucks, each of which had four oxen hitched to it.”²³

The depth of the shortage was reached when an order issued on 15 November required no gasoline-powered vehicle to operate without a special trip ticket personally signed by the commanding general of the entire western theater of operations. Orders were posted that “anyone using fuel for purposes other than the immediate conduct of operations will be considered a saboteur and court-martialed without mercy.”²⁴

November 1944 was the high point of Allied bombing directed against the synthetic plants. After 45 separate massive raids, most in the thousand-plane category, the Germans were effectively deprived of adequate fuel for the rest of the war. The monthly bomb load of 24,000 tons was the coup de grace. Though it was able to bring production levels in November back to the June figures, which were still only 21 percent of normal output, the industry went into a fatal decline. Not only were the production facilities crippled, but the added destruction of storage depots and rail tank cars made it extremely difficult to transport the diminishing amounts of fuel that were produced.

²¹ Adolf Galland, *The First and the Last*, trans. Mervyn Savill (New York: Henry Holt, 1954), 224–26.

²² Galland statement.

²³ Speer, *Inside the Third Reich*, 406.

²⁴ U.S. Strategic Bombing Survey, Record Group 243, Modern Military Record Division, National Archives and Records Administration, Washington, DC.

For Hitler and those Nazis responsible for manufacturing the weapons of war, the situation was infuriating. Even at this late stage of the conflict, Germany was producing record amounts of armaments and weapons. The flow of planes and tanks continued to roll off the assembly lines, but the machines that had once terrorized a continent were idled by an almost absolute lack of fuel.

In October, the first German jet fighters—Messerschmitt Me 262s—were placed in operational squadrons. About 1,200 were built, but pilot training was so restricted by the fuel shortage that the pilots were ill-trained. They crashed more jets learning to fly them than were lost in combat, and the advanced fighters never played an important part in the war.

Germany turned out more conventional single-engine fighters in late 1944 than the United States and Britain combined. Three thousand were built in each of the last months of the year. Tank and motorized assault gun production reached a wartime high in December, when 1,854 units were completed. Most of the new planes and panzers remained stockpiled near the final assembly points because there was no fuel to move them. Germany had the weapons of war to the end but not the means to propel them. Its situation was summed up perfectly with the observation: “Militarily, what hurt most was the catastrophic decline in oil production that had begun in May 1944.”²⁵

The thousand-year Reich was reduced to a pitiful state in which its once mighty forces had fuel supplies that were measured in days, even hours.

²⁵ Earl F. Ziemke, *Stalingrad to Berlin: The German Defeat in the East*, U.S. Army in World War II Series (Washington, DC: Government Printing Office, 1968), 412.

CHAPTER 15

THE WESTERN FRONT

A plentiful and reliable supply of petroleum products was probably the single most vital factor in establishing Allied logistical superiority over the German Army.

~ U.S. Army Quartermaster Corps, 1965

Whenever we went to the rear and saw fields packed with petrol tins as high as a house, rows of guns in their canvas covers waiting to come up, huge dumps of shells, you couldn't doubt that we could do it.

~ Alf Lee, Middlesex Regiment, D-Day veteran

D-Day, 6 June 1944. It was a curious time for Hitler. The beleaguered Nazi leader now possessed futuristic rocket weapons and jet aircraft, but at the same time his armies struggled increasingly with rundown, overworked ground transport, and an air force with approaching impotence.

Nothing pinpointed this incongruity more than a wagon train that wound its way through the old streets of Tôtes in western France one evening shortly after the Allied landings on the beaches of Normandy. The convoy was an eerie sight in the twilight shadows. Except for the clopping hooves of their horses, the 35 wagons moved in silence like a funeral cortege, their cargoes draped in sheets of gray canvas.

The might of German armor rumbling southward to fight the invasion was stopped at road junctions to let the convoy pass. It seemed a puzzling priority. To the knowing few, it was a once-in-a-lifetime scene, a symbol of mankind at a crossroads, with three generations of warfare face to face—old

horse-drawn supply wagons; mechanized panzer units; and under the canvas the first V-1 flying bombs or *Vergeltungswaffen-1* (Vengeance Weapon 1), forerunners of the space age.

The V-1s were destined for launching sites near the English Channel. Several days later, on 13 June, the first of 8,000 such weapons was fired toward England, marking a new phase of warfare: unmanned missiles as instruments of terror. In September, more sophisticated V-2s, which flew high in the atmosphere, became operational, but both rockets were too late to matter. The vital, meaningful fighting was still on the ground and beyond the shores of Normandy. Even while the Allies' fate remained touch and go, Germany's logistical problems had already begun.

Though the Nazi occupation of France was four years old, the Germans had given little thought to its defense beyond kilometers of coastal fortifications. Once inland, behind the German lines, there was little in the way of large backup fuel caches or strategically located supply depots of any magnitude. In the crucial period immediately after the Allied landings, shortages of fuel and motor transport quickly developed.

The Axis air defense was the first casualty. From the onset of D-Day, the Luftwaffe suffered a shortage of aviation fuel; and only two weeks before the Allied landings, six of the Luftwaffe's best fighter squadrons were ordered back to Germany in direct response to Allied raids on Hitler's synthetic fuel facilities.

The German High Command appreciated its resultant weakened air position along the invasion coast, but protecting the oil plants was the higher priority. Although Hermann Göring promised to move the units back deeper into France once the invasion was imminent, precious time was lost, and on D-Day, when an instant response in force was essential, "The Luftwaffe in the west was weaker than it had been at any time during the previous four years."¹

Allied commanders feared air attacks during the first vulnerable hours on the beaches when their troop could be pounded within their small, confined

¹ Chester Wilmot, *The Struggle for Europe* (New York: Harper Collins, 1952), 289.

areas and then pushed back into the sea, but the Luftwaffe's efforts to inflict decisive damage were feeble at best. The Allies, with plenty of fuel stockpiled, enjoyed absolute air superiority. Five thousand American and British fighters were within range of the D-Day beachheads to assure command of the skies. The Germans, on the other hand, had only 198 bombers and 119 fighters available along the entire English Channel coast to challenge the largest amphibious invasion force in history. As night fell on 6 June, the Allies' combined tactical fighter forces had flown 10,585 sorties without a single loss. Within 24 hours, 176,000 troops were ashore. Vast numbers more would follow, along with 2.5 million tons of supplies and equipment to sustain the expanding and advancing invasion force.

General Adolf Galland, who directed fighter operations for the Luftwaffe, found the situation appalling but could do little about it. "This situation on fuel was so terrible that we were forced to bring our young pilots, who were badly needed because of terrible losses and we were extending our fighter force, we had to bring them into operations with only 50 to 60 hours total flying time. . . . The result was that many of our young pilots did not survive three missions."²

By D-Day, German pilots were sent into combat with only one-fourth of the flying time logged by American and British air crews. Precious fuel could not be spared either for pilot training or for testing newly manufactured engines. Normal running-in time for the power units had been reduced from 120 to 30 minutes. Inexperienced pilots and mechanical failures resulted in abnormally high losses during training and while aircraft were being ferried. Only half of the Luftwaffe's fighter losses during the first nine months of 1944 were combat related. More planes than pilot trainees were lost, but during all of 1944, a total of 3,384 pilots were killed while learning to fly. The result was that on D-Day the Germans did not have enough planes or quality pilots to destroy the Allied landing force.³

² Statement by Gen Adolf Galland, LW (Ret), Virginia Bader Aviation Symposium, Alexandria, VA, 2 November 1985.

³ Cajus Bekker, *The Luftwaffe War Diaries: The German Air Force in World War II*, trans. Frank Ziegler (Garden City, NY: Doubleday, 1968), 380.

On land, shortages of fuel and motor transport robbed the Germans of the ability to move up reinforcements quickly or engage in lightning armored counterthrusts. As if that were not enough, there was indecision at the top command levels, a hesitation to accept Normandy as the real thing.

It was not until 1700 on D-Day that the Germans became convinced the landings were not a diversionary tactic. Field Marshal Gerd von Rundstedt then ordered all available units in Normandy into action to eliminate the Allied bridgeheads by dawn.⁴

Meanwhile, swarms of Allied aircraft slowed counterattacks with their interdiction of anything the Germans moved behind the beaches. Even German troops a few kilometers from the coast were frustrated in attempts to advance. Units in Brittany could not move because they lacked transport and finally marched with only as much equipment as they could carry.

By 9 June, the German High Command knew it would fail Hitler's expectations to drive the Allies back into the sea. The integrity of his "Atlantic Wall" coastal defenses had been breached, and delays in the arrival of reinforcements from more distant points became "a cause of increasing difficulty and anxiety."⁵ The *II Parachute Corps*, *17th SS Panzer Grenadiers*, *77th Infantry Division*, and *3d Paratroop Division* were all bogged down at various points in northern France, their movements "hampered by shortage of fuel, as well as air attacks and sabotage along the line of march."⁶

On 10 June, the Germans still nurtured a hope they could dislodge the Allies from Caen and Bayeux and hold Cherbourg (now Cherbourg-Octeville). Their radio traffic that day from *Seventh Army* to higher headquarters, however, indicated the pressing need for more mobile artillery, antitank and antiaircraft weapons, as well as operation of armored units and for faster movement of reinforcements.⁷ The poor fuel situation was stressed

⁴ *Omaha Beachhead*, American Forces in Action Series (Washington, DC: Historical Division, War Department, 1945), 114.

⁵ *Omaha Beachhead*, 147.

⁶ *Omaha Beachhead*, 148.

⁷ *Omaha Beachhead*, 148–49.

several times during the day's communications. *Seventh Army* complained that reinforcements were suffering so many delays that units arrived in dribbles and had to be committed piecemeal. On 10 June, advance elements of the *17th SS Panzer Grenadier Division* bogged down at Saint-Lô, France, for lack of fuel.

By this time there was no rail transport available to the Germans anywhere near the battle zone. Allied aircraft were knocking out rolling stock, rail lines, and bridges leading to the front. Three divisions from Brittany had to disembark long distances from their battle destinations and proceed as best they could. Motor transport was now at a premium, and much of it was reserved for hauling fuel to the armored units in combat. Even this was restricted. Allied planes flew over the battlefield constantly during the day, so German truck traffic moved only at night—and even then at considerable risk. The Germans began referring to the “unbearable” Allied air superiority. Field Marshal von Rundstedt was finally compelled to issue the order: “Move your equipment with men and horses—don’t use gasoline except in battle.”

The commander of the *Seventh Army*, General Friedrich Dollmann, stressed the fuel shortage repeatedly in his reports to higher echelons and emphasized that a favorable resolution of the battle for the French coast depended on the speedy supply of fuel to give armored units the mobility needed for offensive action. If the Allies were to be contained in their existing bridgeheads, his tanks could not stay in static defensive positions as gun platforms. Without sufficient fuel to maneuver freely, Dollmann knew they would be overrun and destroyed as the Allies grew in strength.

It was doubly frustrating for him and other German officers to know large numbers of reinforcements were within helping distance but lacked adequate transportation to reach trouble spots in German defense lines. Other units that could have helped were found wanting. Vehicles of the *2d Panzer Division* were expected to be ready to move when needed. Instead, they were widely scattered on D-Day. Wheeled vehicles were at Caumont, 32 km behind Omaha Beach, while the division's tanks were 241 km away in Paris, where they had detrained to advance by road. When orders came to speed up the tank movements from the French capital, superiors were reminded that

the average Panther tank's motor had to be replaced every 805 km. The implication was that many of the Panthers were close to that level already and might not make it to Normandy.⁸ Although the division's infantry components reached the front, where they were badly mauled, the heavy tanks and armored artillery did not enter combat until much later, by which times the Allied beachheads were secure.

General Hans Speidel, chief of staff to Field Marshal Erwin Rommel, now the *Army Group B* commander in the west, wrote later that the tactical failures "could not be ascribed to negligence in the field command or to reluctance to fight on the part of the troops. It was due solely to the effectiveness of the enemy air and naval forces. In the first days of the invasion they had succeeded in bringing about a serious shortage of fuel and ammunition on the German side."⁹

The Germans tried to fight their war of deprivation with fuel shortages that were destined to worsen. Air raids on the synthetic plants resulted in a sharp decline in fuel production, and even when fuel was available if oftentimes could not be moved to where it was most needed.

During the month of the Normandy invasion, U.S. and British bombers dropped 20,000 tons of explosives on Axis oil-producing facilities. Output from all sources dropped from about 240,000 barrels a day in March to 126,000 barrels in June. The figure would slip to 92,000 barrels by August. Only 5 percent was aviation fuel, just one-half the normal refinery yields for aircraft. For the rest of the war, Germans suffered "desperate local shortages."¹⁰

The German situation was in sharp contrast to the Allied position. From D-Day forward, Allied forces received ample supplies with only a few notable exceptions.

⁸ *Omaha Beachhead*, 161.

⁹ Hans Speidel, *Invasion 1944* (New York: Paperback Library, 1968), 84.

¹⁰ Wesley F. Craven and James L. Cate, *The Army Air Forces in World War II: Mission Accomplished*, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945* (Chicago, IL: University of Chicago Press, 1951), 286.

It was far from an unimpeded flow of oil and gasoline to units on the continent. There were extreme difficulties, but they were resolved.

Plans for the cross-channel invasion began in early 1942. A special task force in Britain was assigned to work out details of supplying fuel for the huge force that would be involved. Without knowing numerical details, and with only a vague understanding of where landings would be made, the staff concluded that three fuel phases would be needed. Initially, invasion troops would bring their own supplies ashore. Next, there would be shipments in bulk across the English Channel when ports were secured to receive them. Finally, when deep-water harbors were available to the Allies, fuel would be shipped directly from the Americas.

The first phase seemed simple enough. Units could be made relatively self-sufficient with fuel in jerry cans to establish beachheads and advance several miles inland. It was assumed that most of the smaller ports that dotted the coast would be captured within 15 days, permitting bulk shipments by small tankers thereafter. The third phase, however, was dangerous and difficult. Oceangoing tankers would have to bring their cargoes from the United States and Caribbean through submarine-patrolled waters to either Cherbourg or Antwerp. No other English Channel ports could accommodate such large vessels. If the Germans made determined defensive stands in those cities, the second phase would be a long one.

Planners believed that as soon as possible after D-Day vessels with shallow drafts, called “Chants” (from channel tanker), moving close in to shore would provide most of the needed fuel. In preparation, 39 such carriers were built for the invasion. Supplementing them would be larger tankers standing offshore and connected to the beach by ship-to-shore pipelines.

There was understandable apprehension about the reliance on the tankers, given their high vulnerability to enemy attack and frequent bad weather in the channel. What seemed to be a more desirably alternative, or at least a supplement, was PLUTO (pipeline under the ocean), a cross-channel pipeline from Britain to France. Nothing on this scale had ever been attempted, even in areas without vexatious currents and tides.

Responsibility for PLUTO was assigned to the British Petroleum Department. In April 1943, the project was turned over to the UK Petroleum Warfare

Department. The task was formidable. Its feasibility was questioned, and the project was regarded as “a leap in the dark.”¹¹ Planning proceeded nonetheless, and in June 1943, the British Chiefs of Staff directed that PLUTO be considered a “matter for immediate execution.”

Two kinds of pipe had been tested and found satisfactory. One was nothing more than hollowed-out armored cable, similar to that used for submarine telegraph lines. The other was rigid welded steel. It was estimated a combined total of 10 lines in two systems would carry from 30,000 to 36,000 barrels of fuel daily across the channel. The amount would cover half the fuel needs of the Allied forces landing on the French coast. Code named Bambi, the original pipelines would run from the Isle of Wight off the southern coast of England to the Cherbourg peninsula. A second fuel feeder system, code-named Dumbo, was to be laid across the shortest possible distance, from Dungeness to Ambleteuse, near Boulogne, when the French coastal area there was seized.

The Allies began stockpiling fuel in Britain in 1942 for the cross-channel move, and nearly 2 million barrels had been accumulated before D-Day. Despite the promise of Pluto, Allied planners felt they could never rely on the underwater supply system to provide all necessary fuel on the continent. If Pluto worked, it would be useful backup. Tankers of varying sizes, however, were always considered to be the prime means of transport. American-built, oceangoing T2 tankers, or “Greyhounds,” were the heart of the tanker fleet assembled. Most were more than 16,700 deadweight tons; could travel without benefit of convoy at 15 knots; and could discharge their 100,000 barrels of oil through pipelines to shore shortage tanks in a matter of hours from moorings within a thousand yards of the beach. Smaller American-built 600-ton “Y” tankers were designed to handle coastal and river shipments.

Plans for shipping oil for the Normandy landings were thus thorough and even ingenious. No one knew, however, if the various methods, primary or backup, would work under actual battle conditions.

¹¹ D. J. Payton-Smith, *Oil: A Study of War-time Policy and Administration* (London: Her Majesty's Stationary Office, 1971), 334.

The initial landing forces relied on jerry cans as planned. Most were hauled to the beaches on D-Day by the British Chants. From D-Day until the end of June, jerry cans transported from England were the only source of fuel for the Allies. The first concrete mooring to offload large tankers was towed to a point off Port-en-Bessin on 25 June, and oil began flowing to shore storage facilities in July through seven large mooring established along the beachheads.

Oil supplies were adequate through the system, but direct shipments to large ports were essential if the increasing numbers of troops and vehicles on the continent were to be supplied. The capture of Cherbourg on 2 June gave the Allies their first big port. Even though the Germans virtually destroyed the dock facilities, the Allies restored them by September when oceangoing tankers began direct deliveries. While Cherbourg was a blessing, it was a small port, able to accommodate only one large tanker at a time, and other discharge points were still needed. Smaller tankers were able to augment supplies when Le Havre and Ostend were opened by the end of September.

German troops methodically wrecked the port facilities at Brest before surrendering the city on 19 September. Although it became a prime logistics center in time, besieged German troops held Saint-Nazaire and Lorient until the end of the war, denying their ports to the Allies.

It was not until Antwerp was captured and its approaches cleared that the Allies felt secure about getting adequate amounts of fuel ashore. While the Belgian port was taken by British forces in early September, continued resistance on Walcheren (then a Dutch province) and along the Scheldt River delayed Antwerp's full utilization for two months. It was not until November that oceangoing tankers unloaded there. Since six months elapsed between D-Day and the opening of Antwerp, the notion of a steady, uninterrupted flow of fuel for the Allies is a distortion. There were serious problems of oil transportation throughout this period. They were eventually solved, however, and few Allied units (General George S. Patton's Third Army being a notable exception) had to curtail operations due to fuel shortages.

Pluto turned out to be a problem-plagued disappointment despite the great publicity given to the project after the war. From D-Day through October, an average of only 150 barrels a day flowed through the underwater pipelines.

During this stage of the fighting, a daily total of 90,000 barrels was being supplied to the Allied forces, a figure that would jump to 175,000 barrels daily during the spring of 1945.

All Pluto pipelines were damaged during installation, some mishandled by the crews laying them. Defective equipment resulted in other delays. When needed most, Pluto was useless. Only when the war was virtually over did Pluto prove marginally workable. By then, it was no longer needed.

From the Normandy landings through the German surrender, Pluto carried 2.7 million barrels of fuel to the continent, or less than 7 percent of Allied consumption. Of the 38 million total barrels used, most were hauled across the channel by small tankers and cargo ships (78 percent) with the rest coming directly from the Americas on heavy tankers.

Perhaps the prime engineering feat involving oil in Europe on the Allied side was the portable military pipeline. The U.S. Army distributed fuel primarily through a network laid down by engineer petroleum-distribution units made up mostly of workers from the oil industry. Four-inch steel pipe in preassembled 20-foot lengths was coupled without welding and laid down at a rate as high as 80 km a day. Portable pumping stations regulated pressure.

The army oil units excelled after the Saint-Lô breakthrough out of Normandy, at one point advancing too far, too fast. A surveyor with one of the companies operating as part of the American First Army, Captain Frederick W. Thompson, later recalled an afternoon when his troops were laying pipe across an open field. A crouching soldier approached Thompson, identified himself as a messenger, and said his general “told me to tell you, sir, to get your men the hell out of here, that the infantry hasn’t taken this field yet.”¹²

When an American was sent overseas to fight, the Army Quartermaster Corps calculated that he would require about 67 pounds of supplies and equipment each day, averaged out among elements. This “maintenance requirement” varied little between the European and Pacific theaters. Gasoline and greases accounted for nearly half the basic requirement. In terms of

¹² Look Magazine, eds., *Oil for Victory: The Story of Petroleum in War and Peace* (New York: McGraw-Hill, 1946), 117.

Table 15. Pounds per person per day

	<i>Europe</i>	<i>Pacific</i>
Food rations	7.17	6.71
Clothing and general supplies	2.73	3.70
Vehicle and weapons replacement	4.72	2.61
Medical	0.30	0.33
Maintenance equipment	3.35	3.15
Engineering equipment	7.28	11.90
Ammunition	8.05	8.61
Fuel and lubricants	33.30	30.40
TOTALS	66.90	67.41
Petroleum percentage	49.80	45.10

Adapted from Appendix A of Richard M. Leighton and Robert W. Coakley, *Global Logistics and Strategy*, vol. 2, 1943–1945, U.S. Army in World War II Series (Washington, DC: Government Printing Office, 1968), 825.
Courtesy of William Morrow, adapted by MCUP

weight, oil products surpassed the more obvious needs of ammunition, weapons, and food by wide margins. Roughly 50 percent of all the tonnage carried overseas to supply U.S. troops worldwide was in the form of petroleum products.

General Patton probably never met a supply officer he liked. He avoided his Third Army’s chief of logistics until the very last week of the war, never conferring with him during the nine fuel-problem-plagued months when Patton’s armor roared across Europe and kept running short of gasoline.¹³ Patton abhorred the mundane details of supply. He demanded as much fuel as possible and cared not where it came from or how. Fighting was his job.

¹³ Col Everett Busch, “Quartermaster Supply of the Third Army,” *Quartermaster Review*, no. 26 (November–December 1946).

Others were left to cope with logistical matters, although Patton sometimes devised extraordinary means to keep his armor rolling.

Don Hale of Richmond, Indiana, was a forward observer with the 358th Field Artillery of the Third Army in 1944. He recalls one method by which Patton helped assure his supply of fuel:

Our outfit crossed the Saar [River] but was pulled back as the Third Army was getting too far ahead of the other armies. We were told to use up our 105mm ammo each day by two or three o'clock as they did not want the 6x6 trucks loaded down with ammo. These 6x6s were to carry gasoline for the tanks once the Third Army started rolling again. Our forward observation group had to invent targets to use up our supply of ammo.¹⁴

Outfits that were attached to more than one army during the war were well aware of Patton's priorities. Troops of the 8th Armored Division's 49th Armored Infantry Battalion often joked about the difference between the Third and Ninth Army. With Patton, gasoline for the unit's half-tracks moved up first, followed by later, more casual deliveries of cigarettes, candy, and other niceties such as soap. In the Ninth Army, the reverse was true. When all was said and done, most soldiers preferred Patton's way. It seemed more secure.

The Third Army established a deserved reputation for unusual and even unorthodox acquisition of supplies: "Roving foraging parties impersonated members of other units, trains and convoys were diverted or hijacked, transportation companies were robbed of fuel they needed for the return journey, and spotter planes were sent hundreds of miles to the rear in order to discover fuel supplies."¹⁵

In September, Patton's forces, despite their tendency for acquiring fuel at any cost, finally ran out of gasoline after a historic dash eastward across France. So did other Allied armies converging on Germany from the west.

¹⁴ Don Hale, letter to authors, 5 April 1981.

¹⁵ Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge, UK: Cambridge University Press, 1977), 221.

Figure 15.1. LtGen Patton in Italy



LtGen George S. Patton (left) speaks with a subordinate officer in Italy, 1943. On the western front in 1944 and 1945, Patton demanded fuel for his armored forces and cared neither where it came from nor how it was acquired.

National Archives and Records Administration

Fuel and transportation facilities were still limited, and the Allied advance ground to a halt. It was up to General Dwight D. Eisenhower, the supreme commander, to decide how to get the offensive rolling again in light of the supply problems if he wanted to cross the Rhine into the German heartland before winter. His two army group commanders, the Briton, Field Marshal Bernard L. Montgomery, and the American, Lieutenant General Omar N. Bradley, argued for a “single strong thrust” swinging through Belgium and encircling Germany’s industrial Ruhr valley from the north. Available supplies would have to go to the forces that would be limited to stores on a bare subsistence level. Montgomery and Bradley each offered reasons why his unit was in a better position to deliver the killing blow, and each fought to deny the opportunity to the other. Eisenhower elected to favor neither and ordered

a plodding, full-front advance by all the armies. As a result, everyone suffered from shortages of fuel and other vital supplies.

When the offensive stalled in September, the front stretched in an arc from Antwerp to the Moselle valley near the French-Swiss border. Fuel had to move up to 483 km from the Normandy ports. Antwerp had just been taken and would not be ready as a full-capacity terminal until late November.

With the benefit of hindsight, it seems apparent that the fuel crisis might have been averted and the war ended several months earlier had the Allies stuck to their original plan of capturing the excellent ports on the southern coast of Brittany on the Bay of Biscay. Not only were offloading facilities available for the biggest tankers, but the railroads afforded direct transport to Paris and on into Germany. Instead of securing the logistical bases on Quiberon Bay and the ports of Lorient and Saint-Nazaire, U.S. strength was concentrated on a direct path from Normandy along the channel coast and toward Paris.¹⁶

In strategy and logistics, the shortest distance between two points may not be always be a straight line. What appeared to be a natural envelopment to the rear was argued but never undertaken, and the Allies paid a high price in the months ahead. Failure to advance to the Bay of Biscay denied speedier shipments of fuel and other supplies from the United States while avoiding the more dangerous routes through the Irish Sea and across the English Channel. The evidence for taking the Brittany ports is persuasive, and the oversight is seen by some as the Allies' "most critical error of World War II."¹⁷

The September halt was a logistical breakdown that need not have happened. "There can be little question that a shortage of gasoline and ammunition, and other supplies, was primarily responsible for our failure to inflict a decisive defeat on the Germans before the close of 1944."¹⁸ Certainly, the political map of Europe today would be drastically different had Western forces outraced the Russians to lands that eventually fell under Communist control.

¹⁶ Omar N. Bradley, *A Soldier's Story* (New York: Holt, 1951), 356–66.

¹⁷ Harold L. Mack, *The Critical Error of World War II*, National Security Affairs Issue Paper No. 81-1 (Washington, DC: National Defense Research Directorate, 1981).

¹⁸ Mack, *The Critical Error of World War II*.

Map 15.1. Allied fuel system, 1944–45



Courtesy of William Morrow, adapted by MCUP

Patton and the Third Army arguably had the best shot at spearheading the drive into Germany. The Wehrmacht fought valiantly in all sectors, but it was reeling from lack of supplies and attrition. German troops facing Patton were among the weakest on the western front, and the Wehrmacht's inability to move units into pressure points would have made it difficult for the Germans to ever stop the colorful general. Once the Third Army broke out of the Normandy bridgehead, Patton was certain he could cross the Rhine by October if adequately supplied. It took him only 40 days instead of the planned 70 to reach Nancy. Eisenhower, by dispersing limited fuel and other materiel to all of the advancing armies on a share-and-suffer-alike basis, stalled the entire offensive for nearly two months. Germany used the time to build up its own forces and regroup. General Bruce C. Clarke, who would lead a gallant American stand at Saint-Vith in December 1944, later noted that the inopportune delay "gave Hitler time to prepare for the Ardennes counteroffensive."¹⁹

Ill-tempered, resentful of supply officers in the rear who could not perform miracles, and concerned only about wiping out the enemy, Patton called theater logisticians "cowardly slackers" and worse. He was convinced there was a deliberate attempt at the highest Allied command levels to withhold fuel from him for political purposes. No one could persuade him that fuel was short everywhere. Without the Bay of Biscay, his was the longest supply line of all.

To read the daily reports of the Third Army is to appreciate the urgency of Patton's fuel situation in September 1944, when his gasoline rations had been cut and a large number of his supply trucks had diverted to Montgomery by Eisenhower.²⁰ Entries included pleas for emergency shipments as his fuel stocks dwindled to a half-day supply. When his tanks and other armor finally ran dry, the Third Army was across the Moselle, and the Rhine was within reach. From then until the end of October, Patton's forces averaged less than a two-day supply of gasoline. The army's infantry divisions were rationed to

¹⁹ Gen Bruce C. Clarke, USA (Ret), interviews with authors, McLean, VA, April 1985.

²⁰ Full mimeographed copies of the Third Army's daily reports can be found in the library of Army-Navy Club, Washington, DC.

5,000 gallons a day. Armored divisions received 25,000 gallons initially, but that allocation was halved in October. Even these reduced rations were possible only because four-engine bombers from England were diverted from regular missions to ferry filled jerry cans to Patton. Other units also received airlifted fuel, but the total never exceeded 60,000 gallons a day for the entire theater.

Patton was partly right in believing the share-alike shortages were not equally applied. The First Army, for one, received greater allocations than the Third. Its fuel reserves were built up to a seven-day supply by mid-October, but it was not until the end of the month that the Third Army got back up to a two-day reserve.²¹ Possibly, Patton's tank crews may have been less conservation-minded than those in the First Army, and heavier consumption would have resulted in slower stockpiling. The records on this are not clear, though there is little doubt all Allied forces were frustratingly slowed because no one had enough fuel.

General George C. Marshall, U.S. Army chief of staff, engaged in hyperbole when he declared, "No plane has failed to fly, no ship has failed to sail, for lack of oil."²² It certainly was generally true for most of the war, on whatever front the Allies fought. Tanks *did* fail to roll, and diversions of planes and ships to provide emergency fuel supplies affected combat operations in the fall of 1944. Above all, the timing could not have been worse. For all of the guessing on what the course of history might have been had the American, British Commonwealth, and Free French armies had not been stalled, the Allies did prevail. It is impossible to compare the temporary fuel plight of the Allies with the unending shortages of the Germans.

Reviews of what caused the basic fuel shortage of the Allies agree there was a combination of factors.²³ Allied armies moved faster and farther than

²¹ Roland G. Ruppenthal, *Logistical Support of the Armies*, vol. 2, *September 1944–May 1945*, U.S. Army in World War II Series: The European Theater of Operations (Washington, DC: Government Printing Office, 1959), 194.

²² *Hearings before the Legal Subcommittee of the Committee on Armed Services*, House of Representatives, 80th Cong., 2d Sess. (1948), 760.

²³ See chapter 15 of Ruppenthal, *Logistical Support of the Armies*; and van Creveld, *Supplying War*.

anticipated. Facilities for offloading tankers and for storing fuel in accessible areas were lacking or insufficient. Finally, there were problems of distribution, and they were greater in proportion to the distance between the channel's coast and the front. There was always enough fuel somewhere but not always enough in the right place, and swirling through the entire episode were Montgomery's political intrigues.

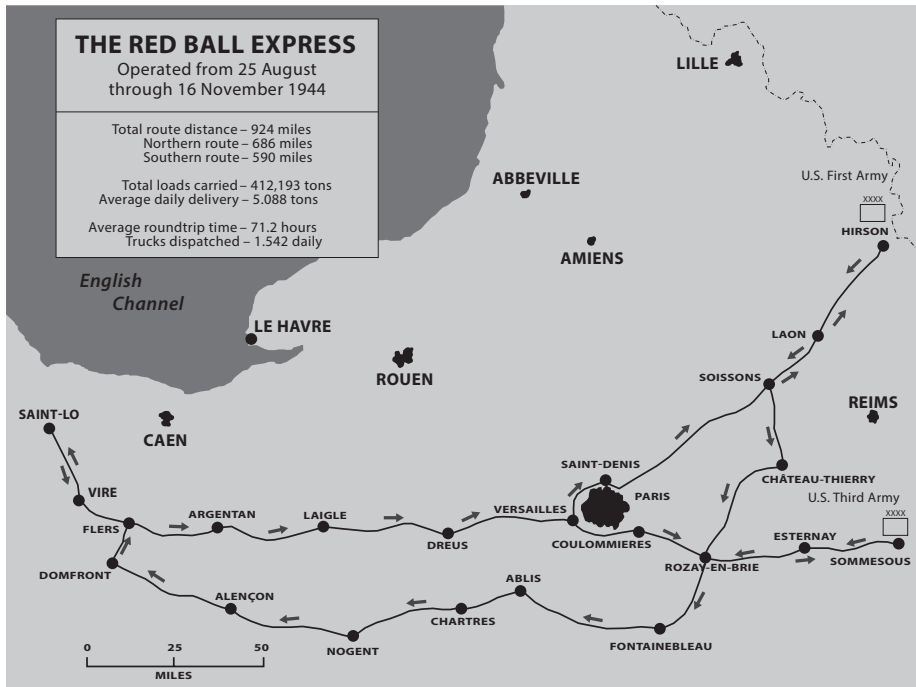
Many of the troubles were solved by improvisation and great ingenuity. The Red Ball Express, which consisted of thousands of trucks carrying fuel and other supplies around the clock over looped one-way roads and driven by indefatigable "double-clutchers," was put together only when the crisis developed.²⁴ Pipe-laying was achieved under heroic conditions and faster than anticipated. A total of 1,530 km of fuel lines was laid down and maintained under adverse conditions and faster than anticipated. The pipelines carried 43 percent of all the Allied fuel, while 35 percent was handled by trucks and 22 percent traveled by rail.

Ultimately, enough fuel flowed again for everyone. The situation improved in November, when the Third Army had a 6.7-day supply; the First Army, 7.3; and the Ninth Army, 9.3. By February, the Allies had virtually all the fuel they wanted. From D-Day through the end of 1944, the critical period, a total of nearly 312,648,000 gallons of fuel and lubricants was distributed to the combined forces.

One problem nonetheless persisted through the end of the war. It involved that mundane object of fuel logistics—the jerry can. The Allies shipped 13.5 million of the containers to Europe. According to the chief quartermaster of the U.S. Army, 3.5 million had disappeared by the middle of October 1944. The shortage of jerry cans exacerbated fuel shortages at every level. Many were treated as disposable containers and abandoned after a single use. Not only was the battlefield littered with them, but they were ubiquitous in the rear zones as well. Soldiers and civilians used them in ingenious ways. Many became stepping-stones and sidewalks, their use increasingly

²⁴ The Red Ball Express was so named because round red markers signified the route. Supply routes in Europe were designated by geometrically shaped color signs. The Green Diamond Express was another such route.

Map 15.2. Allied motor convoys, 1944



Courtesy of William Morrow, adapted by MCUP

noticeable during periods of rain and mud. Some served as chairs and other items of furniture in tents and civilian shelters. A campaign conducted by the French Ministry of Education brought back about a million jerry cans when children were offered prizes for retrieving the wayward empties. Even when military units were required to turn in an empty container before receiving a full one, they continued to remain in short supply. Local production in increases in shipment from the United States and Britain at least kept the supply at manageable levels.²⁵

²⁵ Warren C. Platt, *National Petroleum News*, 10 January 1945.

Figure 15.2. Red Ball Express motor convoy



An American soldier directs a Red Ball Express motor convoy carrying fuel and other badly needed supplies to the front, September 1944.

National Archives and Records Administration

Black-marketing and pilferage probably accounted for losses of less than 1 percent of total fuel supplies distributed to Europe from D-Day through the end of the war. Given the amounts that were being shipped and the fuel deprivation experienced by the civilian populations in the occupied lands, it is surprising that the amount was not greater. Strenuous efforts were made to halt illegal fuel trading, but it was harder to apprehend those stealing it directly because of the variety of means used to transport gasoline. Some of the fuel-hungry French were particularly clever, tapping into unprotected and unguarded sections of the pipelines with plugs and spigots from wine casks. Only in a few cases were the culprits discovered, such as the incident in which a French farmhouse near a pipeline, and later assumed to be filled with jerry cans of gasoline, exploded and virtually disappeared.

CHAPTER 16



FINAL DESTRUCTION OF GERMANY'S FUEL SOURCES

The more I see of war, the more I realize how it all depends on administration and transportation.

~ Field Marshal Archibald Percival Wavell,
British Army, 1946

It is a matter of estimating with certainty the final collapse of the German economy in four to eight weeks. . . . After this, the war can no longer be pursued militarily.

~ Albert Speer to Adolf Hitler,
30 January 1945

Bright moonlight glistened on the Danube River as it coursed its way to the Black Sea through central Yugoslavia. German gunners manning antiaircraft weapons around Belgrade called it a “bomber’s night.” Predictably, sirens sounded, alerting all to the approach of enemy planes. Royal Air Force (RAF) bombers were familiar sights in the night skies, but on the night of 8 April 1944, they did not head for their usual targets in the Balkans. Instead, 19 Vickers Wellingtons and three Consolidated B-24 Liberators operating out of Foggia, Italy, avoided the military and industrial installations. They came in low, under 200 feet, and laid 40 mines in the Danube. The operation was the opening attack in another phase of Allied strategic bombing.

The Danube was an Axis waterway for most of the war. Flowing 2,776 km, from the Black Forest of Germany through Austria, Czechoslovakia, Hungary, Yugoslavia, and Bulgaria, to the Black Sea in Romania, it was a vital transpor-

tation artery, carrying up to 10,000 tons of materiel every day. War weapons and supplies moved from Germany and its Axis partners to the eastern front. On their return trips, the boats and barges hauled grain from Hungary and oil from Romania, food and fuel and destined for the Reich. About 8 million tons of essential materiel reached Germany via the Danube in the peak shipping year of 1942.

Most of the traffic consisted of 200-foot-long barges, each displacing about a thousand tons. They plied the river in ever-increasing frequency as Allied air attacks disrupted Axis rail traffic in Hungary and Romania. For all the upheaval it represented, the change had its advantage, for one barge could carry a load that would have required a hundred 10-ton rail cars. By March 1944, most of Romania's oil was being shipped to Germany by barge. The river was carrying two tons of freight for each ton shipped by rail.

Allied intelligence first identified the need to interdict the Danube as far back as the Casablanca Conference in January 1943. Allied strategists were anxious to block the increasing traffic before the anticipated showdown land battle on the continent once troops landed in France. The RAF was given the job.

From the initial effort on 8 April through 4 October 1944, when the final missions were flown, RAF air crews laid 1,382 mines in the river. In one night's operation on 1 July, a force of 69 Wellingtons and Liberators dropped a total of 192 of the deadly explosives. Altogether, there were 18 missions, all of them on nights when the moon provided enough illumination for the shorelines to be clearly defined from the air. Sometimes the planes unloaded the mines at altitudes of only 40 to 50 feet. It was skilled flying under the most challenging circumstances.

By June, the RAF had laid more than 500 mines the length of the river with gratifying results. The first barges were sunk after striking mines east of Vienna and downriver near Giurgiu in southern Romania. Traffic on the Danube was almost completely halted by May, less than a month after operations began. The river was free for shipping its entire distance for only a few days during that month. Hardly any oil moved. Ports and storage facilities were overcrowded. Regensburg in Bavaria was crammed with barges loaded with war equipment desperately needed on the Russian front. On 1 June, the

Hungarians were forced to warn all shipping between Goenuye and Piszke to stand fast until further notice.

Through mid-June, 39 vessels were sunk. Another 42 suffered varying types of crippling damage after striking mines. The deadly floating objects were aggravatingly ubiquitous to the Danuban barge crews. Civilian sailors deserted en masse until the Germans threatened to draft them into military service.

In further disruptive efforts, the RAF sent Bristol Type 156 Beaufighter night-attack aircraft from bases in Italy to harass river traffic. Armed with deadly cannon, the planes could ignite an oil-laden barge and touch off a dazzling pyrotechnic display. As one Beaufighter pilot reported after a strike, one oil barge “mushroomed up in vivid red and orange flashes.”¹ Eight such oil-carrying vessels were destroyed on the Danube by the night intruders, who also damaged 102 boats of all kinds, crippling about 100,000 tons of river shipping.

By cutting the Danube, the RAF further sealed the fate of the Reich. Captain Mossel, who served as a navy liaison officer with Luftwaffe, wrote in June: “The enemy has mined the Danube systematically and has achieved his objective of upsetting the traffic in the Balkans.” He added, “At present we are unable to cope with the situation.”²

The mine-laying campaign caught the Germans by surprise. A few mine-detecting aircraft were available. Eventually a squadron of German Junkers Ju 52s was equipped with detonating rings to explode the mines but, in great irony, these flying minesweepers were grounded because of a lack of fuel. The prime reason for the shortage in turn was the sharp decrease in petroleum products caused by the disruption of Danube traffic.

German engineers and scientists were pressed into service to find solutions. A demagnetizing station was built at the river port of Ruse in

¹ This quotation and much of the material on the Danube mining operation was taken from Denis Richards and Hilary St. George Saunders, *The Royal Air Force, 1939–45*, vol. 3, *The Fight Is Won* (London: Her Majesty’s Stationary Office, 1954). Additional data is available in unit histories available at the Imperial War Museum, London.

² Richards and Saunders, *The Royal Air Force, 1939–45*, vol. 3, 227.

Bulgaria, 64 km south of Bucharest, the Romanian capital. This measure was far from satisfactory. Even less successful was the conversion of the Serbian tugboat *Jug Bodan* to a minesweeper. It failed to detonate a single mine during its brief and dangerous assignment. One may assume its captain contributed to its failure. He chose to direct operations not from the bridge but from a safe area on the riverbank. The actual work of sweeping was left to seven inexperienced enlisted sailors who worked in cautious terror.

RAF historians estimate that traffic on the Danube was reduced by two-thirds between April and August 1944. German sources agree with this estimate of the operation's impact. Put another way, about 2 million tons of supplies, particularly critical fuel, were denied the Axis.

Germany was still fighting on Russian soil in May 1944. Among the few encouraging reports Hitler received was one informing him that the Luftwaffe's first heavy bomber group was ready to begin operations against the Russians.

Major Horst von Riesen was already at the group's East Prussia headquarters and base, and as commander of *Kampfgeschwader 1* (KG 1 or Battle Wing 1) he felt his new aircraft would play an important role in beating back the Red Army. Each day, freshly painted Heinkel He 177s (Griffins) landed and were quickly integrated into squadrons. Two power units welded together to drive a single propeller and mounted on the front edge of the wing, one to each side, gave the four-engine plane the shape of a shorter distance twin-engine aircraft. The bombers had been assembled and tested under tight security. Germany hoped their attacks on Russian staging areas would come as a devastating surprise.

With the introduction of the new He 177s, Hermann Göring hoped to end what he called "the saddest chapter" of the Luftwaffe, the lack of a long-range heavy bomber. The war had been fought for nearly five years, and there were missed opportunities aplenty because the German air force lacked the ability to strike from afar. Perhaps, Göring thought, he might soon have enough of the Heinkels to realize his long-frustrated plans to destroy Allied convoys far out in the Atlantic and even bomb the United States when midair fueling was perfected.

Figure 16.1. Pegnitz River



A U.S. soldier witnesses vast destruction along the Pegnitz River near Nuremberg, Germany, 1945. By the end of the war, much of Germany's industrial capability had been effectively neutralized by the Allied bombing campaigns.

National Archives and Records Administration

Plagued by horrendous problems and the deaths of a dozen test pilots since its first flight in 1939, the He 177 finally appeared to be ready for combat. Plans in May 1944 called for the production of 200 advance models a month to be achieved by using 6,000 slave laborers from the Oranienburg concentration camp in Germany. The Heinkel could carry more than six tons of bombs or missiles at a speed of nearly 483 km an hour and fly as high as 26,500 feet. Its range of 4,989 km would permit deep penetration of enemy territory for the first time.

The He 177 had much to live down. In January 1944, a few of the aircraft were involved in a heavy retribution raid on London, but the plane's low-level attack procedures yielded disappointing results, and it was abandoned immediately thereafter. Hitler was moved to berate the Heinkel: "They can't even get *that* far. This rattletrap is obviously the worst junk ever to have been manufactured."³

Persistence by Heinkel engineers and the Luftwaffe's commitment to the only available long-range bomber in the immediate future led to modifications and improvements and finally the formation of KG 1 on the eastern front.

Ninety of the He 177s were ready to begin operations when the fuel famine hit. Each of the bombers required 1,800 gallons for a medium-range mission. A flight of 80 thus consumed 146,000 gallons. In August 1944, that amounted to the average daily production fuel for *all* of Germany.

KG 1 started operations without any fuel reserves at its East Prussia base. It lived from day to day. When Allied fighters destroyed a fuel train en route to the field, all planes had to be grounded until the next delivery. Eventually, there were no more deliveries. A lack of fuel kept the Germans from ever fully utilizing their one and only heavy bomber unit of the war. By fall, the He 177s were flown back to central Germany and the squadron disbanded. "It is ironic that the 177s should have to be withdrawn from operations [for lack of

³ David Irving, *The Rise and Fall of the Luftwaffe: The Life of Field Marshal Erhard Milch* (Boston, MA: Little, Brown, 1973), 262.

fuel] at the very moment when this type of bomber was achieving the success which had eluded it for so long.”⁴

The downfall of the He 177 was another in a series of failures that were blamed on Göring, once second only to Hitler in power. The fall of the World War I aviation hero from grace and power in the Nazi hierarchy was gradual. He retained his grand titles—Reich marshal, economic plenipotentiary, chairman of the Reich Research Council, chairman of the Defense of the Reich, master of the German Hunt—and he was still commander in chief of the Luftwaffe, but by 1943 he was a mere figurehead. He shunned reality and feigned illness. His drug addiction (up to 100 paracodeine pills a day) rendered him helpless and hopeless.

Göring’s Luftwaffe was the most powerful air force in the world at the beginning of the war. By 1943, it was incapable of offensive operations and was equipped with semiobsolescent aircraft using inferior fuels. Disastrous failures in the battles of Britain, Malta, and Stalingrad—which Göring pledged to keep supplied with aircraft—plus the destructive Allied air attacks on Germany itself doomed the Luftwaffe and Göring.

Nonetheless, the Reich marshal sometimes intruded in unpredictable and whimsical ways. In early October 1943, Göring learned that fighter planes were being equipped with two 30-gallon auxiliary fuel tanks. It was a long-belated move making the Messerschmitt Bf 109s and Focke-Wulf Fw 190’s more effective by giving them greater range. Göring was furious, charging that not even the “extravagant Americans” would waste fuel that way. He demanded that pilots be instructed to jettison empty tanks when in combat. The Luftwaffe obeyed Göring’s order by telling the pilots on 12 October not to drop their spare tanks except when they found themselves in desperate situations.

Göring became a joke among those with whom he was still in contact. There were many monuments to his folly. For those responsible for fueling the Luftwaffe, the most conspicuous was the Engine Institute of the Hermann

⁴ Alfred Price, *Luftwaffe: Birth, Life and Death of an Air Force* (New York: Ballantine, 1969), 147.

Göring Aviation Research Center at Völkenrode near Brunswick. The imposing array of brick offices and laboratories was ordered built in 1936 after Göring was named head of war planning and fuel coordinator. Construction was completed in 1938 and the complex was equipped “without regard to cost.”⁵

Göring envisioned the Engine Institute as a technical think tank that would help maintain Germany’s creative position of aviation excellence. Hundreds of the best scientists and technicians were employed. Like many of Göring’s projects, the Engine Institute failed. It was a white elephant, producing nothing of practical value. To those involved in aviation engineering and fuel problems, Völkenrode represented a wasted resource that drained the industry of personnel, equipment, and millions of marks that should have been applied elsewhere. The Engine Institute was called a luxury “hobby shop” where individual researchers pursued narrow theoretical studies oblivious to national need. It was as if there were no war. The institute’s general director claimed tangible results were never expected.

No thanks to the Engine Institute, progress was being made by others. Jet aircraft and rocketry were advanced to levels previously unknown. Those notable achievements cannot be underestimated, yet there were the direct applications of scientific and technological breakthroughs achieved prior to the war. Germany’s first rocket-powered flight was launched by Fritz von Opel in 1929. A rocket weapons center at Kunersdorf was established the next year, followed in 1937 by the more advanced facility at Peenemünde.

Then, two years later, in 1939, German aviation progress seemed to come to a sudden halt, though momentum carried it right through the end of the war. Still, the prewar Heinkel He 178 was never developed. After 1940, only engine and fuel research of an exotic nature was emphasized. Practical jet planes and the V-weapons (*Vergeltungswaffen* or retaliation weapons) resulted, but they became operational too late to affect the outcome, even though General Adolf Galland had flown a fighter jet, the Messerschmitt Me 262,

⁵ U.S. Strategic Air Forces in Europe, *Complete Survey of Aviation Fuel Utilization Research in Germany during the War*, Technical Intelligence Report No. A-480 (U.S. Army Air Forces, 1945).

as early as 22 May 1943. “I was convinced this aircraft could be the solution against the day attacks,” he reflected. “I tried everything to get this aircraft into the fighter arm but Hitler decided the other way.”

Eventually, the jet became operational, and the German ace recalled shooting down two British Martin B-26 Marauders with one rocket because of the plane’s superior speed and maneuverability.

“You could approach the bombers without taking care of the escort fighters and when you came in at a certain angle . . . when you came from downstairs, then the air was full of wings and fuselages,” he said. “And you could fire this aircraft out of a distance of six hundred meters. This meant out of range of defensive fire.”

One of the mysteries of World War II has to be Hitler’s delay in developing his jet fighter considering the early test flights by the Luftwaffe prior to the war. The engines in the German jets that first saw action during the conflict were developed in 1935. The kerosene fuel of the plane was readily manufactured from coal, which Germany had aplenty. Galland said the engines of the jets finally used near the end of the war lacked endurance. He blamed this to a great extent on the lack of proper steel, a problem that earlier use might have solved, but Berlin dictated a freeze on programs to perfect existing aircraft and fuel. The resulting stagnation of creativity in the areas of applied combat, coupled with Germany’s depleted resources, was a sore that soon festered and became fatal.

German governmental facilities such as the Engine Institute and other smaller Air Ministry research centers were not only wasteful but unmindful of what needed to be accomplished. A postwar U.S. study concluded that their efforts “consisted of technical service, seeking emergency measures for augmenting dwindling supplies and of academic studies of the elements of combustion.”⁶ The second area—what to do about supply shortages—was halfhearted at best and not useful at all.

⁶ U.S. Strategic Air Forces in Europe, *Complete Survey of Aviation Fuel Utilization Research in Germany during the War*.

Engine manufacturers, including Daimler-Benz, BMW, and Junkers, and the I. G. Farben chemical companies did more than the government centers to promise useful fuel research. Even then, no entity in Germany attempted to increase engine performance through the development of improved fuels. Berlin was unyielding and inflexible. Once the Air Ministry settled on a particular fuel with stated properties and characteristics, little effort was made to upgrade the fuel. In the cases of C-3, which was 95- to 97-octane, and jet-propulsion fuel, only minimal emergency measures to improve them were ever considered. New fuel requirements were never projected. The result was that fuels developed in 1941 and 1942 were to power German planes for the remainder of the war.

The scarcity of crude oil and enforced reliance on hydrogenated substances were limiting factors, but there were others. One of the most important was a lack of imaginative leadership. Potential benefits of fuel upgrading, which continued among the Allies throughout the war, was also denied when facilities were stripped of professional personnel engaged in practical programs. The Engine Institute, however, retained its vast staff. In the end, there was no research on the properties of high-octane fuel components or any significant research on substitutes.

During the last five years of the war, it was impossible to meet demands for fuel quality improvement, despite a demonstrated need. The single exception perhaps was when the Focke-Wulf 190 was shown to need a boost in "flash" performance for interceptor operations. The problem was solved with the injection of nitrous oxide. Still, the basic fuel was the highest quality 95- to 97-octane aviation gasoline that was developed in Germany. This fuel was in constant short supply and would have been unavailable for combat squadrons except for the sharp cutbacks in training hours.

The C-3 95- to 97-octane fuel was originally made up of synthetic isoocanes and aromatics with a mix of 4.6 cubic centimeters of lead per gallon. Later, more lead was added, though that still did not affect its basic octane level at cruise range. The fuel produced a low "lean" rating. This resulted in high cylinder temperatures in normal flight, as opposed to "flash" responses with injection when fully powered. The resulting high temperatures led to uneconomical consumption, in effect making them gas guzzlers. An increase

in “lean” through the use of a higher octane would have eliminated the problem. German engineers admitted later that 100-octane levels obviously would have been preferable but that Germany did not have the means to raise octane levels.⁷

An even more serious fuel problem was flameout of jet-fighter engines at high altitude. With flameout, the engines could only rarely be restarted. It is not surprising that of the 1,296 Messerschmitt Me 262 jet fighters built, only 300 or so ever engaged in combat. Test and training accidents, many directly attributed to fuel-related problems, took an overwhelming toll of pilots and aircraft. Of the nine aircraft in the first combat squadron, four were lost before going into action.

The fuel used by the world’s first jet fighter was simple. Regular home-heating-type oil was the basic component, to which was added 5 to 8 percent normal octane gasoline. It was dirty, and quality suffered because volume was more important. The tradeoff was an inferior fuel, though more was readily available.⁸

An improved fuel was possible, but no effort was made to give the Me-262 a better, safer propellant. Carbon formation in the combustion chamber led to a loss of efficiency as well as flameout. The problem was more severe at higher altitudes. Incredibly, the average life of the Junker engine that powered the Me-262 ranged from only 20–50 hours. General Galland said some engines were removed after only 12 hours.⁹ Today’s jet fighter engines have an average life of 48,000 hours. As was common with the Air Ministry, once a fuel or an engine was accepted with certain specifications, improvement modification was seemingly impossible. Hidebound Air Ministry officials grappled with problems by ignoring them. Fuel and engine improvement were completely overlooked when jet fighter became operational.

⁷ U.S. Strategic Air Forces in Europe, *Complete Survey of Aviation Fuel Utilization Research in Germany during the War*.

⁸ Cajus Bekker, *The Luftwaffe War Diaries: The German Air Force in World War II*, trans. Frank Ziegler (Garden City, NY: Doubleday, 1968), 356–57.

⁹ Statement by Gen Adolf Galland, LW (Ret), Virginia Bader Aviation Symposium, Alexandria, VA, 2 November 1985.

Research on antiknock additives that might prove better than lead was begun at the I. G. Farben Oppau laboratory in 1943, but only compounds of chlorine and bromine were considered. The tests were still going on when the facility was destroyed by Allied bombers in 1944. BMW briefly experimented with tar oils as an additive for C-3 fuel, but the results were negative.

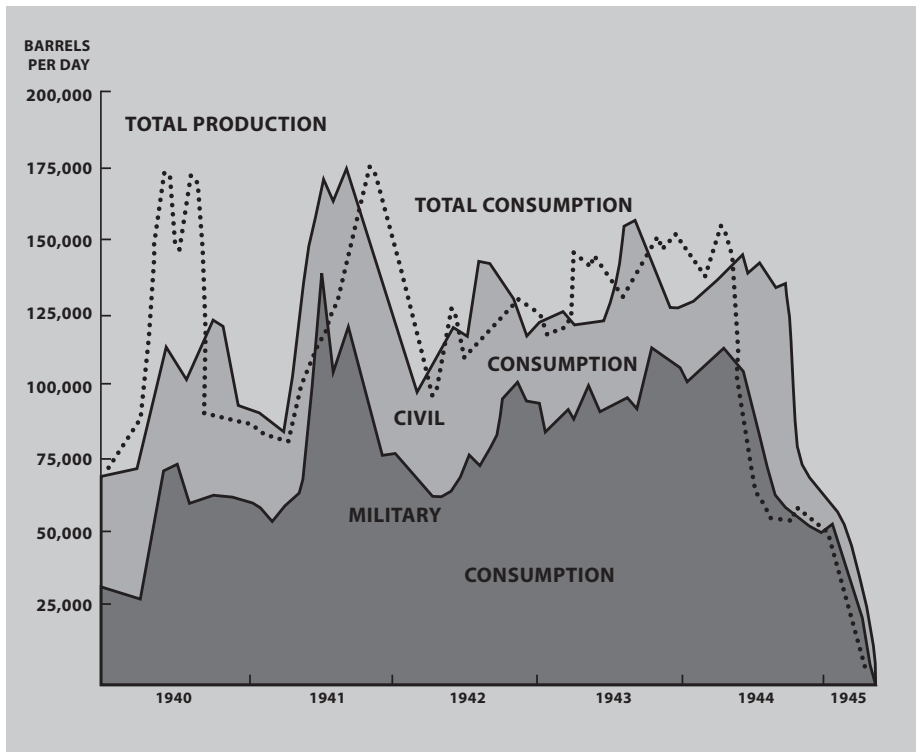
After the war, American experts studying Germany's fuel facilities found much that impressed them, above all the extent of synthetic production. Yet, there was the realization of the tremendously high price Germany paid for its synfuel. For example, the I. G. Farben hydrogenation plant at Leuna, which produced most of the aviation fuel, was monstrous in size, but its output was still extremely limited. A conservative U.S. estimate concluded that 10 times as much steel was required per barrel of gasoline produced than for an average American refinery. It also took a half-ton of bituminous coal to produce a barrel of synthetic oil. In addition, 80 percent of the coal that was the base element for ersatz oil came from the Ruhr, an area within the range of Allied bombers from the very start of the war. It became apparent early in the fighting that this reliance on a vulnerable production and transportation source would jeopardize the entire synthetics program, even with the large plants still safely far away in southeast Germany.

Most German scientists were quick to criticize the restraints placed on them and the arbitrary standards forced by centralized planning. Many complained that imaginative programs were impossible, although problems were clearly defined and not beyond solution. All agreed, however, that the root cause of Germany's fuel problems was a lack of natural crude oil.

From 1939 through 1945, Germany used nearly 200 million barrels of crude oil produced in other countries. Its own fields yielded 64 million. A total of 235 million barrels of synthetics was manufactured during the same period.

While natural crude was only one-fifth of Germany's overall oil provision at the end of 1943, it accounted for one-half of the Third Reich's increasingly meager supply in the last 12 months of the war. The increased reliance on crude resulted from the destruction of the synthetic plants; but in 1945 a desperate Germany, its army forced back within its own borders, had no alter-

Figure 16.2. German fuel production and consumption, 1940–45

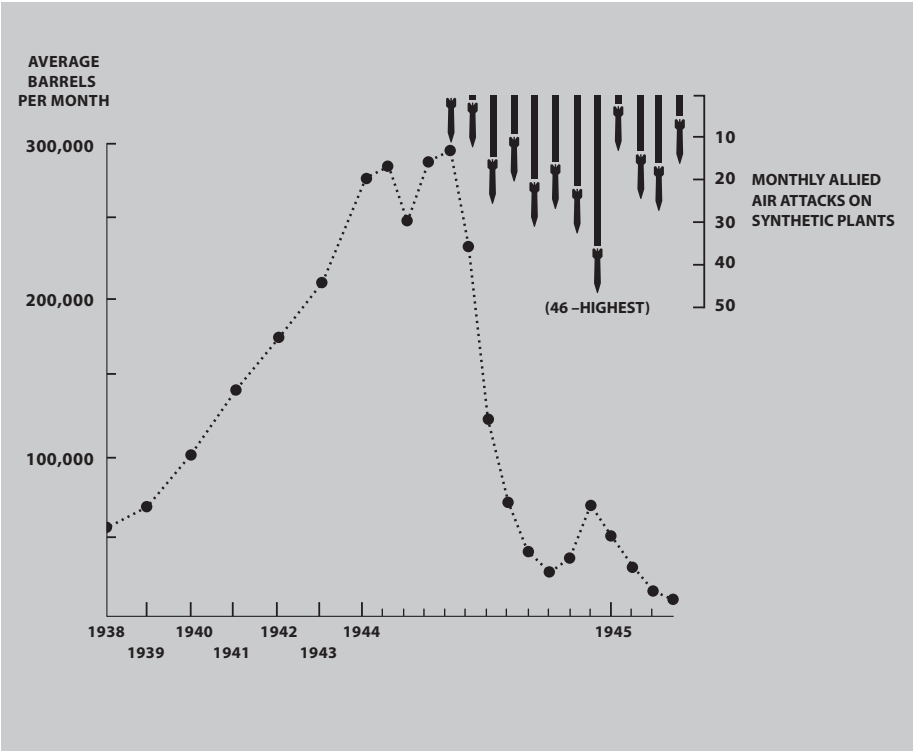


Includes all motor gasoline, diesel fuel, and aviation fuel.
Courtesy of William Morrow, adapted by MCUP

native except synthetics. The foreign oil fields once under Nazi control were gone. The manufacture of conventionally powered aircraft was halted, and only jet planes were authorized because of fuel availability.

The final effort to expand synthetic production, begun in 1944, was directed at enlarging and repairing damaged facilities and moving as many as possible underground. More than 12,000 workers, about half of them slave laborers, and \$560 million (1.4 billion RM) were earmarked for the plan. Only 30 percent of the money would be spent by the end of the war. A few small underground installations were actually finished by then, but scores of unfin-

Figure 16.3. Effects of Allied air offensive on German synthetic fuel production



Courtesy of William Morrow, adapted by MCUP

ished sites were scattered among the quarries, mines, and caves of Germany and Austria. It was the final unpromised panacea divined by an overreaching German leadership. In the end, as in the beginning, oil autarky was only a dream. In reality, synthesis was an inadequate palliative for Germany’s lack of natural crude.

There was another side to the German synthetic fuel program that has passed largely unnoticed. Morality was abandoned in the effort to produce oil from coal at any cost. Malnutrition was endemic among the synthetic plant slave laborers, who were fortunate to receive 1,000 calories a day. I. G. Farben, which op-

erated most of the facilities, in its report to the government on food provisions in March 1941 said, “The delivery of meat is out of the question for this year.”¹⁰

Medical treatment for slave laborers was virtually nonexistent. A draft of 500 Russian prisoners, for example, was decimated by disease within two months after being herded to the Landsberg synthetic plant. Eighty-two of them died, and nearly 200 were too ill to work. An Auschwitz camp for 2,500 workers—40 percent of them women—had no washing facilities.

Polish worker-prisoners at the Pölitz synthetic fuel plant near Szczecin called it “the slaughterhouse.”¹¹ Fires, explosions, and lethal gas attacks were common. On 26 June 1942, for example, seven men were engulfed in flames when a gas connection pipe burst and ignited a motor pump. A tower of fire more than 200 feet high roared until the gas flow could be cut off. Another gas leak and explosion claimed two more lives only days later. Late in July, a third major accident produced more casualties. The Gestapo suspected sabotage, which subsequent inquiries disproved, but the slave laborers knew that, for whatever reason, Pölitz was a powder keg.

If the problem of fires and explosions in the hydrogenation process was not enough, there was always the chance of being caught in an air raid. Although only a few raids against the synthetic plants were flown during the early years of the war, they were deadly, and the workers lived in constant fear of them. By October 1942, six of the installations in the Greater Reich had been attacked. Fifteen workers were killed during a raid on Pölitz when a bomb destroyed their living quarters.

Perhaps to assuage their consciences or give their employment practices a measure of legitimacy, I. G. Farben and other operating companies did pay wages to the slave laborers. The German Labor Office set the pay scales, the equivalent of 12 U.S. cents per hour for unskilled workers and 16 cents for skilled laborers.

¹⁰ The bulk of the material in this section comes from Terry Hunt Tooley, “The German Plan for Synthetic Fuel Self-Sufficiency, 1933–1942” (unpublished thesis, Texas A&M University, 1978). Tooley relied heavily on mimeographed transcripts of the U.S. Army Military Court at Nurnberg and the files of the German Document Retrieval Project of the university.

¹¹ Bogdan Kipling, interviews with authors, Washington, DC.

Little wonder the slave force sought to escape. Of the 4,914 foreign labors at Auschwitz in 1942, about one-quarter of them had fled by September. I. G. Farben worked with the Gestapo to clamp down on such absenteeism and to determine how many guards would be necessary to stop breakouts. It was decided that one guard was required for every five workers. Other steps were taken, such as improved barbed-wire fencing around work and living areas and moving workers from their camps to the plants in daylight hours only. To prevent escapees, synthetic facilities were shut down completely on foggy days.

Productivity among slave laborers was predictably low. I. G. Farben authorized its German foremen to flog recalcitrant slave laborers, although the beatings were to take place out of sight of other workers to avert further demoralization. I. G. Farben officials considered corporal punishment necessary since “every type of pressure, even sending them to a concentration camp, remains without result.” Plant foremen were reluctant to turn “troublemakers” over to the Gestapo for “discipline.” A worker, no matter how unproductive he or she might be, was preferable to no worker at all. The Gestapo tended not to return the slave laborers.

Concern about low productivity rates among slave laborers mounted as greater production was demanded from the synthetic plants. The Reich commissioner of labor, Fritz Sauckel, surveyed each foreign group working at the facilities and compared the results with German workers. The report concluded the French were 80–90 percent as efficient; Belgians, 75–85; Poles, 65–75; Serbs, 60–70; British, 45–55; and Russians, 40–50.

The study was put to good use. At least twice as many Russians and Germans, for example, would have to be used to produce ersatz oil. There was, after all, a great pool of slave laborers available, and numbers were not important. I. G. Farben felt it could boost production even with increasing numbers of foreigners. The giant company had studied such matters for a number of years. As far back as 1940, I. G. Farben had decided to build a new facility at Auschwitz in occupied Poland because of the concentration camp located there. It was “a logical, if grotesquely amoral, industrial decision.”¹²

¹² Tooley, “The German Plan for Synthetic Fuel Self-Sufficiency, 1933–1942,” 102.

The decision to use slave labor in its vital synthetics industry seemed logical to German leaders. They were willing to risk low productivity and even sabotage in view of Germany's manpower situation. The number of workers required to man key industries greatly exceeded the pool of available German men and women.

Hitler, as early as March 1939, suggested using Poles who would be captured in the forthcoming war to fill the Reich's labor ranks.¹³ After the invasion, the Germans lured some Poles with promises of steady employment, herded others in sweeps through the cities, and finally simply trucked them out of prisoner-of-war and concentration camps.

The labor problem intensified as Germany built more synthetic plants to meet its growing fuel needs. In 1941, for example, 45,000 new workers were needed each month to operate newly constructed installations. From July through September, the industry could get only a little more than half that number each month. The figure eventually dropped still further from October through December, when only 22,000, fewer than half the required number, were brought into the synthetic labor force.

As the manpower shortage became more critical, the Germans turned increasingly to "volunteers" from the occupied countries. Workers from France, Belgium, and Holland (plus some from Axis Italy) were recruited. The problem was that these "free workers," as they were called, also had the right to return home. Half of them, about 55,000, in the synthetics and refining facilities had done so by October 1942. The answer was greater use of "eastern workers, who cannot run away from us," as Carl Krauch, section head of the Reich's Office for Economic Development, stated.

When the Greater Reich's synthetic and crude oil industry was at its operating peak in April 1943, a total of 136,800 workers were employed. Of that number, about 32,000 were foreign slave laborers. By the following year, slave workers constituted a full one-third of the industry's workforce. As Berlin realized, dependence on such a significant percentage of slave labor in so vital a

¹³ This date is interesting, particularly for those who still wonder when Hitler opted for war or who think he could have been persuaded by diplomacy not to attack.

sector of the economy was playing with fire. That was doubly so when the war effort “hinged on the product.”¹⁴

A fuller appreciation of the difference in fuel use between Germany and the Allies can be gained by considering a single day’s raid by bombers of the U.S. Eighth Air Force. On 30 November 1944, about 1,200 American heavy bombers attacked German synthetic-oil plants at Böhlen, Zeitz, Merseburg-Leuna, and Lützenkendorf and two rail marshaling yards. Each of the aircraft, Boeing B-17 Flying Fortresses and B-24 Liberators, consumed about 200 gallons of aviation fuel during each hour of flight. The round trip averaged about 1,930 km and covered six hours of flying time. All the bombers that day thus consumed 1,440,000 gallons of fuel, more than 34,000 barrels. That amount was more than *entire* Luftwaffe force used on an average day in 1944.

During that year, the German air arm expended most of its fuel in combating Allied bombing raids, but thousands of other aircraft were engaged on the western, Russian, and Italian fronts as well. In addition, the Germans were using air transport in diminishing but significant numbers for supplying their ground forces, plus attempting to train pilots. The Luftwaffe’s total aircraft strength during the course of the year was about 8,500 planes operational at any one time.

On an average day in 1944, however, all the Luftwaffe’s planes, on all fronts and in the full range of activity, consumed only 32,500 barrels a day. That year’s average distorts the great drop in consumption that took place after the Allied oil-bombing offensive got underway. In November 1944, Luftwaffe consumption was down to 12,500 barrels a day.

The bombers of the U.S. Eighth Air Force thus expended almost three times as much fuel in the 1,200-plane raids of 30 November as did the entire Luftwaffe, continent-wide and for all missions, on that same day.

¹⁴ Arnold Krammer, “Fueling the Third Reich,” *Technology and Culture* 19, no. 3 (July 1978): 416, <https://doi.org/10.2307/3103372>.

CHAPTER 17



GERMANY'S FINAL OFFENSIVE AND COLLAPSE: *From the Battle of the Bulge to V-E Day*

Above all, petrol governed every movement.

~ Winston Churchill,
Prime Minister of the United Kingdom

It was not until the 26th [of December] that the rest of the reserves were given to me — and then they could not be moved. They were at a standstill for lack of gasoline — stranded over a stretch of a hundred miles — just when they were needed.

~ German general Hasso von Manteuffel, commanding general
of the *Fifth Panzer Army* during the Battle of the Bulge

Stavelot was an unlikely major fuel center. Baedeker guides stressed the Belgian town's history, going back to the seventh century when it was "the see of abbots of princely rank." Remains of the Romanesque tower of the Benedictine abbey still dominated Stavelot in December 1944.

By then, the town had been transformed into a giant gasoline station. The American Ninth Army, crowding toward the Rhine and the German heartland, had amassed 2.5 million gallons of fuel around Stavelot and other nearby storage centers to propel its forces eastward. The town as a gas station was reinforced when the area's map depot was located there with its collection of more than 2 million maps of various scales. At Stavelot, just like back home at peacetime civilian service stations, American troops could fill up and select maps to locate their way. From corps to company, Stavelot was the way to go. Fill up, find your bearings, and press on toward the Rhine.

Stavelot straddles one of the few major roads through Belgium leading to Germany. The fuel stored there made it the largest depot on the European continent. Hundreds of thousands of filled five-gallon jerry cans stood along a 19-km stretch of tree-lined road from Stavelot to Spa and in the off-road forests, even up to the once fashionable park areas of the Bois des Mineres and Bois de Belheid outside of Spa.¹ Ninth Army armor and infantry units had only to pause long enough to load up their vehicles and supply trucks with fuel and then be on their way fully replenished.

Then suddenly, on 16 December, the U.S. forces that had rolled eastward since D-Day were on the defensive. Without warning, eight German panzer divisions broke through a silver wall of fog in the thinly held Ardennes forest early that damp, cold morning and caught the Americans by surprise.

Spearheading the bold counterstroke was a combat group of the *1st SS Panzer Division* commanded by Lieutenant Colonel Joachim Peiper, onetime adjutant to Heinrich Himmler and a veteran of the Russian campaign. On the eastern front, his tank unit earned the sobriquet “Blowtorch Battalion” for burning two villages and killing all the inhabitants.

Peiper’s orders were to drive his 142 tanks, including newer and more powerful Panthers and King Tigers, through Stavelot and Liège and on to the big Allied port of Antwerp, the prime objective of the giant German offensive. His panzers and self-propelled guns quickly rolled through Lanzerath, Honsfeld, and Büllingen in Belgium. At Büllingen, on the morning of 17 December, Peiper captured a fuel dump containing 50,000 gallons. He ordered 50 captured American GIs to the top off his tanks. After they did so, several of the prisoners were shot and killed, though it is a matter of dispute as to who actually killed them. This was followed by the infamous massacre at Malmédy, when his men gunned down 86 prisoners. Eventually, Peiper’s troops were tried for murdering 308 prisoners of war and 111 Belgian civilians.

Refueled after Büllingen, Peiper’s *Kampfgruppe* (combined-arms group), headed for Stavelot to cross the Amblève River. Only the Amblève and the

¹ Known around the world as “five-gallon jerry cans,” the cans actually held 4.5 U.S. gallons of gasoline.

Meuse, which Peiper planned to cross at Liège, impeded his panzers' path to Antwerp and the English Channel.

By dusk of 17 December, Peiper's advance tanks had reached a hill overlooking Stavelot. The handful of Americans there to defend the town was pitifully small. Company C of the 291st Engineer Combat Battalion had the responsibility for blowing up bridges over the Amblève at Stavelot and Trois-Ponts, a few kilometers to the southwest. A Belgian Army detachment was guarding the 2.5 million-gallon fuel dump.

A squad from the 291st under Sergeant Charles Hensel reached the stone bridge at Stavelot at about the time Peiper's lead tanks were approaching the town. Hensel found the bridge unguarded. All his squad carried in firepower was a bazooka, a .30-caliber machine gun, and the members' individual weapons. He positioned the bazooka and machine gun in front of the bridge on the road toward Büllingen and planted 13 land mines in the road itself. What the Americans did not know was that a force of nearly 150 tanks was coming at their pitiful roadblock.

At 1930 that night, one of Hensel's soldiers heard tanks approaching. He calmly and bravely stepped out on the road and yelled, "Halt!" German infantrymen riding atop the tank answered with a blistering barrage of fire. But after the bazooka crew fired several shots, the Germans decided not to advance. In the darkness, they could not be sure of the size of the force ahead.

The American squad, shaken but successful in stopping the German juggernaut, recrossed the bridge into Stavelot, leaving the mines in the road to warn them if the Germans resumed their attack.

Sergeant Hensel radioed for help and then checked to determine whether the explosives placed under the bridge's supports by the engineers were still wired for detonation. As they scampered through Stavelot, the GIs were greeted by about 50 soldiers they assumed were part of an American infantry group brought up to defend the town. Hensel and his troops were happy to see them but were too busy to talk.

The job of the larger force of newcomers was deception. They were German troops dressed in captured American uniforms, part of Lieutenant Colonel Otto Skorzeny's *150th Panzer Brigade*, which used English-speaking troops to create havoc and confusion behind American lines during the Ardennes offen-

sive. The group in Stavelot that night made sure the Amblève River bridge was not set for demolition. They undid the wiring after Hensel's squad pulled back, then moved quietly on to other areas to practice their chicanery.

That same night, *real* American troops were on their way to Stavelot, and just before daybreak, elements of the 526th Armored Infantry Battalion under Major Paul J. Solis arrived. Shortly, an artillery battery from the 7th Armored Division also appeared. Tank destroyers and antitank guns were moved into positions at key points near the prized bridge and at the road leading to the fuel dump, where the nearest of the stacked jerry cans were only a thousand feet or so from the span.

Peiper, meanwhile, anxious to move forward, was annoyed that his panzer column had stopped overnight. Concerned about fuel since his armor was expected to roll 145 to 160 km, he reviewed the maps provided by his intelligence staff. His big Tiger II carried a full load of 227 gallons but got a little more than a kilometer per gallon. The fuel dump at Büllingen had been properly marked, and the maps also showed part of the gasoline storage areas outside Stavelot. But the maps were not up to date. They pinpointed the fuel dump as being concentrated just outside Spa, which represented only the extreme perimeter of the massive fuel supply area and the spot most distant from Peiper. The panzer leader had no idea of the giant stockpile almost within sniffing distance.

His panzers had rolled from Büllingen with full tanks and now, a day later, were again in need of fuel if they were to reach Liège, 39 km away, and Antwerp, 113 km beyond Liège. A race to the English Channel was possible only if the panzers had full tanks before leaving Stavelot. Peiper was within a few thousand feet of all the fuel he would have needed to reach Antwerp. For that matter, the stockpile at Stavelot would have provided all the fuel needed for all 24 divisions, the 1,500 tanks, and the trucks and support vehicles necessary to transport the 300,000 Germans in the Ardennes offensive for 10 days.²

² German planners estimated daily fuel consumption of the entire Ardennes force at 260,000 gallons.

With first light on 18 December, Peiper's tanks assaulted Stavelot. The mines left by Sergeant Hensel's unit had been cleared, and the long column rolled toward the bridge. As Major Solis watched from his concealed command post on the other side of the river, a Panther tank gingerly approached the bridge, then crossed it, reaching the north bank. The bridge did not blow up, and more tanks poured across. Solis ordered his gunners to fire.

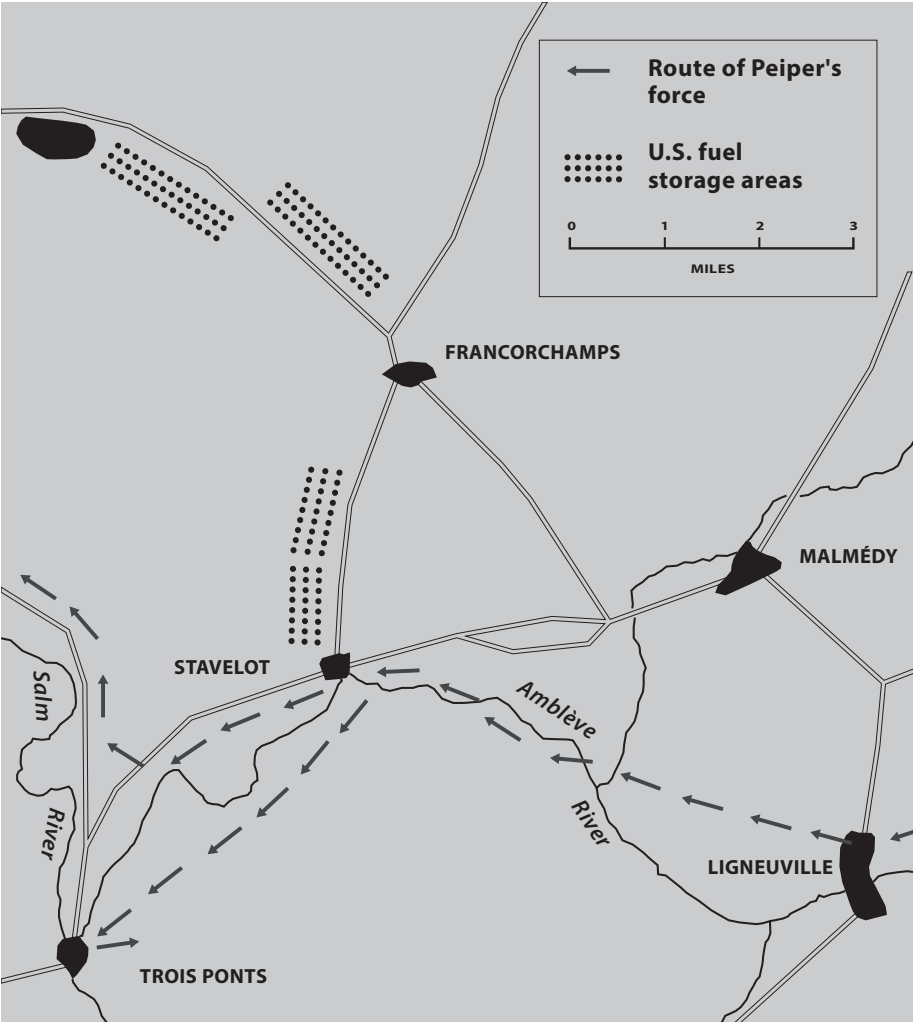
By 0800, the Americans knew they could no longer hold their positions. Solis ordered his troops to pull back, and most of them retreated toward Malmédy while the major, with a single antitank gun and about 15 soldiers, headed for the fuel dump up the highway to Spa. Working quickly, the small rear guard ignited gasoline stored in jerry cans in a deep ditch along the road. Soon, a line of flames extended far down the corridor, and then a perfect barrier was created when the fire jumped to cans on the other side as well. The inferno, its heat impenetrable, halted the Germans. Itching to penetrate farther west through confused Allied defenses, they turned back in their advance to Spa and headed away from Stavelot toward Trois-Ponts with Peiper unaware that he had missed capturing the biggest fuel dump in Europe. In recounting the battle later, Peiper said, "We proceeded at top speed towards Trois-Ponts in an effort to seize the bridge there. . . . if we had captured the bridge at Trois-Ponts intact and had enough fuel, it would have been a simple matter to drive through to the Meuse early that day."³

Before the wall of flames that blocked the Germans at Stavelot was extinguished by American reinforcements, it had consumed 135,000 gallons but, in the process, saved the remaining 2,365,000 gallons from the enemy.

If Peiper had crossed the Meuse River on 18 December with the fuel depot in his hands, history might have changed. There were no natural obstacles to Peiper's advance from Liège to Antwerp. At Trois-Ponts, however, Peiper began his decline. The two bridges there over the Amblève were demolished before his tanks could cross. Some of Peiper's forces followed a

³ Hugh M. Cole, *The Ardennes: Battle of the Bulge*, U.S. Army in World War II Series: The European Theater of Operations (Washington, DC: Office of the Chief of Military History, Department of the Army, 1965), 267.

Map 17. Route of LtCol Peiper's force in the Battle of the Bulge



Courtesy of William Morrow, adapted by MCUP

circuitous route to reach Stoumont and Forges to the west, but they were no longer on the straight path headed for Liège.

As for the fuel dump, it had been lost to Peiper forever.

From 18 December on, it was hard going for his forces. Fuel had become the chief limiting factor that day. As the U.S. historian of the battle wrote, “Without fuel the punch and drive were gone.”⁴

Once so close to coveted fuel, Peiper ran out of gas and luck. He was threatened with encirclement by 20 December. The Germans vainly tried to save Peiper’s group, to keep the remaining troops alive, and to salvage the armor. They also wanted to retain possession of the area north of the Amblève that Peiper had captured. The German Army High Command overruled the commander of the *SS Panzer Corps*, who wanted Peiper to break out to the east, insisting that Peiper should be resupplied to “once again set his *kampfgruppe* on the way west.”⁵

An airlift during the night of 22 December proved futile. Twenty planes of the Luftwaffe tried to parachute gasoline and ammunition to Peiper. Many of the fuel containers fell into American positions, and the Germans could not recover enough material to alter their situation.

On the day after Christmas, the *1st SS Panzer Division* and Peiper’s *Kampfgruppe* were removed from the books as combat units. A few fighters escaped, but the bulk had been killed or captured. Just a week after the fuel stores at Stavelot were unknowingly bypassed, the German dream of turning the war around had vanished.

For most of the war, “German strategy was limited to the pace of the horse drawn wagon and the infantry.”⁶ The Ardennes offensive was further evidence of the failure to exploit mechanized warfare because of a fuel deficiency, resulting in still greater dependence on archaic transportation. That was never more evident as Germany struggled to deploy its remaining forces to stave off total defeat.

German combat infantry divisions, the backbone of the Wehrmacht, were reduced to skeletal force strength. Heavy battlefield casualties and material shortages due to reductions in production capacity forced the German High

⁴ Cole, *The Ardennes*, 338.

⁵ Cole, *The Ardennes*, 374.

⁶ W. Victor Madej, *Hitler’s Dying Ground: Description and Destruction of the German Army* (Allentown, PA: Game Publishing, 1985), 85.

Figure 17.1. German prisoners during the Battle of the Bulge



An American soldier guards German prisoners during the Battle of the Bulge, 1944. As the campaign went on through the winter of 1944–45, German units ran out of fuel, and many soldiers were subsequently killed or captured by Allied troops.

National Archives and Records Administration

Command to restructure the basic division. In the final winter of the war, Germany maintained 273 divisions, of which 188 were essentially infantry. Most of the rest were badly depleted panzer grenadier and mountain units. Although 4.7 million troops were already casualties of war, the Germans still had 8.4 million in uniform. The bulk of them were in the army, increasingly boys 16 or younger and men older than 45.

At the beginning of the war, 17,000 soldiers were assigned to each of the standard-size divisions. The units of 1945 were scaled down to 11,900, including 700 *Hilfswillige*, or volunteer laborers, most of whom were Russian. Cutbacks in weapons and motor transport were equally severe.⁷

More than ever, horses provided the main source of logistical movement. “The lack of fuel doomed most of Germany’s twentieth-century army to a nineteenth-century pace.”⁸ The new standard division was equipped with nearly four times more horse-drawn vehicles than trucks. Three thousand draft horses were allocated to each division. Infantry in the German Army in the last months of the war were more likely to march everywhere and be supplied by horse-drawn carts than they were at any other stage of the war. The supply situation was such that the supposedly mobile grenadier battalion of 700 troops in each reformed division relied primarily on bicycles for transport.

In the American forces and other Allied armies on the western front, on the other hand, the use of horses was nonexistent. Table 17 compares the vehicular strength of German and U.S. infantry divisions in late January 1945.

While fuel and vehicle shortages plagued the Germans and were prime factors in restricting their transportation, the Allies moved vehicles and fuel around the continent with comparative ease. Europe’s highway system gave the Allies a tactical superiority of immense importance. On 1 April 1945, the 84th Infantry Division was motorized and rode in 264 two-and-one-half-ton trucks to an assembly area near Wesel, Germany, to cross the Rhine.⁹

The American two-and-one-half-ton truck was a real workhorse and was used interchangeably for cargo and personnel. In comparison, it was difficult for the Germans to provide any semblance of mechanization. Their production of trucks, for example, fell to 3,600 by December 1944 from a peak of 10,400 per month in March 1943. The entire Germany Army was equipped with only 260,000 trucks by then, and losses far exceeded replacements. German military consumption of motor gasoline and diesel oil dropped to 40,000 barrels

⁷ John E. Stauffer, “Infanterie-Division 45,” *Military Journal*, no. 12, n.d.

⁸ Madej, *Hitler’s Dying Ground*, 11.

⁹ Harold P. Leinbaugh and John D. Campbell, *The Men of Company K: The Autobiography of a World War II Rifle Company* (New York: William Morrow, 1985), 259.

Table 17. Axis and Allied divisional vehicular strength

<i>Type of vehicle</i>	<i>German</i>	<i>American</i>
Ambulances	—	30
Personnel trucks	146	—
Trucks, 1/4-ton (jeep)	—	665
Trucks, 3/4-ton (weapons carrier)	—	223
Dump trucks	—	27
Wreckers, 4-ton	—	4
Wreckers, 6-ton	—	3
Cargo trucks	185	—
Trucks, 1 1/2-ton, cargo	—	105
Trucks, 2 1/2-ton, cargo/personnel	—	275
Half-track trucks	16	—
Buses	3	—
Tractors	32	21
Half-track tractors	3	—
Self-propelled assault guns	14	—
Cars, light M8 with armament	—	13
Cars, utility M20 with armament	—	1
Half-tracks with armament	—	5
Trucks, 2 1/2-ton, other	—	84
Trucks, heavy wrecker	—	1
Motorcycles	90	—

Table 17. Axis and Allied divisional vehicular strength (continued)

<i>Type of vehicle</i>	<i>German</i>	<i>American</i>
Motorcycles with sidecar	41	—
Half-track motorcycles	7	—
Trailers	30	641
Bicycle	1,465	—
Horse-drawn vehicles	1,273	—
Saddle horses	551	—
Draft horses	3,057	—

Courtesy of William Morrow, adapted by MCUP

per day by January 1945 from the 120,000 barrels a day it had reached in the summer of 1941 following the invasion of Russia. Since Germany’s total motorized strength, including everything from tanks to trucks, had increased threefold by 1945, the increase in fuel consumption should have gone up accordingly. Instead of tripling, it declined by two-thirds. “Inadequate mobility doomed the ground forces to conduct a hopeless attrition against overwhelming numbers and resources.”¹⁰

Germany miscalculated grievously in believing fuel supplies were adequate to undertake a major offensive in December 1944, although U.S. and British bombers had given its synthetic fuel industry a respite from September until near the end of the year by focusing on other targets. Not only did the Germans have insufficient gasoline, but the means to deliver fuel for a blitzkrieg in a campaign of difficult logistical dimensions were lacking as well. Some Wehrmacht divisions started the Ardennes offensive with more horses than comparable German units possessed in 1918.

¹⁰ Madej, *Hitler’s Dying Ground*, 15.

A dire shortage of transport animals in World War I, according to Germany's master strategist of the time, General Erich Ludendorff, was the biggest obstacle to launching German mobile attacks in the closing stages of that conflict. A quarter of a century later, Berlin found itself in a similar predicament when the panzer-led strike in the Ardennes was bogged down by a lack of motor transport. In desperation, the Germans were forced to turn back the clock to horse-drawn transportation.

In all of 1944, German truck and other military vehicle production was only half the number lost in combat or abandoned as beyond repair. Overaged and undermaintained vehicles commandeered in the occupied countries collapsed and could not be put back into service because of a lack of spare parts. The better ones had been seized in the early 1940s, and those that remained were barely worthy of being referred to as transport at all.

Supply centers for the Ardennes offensive were widely scattered, and the most important were east of the Rhine at least 56 km away from the front. The heavily forested terrain was also a liability from a supply point of view. Slippery surfaces and heavy snows, according to the Germans, reduced rated road capacities by at least a third.¹¹

Weather was a key factor in the Ardennes battle. It might have been less so had plans gone according to schedule, but fuel consumption by German tanks and other vehicles in getting to jumping-off points was far greater than anticipated. As a result, the original 19 November date for the start of the offensive was pushed back by nearly three weeks while storage tanks west of the Rhine were replenished.

Even the strict security that marked the offensive contributed to the shortages by causing many of the vital fuel-supply depots to be positioned far to the rear. Planners at the operational level, privy to nothing more than "something is being proposed that will require a stockpiling of fuel," assumed they were preparing for a fallback action that would carry them eastward toward or over the Rhine, not a strike westward that would require extended supply lines. Thus, secrecy, as General Heinz Guderian noted, was so stringent "that

¹¹ Cole, *The Ardennes*, 665.

distribution of supplies for the attacking force, in particular the fuel supplies, suffered in consequence.”¹²

Nevertheless, by German standards the fuel buildup was intense. From October on, horse-drawn wagons, instead of trucks, hauled fuel from railheads to advance supply depots on all fronts. Combat units were cut below normal subsistence levels, with fuel deliveries off by as much as 50 percent. By robbing Peter to pay Paul, Hitler “deprived already inadequate armored reserves, especially on the eastern front, of their ability to maneuver.”¹³

Hitler was convinced that sufficient quantities of gasoline would be available for the Ardennes offensive, but it is revealing that he sensed grave difficulties that could be overcome only by partially demobilizing even his armored divisions. At Field Marshal Gerd von Rundstedt’s headquarters, Hitler delivered a two-hour speech to his top generals that is almost startling in revealing his thinking:

The fuel actually needed for this operation is available. That we shall get there, there is no doubt. The general transportation situation is more difficult. Improvement in the transportation situation will depend on the extent to which each commander of a unit, each troop leader, examines conscientiously what he needs to take along and what is not absolutely needed. Everything that is taken along and is not absolutely necessary is not only a burden for the troops but a burden for the supply forces, a burden for the entire fuel situation, and that means a burden for the coming operation. . . . The character and the honor of a Panzer division—whether an army or an SS division makes no difference—is not demeaned if its battalions march for once on foot. If they cannot close up because of a road jam, then they are compelled to march on foot anyway. They have to get up to the front under all circumstances. If this operation were headed for the Sahara or for Central Asia, I would say that I understood that you do

¹² Heinz Guderian, *Panzer Leader*, trans. Constantine Fitzgibbon (New York: E. P. Dutton, 1952), 300.

¹³ Kent Roberts Greenfield, ed., *Command Decisions*, U.S. Army in World War II Series (Washington, DC: Center of Military History, Department of the Army, 1960), 448.

not want to part with your vehicles, but this operation, which in any case will not extend for more than 50 to 60 kilometers, can be carried out on foot. The infantry has to do that anyway and has never known otherwise. The infantry accepts this as its God-appointed fate and its honorable duty, but Panzer units regard it as kind of disgrace if suddenly some must for a while march on foot.

Hitler had an incredible knowledge of individual actions and drew on reports to illustrate his point about clogged transportation. He told the generals in the pre-attack speech about an incident involving the *12th SS Panzer Division* blocked in battle:

You could not get ahead and you could not get back. Finally not even the fuel was brought up. The vehicles hardly moved. They actually let the motors idle. They kept them running during the night to prevent damage from freezing, et cetera. The men kept warm that way, too. An immense amount of gasoline is needed. Everywhere the roads were bad. You had to drive in first gear.

One has the impression Hitler might have been sitting with his tankers. He appreciated the problems they faced and was driving his logistics experts to make sure the offensive could be sustained.

German quartermasters scraped the bottom for every drop of fuel available. Field Marshal Wilhelm Keitel, supreme commander of the armed forces, promised that 900,000 gallons of motor fuel would be made available for the 19 attacking and 13 reserve divisions, but his figure turned out to be hopelessly optimistic. At the same time, the German High Command grossly underestimated the amount of fuel that would be needed to reach Antwerp. Saddled with these errors, the attacking force was predestined to fail although the High Command assured Hitler on the eve of the offensive that gasoline stocks were adequate and he should not concern himself with logistics.

On paper, the plans did look good. Even though the 900,000-gallon stockpile figure fell short, perhaps by several hundred thousand, one High Command estimate assumed a bare minimum consumption of 170,000 gallons to reach Antwerp, and that amount seemed readily available. Or so it

was thought. As noted earlier, most of the fuel was stored east of the Rhine, a good portion of it as far back as Bonn. There was no rail system to get it forward. Trucks were scarce.

The *Fifth Panzer Army*, which was assigned the specific task of racing to Antwerp, realized days before the start of the operation that it would experience fuel difficulties. It began its attack on 16 December with only enough fuel to advance about 80 km, although it had been promised enough gasoline to move 261 km before a refill. Even the latter would have been adequate only under ideal conditions—no obstacles of nature, no enemy resistance, and advancing in a fairly direct line with bridges intact, normal road conditions, and no maneuvering or idling.

Not unexpectedly, the effects of receiving only partial fuel loads and little promise of replenishment were immediate. On the second morning of the offensive, the *116th Panzer Division* still had not made it to Dasburg, where it was to enter the battle. It finally got rolling four days late after receiving 25,000 gallons of captured American gasoline hastily shipped to the rear. On 20 December, the *2d Panzer Division* waited for gasoline north of Bastogne and could not advance to the Meuse as ordered. Its commander, under intense pressure, was able to move only the bicycle battalion, which they motorized by piling the soldiers into captured American trucks, jeeps, and half-tracks. Their tanks had to sit where they were.

Postwar analyses show that German fuel consumption peaked on 18 December, the third day of the offensive, and deteriorated after that. On that day alone, about 100,000 gallons of fuel were used by German ground forces in the Ardennes. When it is realized that on that single day the Germans used 59 percent of the fuel they estimated they would need for the entire campaign to reach Antwerp, their planning appears horribly flawed.

The fuel situation was belatedly recognized by the High Command. On 21 December, Hitler and the General Staff found the Wehrmacht far from victory. Although spearhead elements of the *Fifth Panzer Army* were less than 64 km from the Meuse, General Hasso von Manteuffel was almost three days behind schedule. His location, nonetheless, was excellent. His army's door to the Meuse was open down the valley of the Ourthe. Von Manteuffel, however, was not receiving enough fuel to continue to advance. Similarly, the *2d*

Panzer Division was able to move only a few tanks and artillery piece forward to maintain momentum. The small force was easily beaten back by U.S. paratroopers at Fraiture, Belgium, but with gasoline the full division might have smashed forward with ease through the American units still reeling from initial German successes.

By 24 December, with perfect flying weather back for the Allies, the situation for the Germans became totally grim. Major Allied counterattacks appeared likely, but the *Sixth Panzer Army*, by then immobilized by lack of fuel, could only stand in place. An advance guard of the *2d Panzer Division* was reduced to moving on foot. "Harassed commanders were forced to issue emergency orders to their troops to seize whatever gasoline they could find along the way. And equally serious, many of the artillery units and supply echelons were stranded while the fuel was diverted to the hungry tanks."¹⁴

Ten days after the offensive began, von Manteuffel summed up the plight of his panzer army: "The situation becomes critical. From the German point of view the Battle of the Ardennes has now become a defensive battle. Casualties both in men and equipment are heavy. The supply system is defective, fuel for vehicles in particular being completely unobtainable owing to [the] enemy's air superiority."¹⁵

Ironically, while three of the five divisions of the *XLVII Panzer Corps* were by now totally immobilized because of a lack of fuel, the *10th Panzer Division* was awaiting instructions in an assembly area west of Bonn fully loaded with enough fuel to advance 322 km or more. Yet, the unit never joined the battle since the Germans were unwilling or unable to move units being held in reserve because of the air strikes to which von Manteuffel referred.

Allied air superiority was almost won by default in the Ardennes campaign. Hitler had assured his ground commanders they would be supported by 2,000 aircraft of the *Luftwaffe*, but when the offensive started, only 325 planes were available on the entire western front. The situation improved somewhat by the first of January, when the number increased to between 850

¹⁴ Robert E. Merriam, *Dark December* (New York: Ziff-Davis, 1947), 35–36.

¹⁵ Seymour Freiden and William Richardson, *The Fatal Decisions* (New York: William Sloane Associates, 1956), 248.

to 900, but there was no way by then to blunt Allied air power interdicting supply lines and attacking the now-disorganized German ground forces.

Fuel was also a factor in limiting the full destructive potential of German V-2s, the 13-ton wingless rockets that were propelled by a reaction jet engine. The V-2s required only a minute of powered flight. Alcohol burned in an atmosphere of oxygen fed the propulsion motor. The mixture was pumped to the jet engine by a steam turbine.

Liquid oxygen production for the V-2s was started late in 1943 at two specially constructed plants, at Schmiedebach in Thuringia and Puchheim in Austria. Coal hydrogenation generally provided liquid oxygen, but Hitler ordered separate facilities just for the V-2s because he feared the synthetic oil plants would be too vulnerable to Allied air attacks (which they were). Alcohol for the V-2s came from potatoes, mostly from Poland and East Prussia. The Russian advances eventually cut off most of the potato supply and created difficulties in the production of sufficient quantities of alcohol. While liquid oxygen output at Schmiedebach and Puchheim remained sufficient to fuel the V-2s, growing transportation problems made it impossible to maintain sufficient quantities at the launching sites.

V-2 attacks began in September 1944. About 5,000 of the vengeance weapons were launched through the end of the war. Hitler had planned 10 times that number, but overall production delays and the inability to deliver the necessary amounts of liquid oxygen from the special plants, coupled with the destruction of the synthetic plants that could have provided adequate supplies over a more manageable transportation network, limited the devastating role of the V-2.

Horses played an increasingly important role in the German's supply system during the battle, but as more and more of them were brought forward to haul fuel and other supplies, a serious problem developed in "fueling" them. Straw and hay were available, but the High Command had to issue an order that soldiers could not use the straw as bedding. Foraging material became scarce in the later stages of the offensive when the countryside was effectively stripped of horse feed.¹⁶

¹⁶ Cole, *The Ardennes*, 668.

While the Germans used millions of horses in World War II, the U.S. Army had none. The only animals used by the Americans were mules, used primarily by American troops who fought their way northward in the mountains in Italy. Two American ships were converted to mule transports, with stalls constructed in the cargo hatches.

“They had to have mules,” recalled Lieutenant General Russel L. Vittrup, who served as an organization and equipment officer in the Mediterranean theater. “Either the men hauled equipment to the top of the mountain or the mules did. So, they started yelling for mules.”¹⁷

At first, the GIs took the mules of Italian farmers. When the farmers complained, the Allied command stepped in. “That was one of my jobs—to find mules,” Vittrup explained. “We scoured the Middle East, we scoured Spain, everywhere. Not only were mules hard to find, mule ships were hard to get. Anyway, we moved I don’t know how many mules into Italy, and we had some ready to go into southern France, too.”

The psychological effect of German army horses on American soldiers was very positive. Granted, the German soldier was a remarkably good fighting man, but his image as a “superman” that Hitler tried to sell was badly tarnished in the eyes of the American military, which considered German reliance on horses extremely primitive.

“Their use of horses solidified our faith that we would whip them in the end,” recalled Allan Christiansen, an infantry officer in World War II.¹⁸

Perception can be as important as reality in measuring an enemy. It can give a psychological edge that tips the scales of battle. American soldiers weaned on automobiles in a nation that had replaced horse-drawn vehicles with trucks and tractors perceived an army still using horses as innately unequal. This was especially true of the American armored divisions trained to encircle large areas of land rather than make slow and costly frontal assaults on well-dug-in troops. Slow, horse-drawn vehicles could hardly be expect-

¹⁷ Interview with LtGen Russel L. Vittrup, USA (Ret), Alexandria, VA, 9 December 1985.

¹⁸ Allan Christiansen, letter to authors, 26 November 1985.

ed to successfully transport and supply the Nazi army in the face of an overwhelmingly mechanized Allied force.

The American GI instinctively sensed this superiority. To them, horse-drawn vehicles were a throwback to an earlier, inferior age. He knew that firepower and mobility were on their side. Their task was to use these twins of victory wisely and effectively, and for the most part they did.

Christiansen recalled the German retreat across the Arno in Italy. “They could not withdraw in force with their horse-drawn vehicles,” he said. “We found hundreds of dead horses when we crossed the river. The discovery really opened our eyes to the limitations on German mobility.”¹⁹

When the German Army fell into full retreat during the Ardennes offensive, the fuel situation was even more desperate. General Fritz Bayerlein, commander of the *Panzer Lehr Division*, recalled:

Fuel was so desperately scarce then . . . in realigning my division a regiment marched on foot through the snow from the extreme north to the extreme south end; there was no gasoline to be spared. Fuel had to be transported by daylight and enemy fighters singled out the tank trucks. There were repeated air attacks on my forward tank repair shops and bombing had made the main roads impassable through the retreat route as the Houffalize [Belgium] bottleneck, requiring the use of rough by-pass roads. Because of these factors, I left 53 tanks by the roadside between 11 and 15 January.²⁰

No longer could the Germans count on captured Allied oil supplies to fill their empty tanks. It is interesting to note that the official American logistical history of the war states that U.S. supplies lost to the Germans were “negligi-

¹⁹ Allan Christiansen, letter to authors, 31 July 1985.

²⁰ *The War Reports of General of the Army George C. Marshall, Chief of Staff, General of the Army H. H. Arnold, Commanding General, Army Air Forces [and] Fleet Admiral Ernest J. King, Commander-in-Chief, United States Fleet and Chief of Naval Operations* (Philadelphia, PA: Lippincott, 1947), 425.

Figure 17.2. U.S. soldiers with tank in Germany



American armored infantry operate alongside a tank in Germany, April 1945. The overwhelmingly mechanized Allied forces possessed a clear superiority over their German enemy, many of whom relied on horse-drawn vehicles.

National Archives and Records Administration

ble.”²¹ To the Germans, captured gasoline was in many cases lifesaving. While in retreat, however, this source of supply was denied.

If the losses termed “negligible” had been available to the Germans, they could have waged their Ardennes campaign by their original estimates. In addition to the 135,000 gallons that went up in flames at Stavelot, German

²¹ William F. Ross and Charles F. Romanus, *The Quartermaster Corps: Operations in the War Against Germany*, U.S. Army in World War II Series: The Technical Services (Washington, DC: Government Printing Office, 1965), 426.

planes destroyed 100,000 gallons stored for Patton's Third Army, and another 650,000 gallons burned when the supply center in Liège was hit by German planes and a V-1 flying bomb.

The Liège center was alerted to evacuate three times during the Battle of the Bulge but continued to operate as the main supply depot, fed by almost unlimited resources. Rail shipments and trucks kept the Allied forces fully fueled.

Having stockpiled fuel for months before the offensive and then seen it used without results, the Germans had to reassess their capabilities. Hitler's historian wrote the following on the situation in mid-January: "It has now gone so far that in any operation, even those local in nature, it first had to be inquired if adequate supplies of gasoline and diesel oil were available, and whether they could be procured at the right time."²²

The extent to which the fuel situation affected operations was magnified by the sudden offensive explosion of the Russians on the eastern front after a hiatus of several months. The Red Army kicked off its winter offensive on 12 January 1945. Hitler responded by ordering the entire *Sixth Panzer Army* and four divisions from the west to the east to fight the advancing Russians. A move so massive was difficult under ideal conditions. Without adequate fuel, Hitler was told the redeployment could not be undertaken. The units were moved eventually but too late to halt the Russians before they could force their way closer to Berlin.

It was a miracle the German Army could take to the field at all. By the beginning of spring, Germany was described as "nearly as prostrate as any nation in history had ever been while still continuing to fight."²³

Many, like Albert Speer, knew the outcome had been decided long before. Speer felt the war was lost in January 1945 after the Ardennes offensive. Still, as he later stated in a deposition before the International War Crimes Tribunal, the turning point was when the Allies started bombing oil facilities:

²² Merriam, *Dark December*, 158.

²³ Charles B. MacDonald, *The Last Offensive*, U.S. Army in World War II Series: The European Theater of Operations (Washington, DC: Government Printing Office, 1973), 335.

All of our attempts [to prosecute the war] were fruitless, however, since from 12 May 1944 on our fuel plants became targets for concentrated attacks from the air. This was catastrophic. Ninety percent of the fuel was lost to us from that time on. The success of these attacks meant the loss of the war as far as production was concerned; for our new tanks and jet planes were of no use without fuel.²⁴

The revolutionary black German jets were spotted useless on the ground along Hitler's equally innovative autobahns by American air reconnaissance units.

"The autobahns were a natural for the jets," explained Harry Bott, who flew with the 10th Photographic Group of the 162d Tactical Reconnaissance Squadron of the XIX Tactical Command, attached to Patton's Third Army. "They provided long concrete runways for them when they had difficulty using the short, dirt type fighter fields for ME [Messerschmitt Bf] 109s and wooded areas off the autobahns were excellent to hide aircraft from enemy planes."²⁵

From July 1944 until the end of the war, the Luftwaffe consumed an average of only 5,500 barrels of aviation fuel daily. The total amount for the period was less than used in the month of June 1944 alone, before the impact of Allied bombing on oil production was felt. Put another way, the Luftwaffe in the last 10 months of the war existed on one-tenth as much fuel as it needed to maintain any semblance of normal operations.

Even when they went aloft, German pilots avoided fuel-consuming dog-fights. Bott recalled his first encounter with a jet in late April 1945 southeast of Munich at 4,500 feet: "He flew straight up in front of me, about 1,000 yards. Scared the hell out of me. He continued up over me. At the top of his apex he was about 2,000 feet directly above me. Looking at each other, I had only one thought—how the hell to avoid being shot down."

²⁴ International Military Tribunal, *Trial of the Major War Criminals before the International Military Tribunal, Nuremberg, 14 November 1945–1 October 1946*, vol. 16, *Proceedings*, 11 June 1946–24 June 1946 (Nuremberg, Germany, 1948), 484.

²⁵ Harry Bott, letter to authors, 10 November 1985.

The pilot of the faster, more maneuverable jet could have easily pounced on Bott's slower, clumsier propeller-driven aircraft. Instead, they simply rolled over and continued on northwest toward Munich.

It was not only the bombing of the synthetic plants that deprived Germany of military fuel. Once Romania was lost, Hungary became a key source of the German natural crude supply. The petroleum from the Lake Balaton region was important, its characteristics particularly suitable for the reining of aviation fuel. The importance of Hungarian oil was made clear when Hitler made an otherwise incomprehensible decision to move units from the western front to Hungary in early 1945 instead of warding off the Russian thrust to Berlin. Lake Balaton oil and the meager production from the Zistersdorf area of Austria were the main sources of crude left to Germany as its leaders saw the synthetic plants systematically destroyed.

From the start of the Allied attacks on the German oil industry until the end of the war 12 months later, the U.S. Eighth and Fifteenth Air Forces dropped 130,000 tons of bombs on Germany's synthetic and crude oil producing and refining facilities. At the time of the surrender in Rheims, the Germans were producing a mere 5 percent of the fuels they had turned out before the Allies began the concerted campaign to stop the flow. Germany was truly starved for oil, "as her captured commanders and officials testified, often with genuine emotion, for the last year of the war. Her air force seldom flew after the first concentrated attacks. Tanks and trucks had to be abandoned. Toward the last, even the most august Nazis in their hierarchy were unable to find gasoline for their limousines. Germany's industries were badly crippled, and an enormous amount of effort was absorbed in the furious attempt to defend and rebuild oil installations."²⁶

²⁶ Wesley F. Craven and James L. Cate, *The U.S. Army Air Forces in World War II: Mission Accomplished*, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945* (Chicago, IL: University of Chicago Press, 1951), 794.

CHAPTER 18



JAPAN'S SINKING FORTUNES

It was a war begun as a fight for oil and ended by the lack of it.

**~ printed in the Japanese newspaper *Asahi Shimbun*,
September 1945**

God was on the side of the nation that had the oil.

**~ Professor Wakimura, Tokyo Imperial University,
during a postwar interrogation**

Bringing his destroyer escort up the winding Saigon River, Commander Tadao Kuwahara of the Imperial Japanese Naval Reserve was struck by what he saw. The 15 ships of the convoy appeared to be floating on rich, green flatland. Gentle but constant bends in the river cut off any view of water except ahead of his boat, and the vessels loomed incongruously above the alluvial plane, the river unseen.

Ahead and behind, helmsmen cautiously steered while lookouts combed the sky for enemy aircraft. It was a danger zone with no room to maneuver if attacked, and the convoy had little firepower to fend off hostile intruders. The five tankers in the convoy were defenseless, their crews without the promised 25-millimeter (mm) machine guns. Shore facilities were being stripped of weapons because of the appalling losses of oil haulers, but the guns had not arrived.

Kuwahara had been lucky so far. Since taking over the *Ukuru*-class escort ship, action had been sparse. The first convoy he escorted reached Singapore with a single, high-level attack by American bombers. The Consolidated B-24

Liberators inflicted no damage from their safe but too high altitudes. The eight tankers on that run from the naval base at Moji on Japan's southernmost island carried fighter planes strapped to their decks instead of oil. Whether northbound with oil or southbound with weapons and supplies for beleaguered imperial forces, the tankers were inviting targets for American ships and planes.

As the *Ukuru* steamed up the 55 km to Saigon (now Ho Chi Minh City) on 6 January 1945, Kuwahara knew his escort unit, the *101st Flotilla*, would pick up another group of ships for a return run to Japan. Vice Admiral Ryūtarō Shibuya, the convoy commander aboard the light cruiser IJN *Kashii*, had already told the other escort captains that the flotilla would stay in Saigon only two days and would not go on to Singapore.

During the brief layover in the Indochinese (now Vietnamese) port city, Kuwahara strolled down the fashionable Rue Catinat street near the docks and talked to fellow officers from other ships. Like Kuwahara, many were former merchant marine officers commissioned in the Imperial Japanese Navy when the war started.

Kuwahara was a master of Nippon Steamship Company liners until early 1942. Then he and his ship, IJN *Nitta Maru*, were pressed into military service. *Nitta Maru* was converted to an escort aircraft carrier simply by having a flight deck placed down its length and by being renamed IJN *Chuyo*. Through 1943, *Chuyo*, with Kuwahara in command, transported planes to Truk, Rabaul, and other advance bases in the southern war zone. He found it fascinating to watch the aircraft take off from the flight deck within a few kilometers of shore and make their way to nearby land bases. *Chuyo* was part of a convoy into Saipan that came under heavy attack. Kuwahara saw five large ships sunk by submarines as they approached the island. When Saipan was lost, Kuwahara knew Japan's fortunes were sinking too. He was transferred to *Ukuru* shortly before a U.S. submarine sent *Chuyo* to the bottom.

The convoy formed in Saigon at the beginning of 1945 was a large one. Eight freighters and four tankers loaded with East Indian oil sailed at noon, 9 January. Together with the six escorts led by *Kashii* serving as flagship, the convoy wound its way down the Saigon River and into the South China Sea.

In open waters, the convoy picked up speed, but it still moved at only eight knots because of the slower ships.

After cutting close by Cap Saint-Jacques (a.k.a. Vŭng Tàu), the convoy hugged the coastline. Near dawn the next day, an American B-24 sighted the ships but did not attack. The bomber circled out of anti-aircraft range for 30 minutes before it flew off to the east. That night, the convoy pulled into Phan Rang Bay, 265 km along in its trip. Laying over in relatively protected areas was a new tactic of the Imperial Japanese Navy. Until recently, the ships sailed by night and found sanctuary during the day. But too many merchant ships without escorts were being picked off. The convoy system was started to provide maximum protection with the limited numbers of men-at-war available.

On 11 January, the convoy reached Qui Nhon, the shallow harbor farther up the coast. Here, Admiral Shibuya was told he could expect little protection for the long, open-sea leg of the trip to Hainan Island because of shortages in aviation fuel. Planes were available but gasoline was lacking. The problem was common. Another convoy commander later said, "When we requested air cover, only American planes showed up."

At 0700 the next day, the 18 ships left Qui Nhon. A single Mitsubishi A6M Zero fighter pilot patrolled overhead. At 0855, three U.S. Navy Grumman F6F Hellcats sped into view and quickly jumped the Zero, sending it flaming into the sea. An hour later, two more American fighters appeared. Everybody on the convoy ships knew a U.S. carrier must be close by and that they would soon be assaulted by dive bombers. They did not have to wait long. At 1104, about 20 Grumman TBF Avengers and Curtiss SB2C Helldivers roared into sight and closed on the convoy.

The American planes, in several passes out of the east, hit the heavily loaded, 6,900-ton freighter, *Eiman Maru*. A bomb enveloped the ship in flames, and the once clear, calm water churned as it sucked up the stricken vessel. Kuwahara dodged five near misses with violent flanking turns. Anti-aircraft fire from the escorts brought down one plane.

The attack lasted a half hour. Admiral Shibuya ordered the convoy to reform. The ships slowly slipped back into formation and remained tight when, at 1229, a single plane swept in for a quick but unsuccessful run. *Kashii* again

led the convoy, while other escorts flanked the tankers and freighters to seaward.

Shortly before 1400 that afternoon, lookouts spotted a large formation of U.S. bombers. Kuwahara watched the planes circle lazily to the west over the Annamese coast for the next 13 minutes. By then, 70 aircraft were in position to make bombing and torpedo runs. The first wave concentrated on the point of the convoy. Two planes scored direct bomb hits on *Kashii*. A torpedo from another plane caught the cruiser on the starboard side aft, exploding its magazine. *Kashii* went down stern first and settled on the bottom with its bow jutting 10 feet out of the water. Admiral Shibuya and his entire staff were killed.

To the starboard quarter of the convoy, one of the destroyer escorts was hit aft, and the bomb ignited depth charges. Billows of white smoke poured from the after main deck as the ship slowly slipped below the surface.

The attack was unrelenting. Wave after wave of American planes came in, and Kuwahara would never forget the destruction. The 10,000-ton tanker *Kyokuun* went up in a fireball. Two freighters burned violently before sinking. A destroyer escort behind Kuwahara's *Ukuru* disappeared within minutes of being hit. Survivors across a wide stretch of water held onto the floating debris. Though under direct attack, *Ukuru* picked up 19 sailors from *Kashii*. Several bombs crashed through *Ukuru*'s main deck. Kuwahara was getting damage reports when he spotted two torpedoes bearing down on his ship. He ordered the ship into a sharp turn. The torpedoes—visible just below the waterline—rushed past harmlessly. Through it all, *Ukuru* kept a general heading north. Kuwahara was informed that 12 of his crew were dead and 29 were wounded. He could not imagine why his ship was still afloat.

Rain squalls suddenly loomed ahead, and Kuwahara steered for them. In a final look back, he saw only three other destroyer escorts. Every tanker and freighter of the convoy had been sunk or beached.

At midafternoon on 13 January, *Ukuru* limped into the port of Yulin on Hainan Island. There was little respite. U.S. Navy planes came over the mountainous approach to the harbor and pounced on the few ships at anchor. Kuwahara watched the planes blow up an empty 10,000-ton tanker that had eight planes destined for the south on its deck. More planes came daily until 17 January. *Ukuru*'s gunnery officer informed Kuwahara that only 5,000

Figure 18.1. U.S. carrier planes over Japan



U.S. Navy carrier-based planes attack targets over Japan, July 1945. Allied air devastated Japanese merchant shipping throughout the Pacific, rendering Japan nearly impotent by the war's end.

National Archives and Records Administration

rounds of machine-gun ammunition were left. If another attack came, they could fire back for only a few minutes. But none came. There were not any worthwhile targets left.

Later Kuwahara learned that the southbound convoy to Singapore that *Ukuru* had escorted as far as Saigon suffered the same fate. Every vessel was sunk during mid-January. Kuwahara would recall, "Out of a total of 30 to 40

freighters and tankers and 20 escorts, the only ships which escaped were the three escorts of my group which reached Yulin.”¹

January 1945 was an especially cruel month for Japan, for it became inescapably clear that the war could not be prosecuted successfully. The fate of the convoys in which Kuwahara sailed that month demonstrated the total inability of Japan to maintain a semblance of resistance. The military was impotent; the economy, bankrupt.

Boeing B-29 Superfortresses began attacking the home islands from Saipan in November 1944. A mine blockade exacted a heavy toll of the ships that survived Allied aerial and surface attacks and totally disrupted the movement of those still afloat. All navigation to and from the occupied lands to the south was cut when U.S. forces reoccupied the Philippines.

Not a single drop of oil was imported in 1945. Kuwahara’s convoys were among the last to attempt to bring home Southeast Asian oil. A final convoy left Singapore in March but was sunk piecemeal. One naval captain said, “Toward the end the situation was reached that we were fairly certain a tanker would be sunk shortly after departing from port. There wasn’t much doubt in our minds that a tanker would not get to Japan.”²

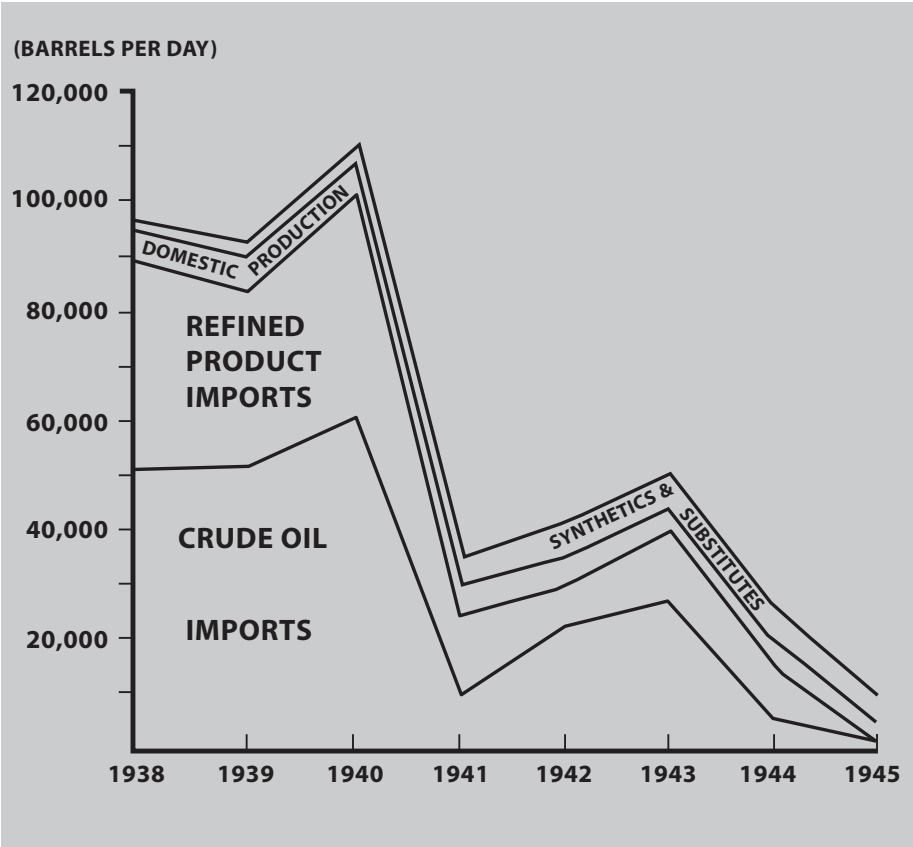
Japan was at its wit’s end to provide the barest needs to its military. The major Indonesian oil shipping ports of Balikpapan and Surabaya had been abandoned in December 1944, and by January 1945 the Imperial Japanese Navy was forced to fuel some of its ships with alcohol. Navigational training was eliminated for pilots.

Although the military controlled all fuels, it was helpless to find additional supplies. Combat units were reduced to impotence. The civilian population could not be called on to sacrifice further; it had already sacrificed all. Japanese who lived through the winter of 1944–45 remember it as a season of bare subsistence. The weather was severe with 45 consecutive days of below-freezing temperatures. Records show it was the coldest winter in

¹ U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials* (Washington, DC: Government Printing Office, 1945), Interrogation No. 53.

² U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials*, Interrogation No. 468.

Figure 18.2. Fuel sources for the Japanese home islands

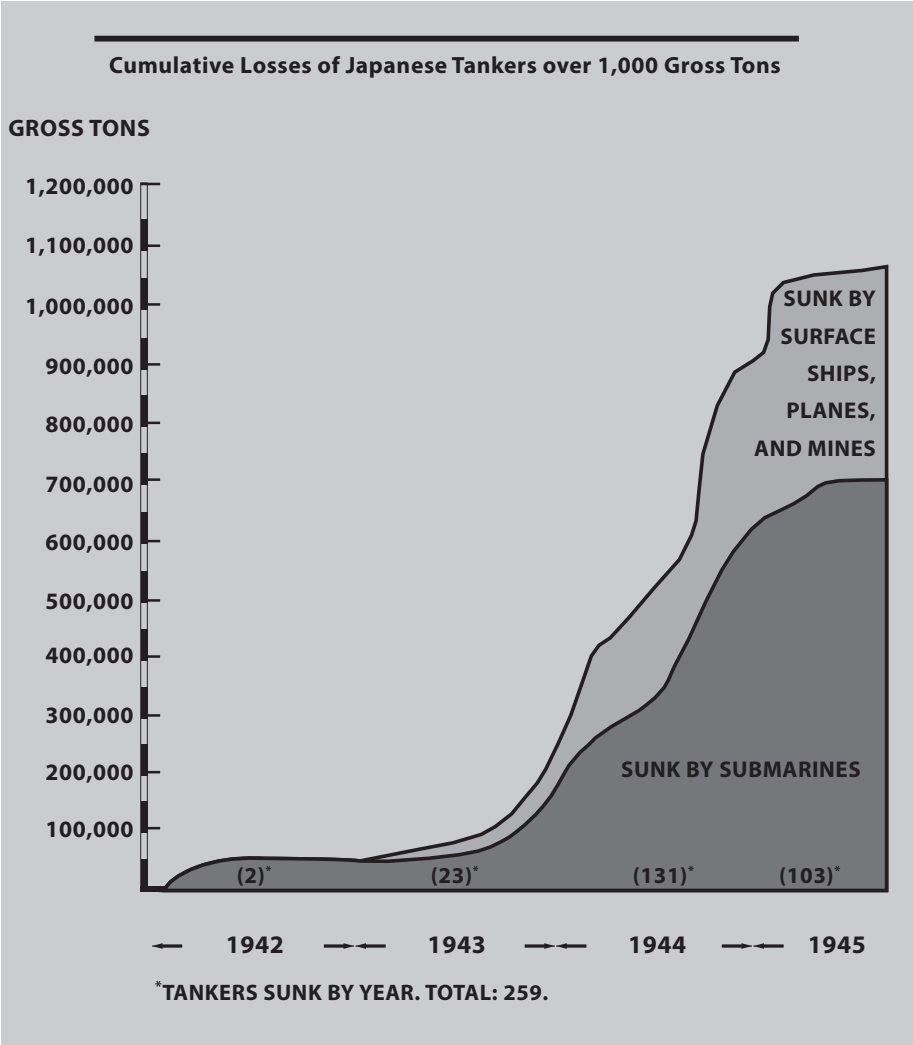


Courtesy of William Morrow, adapted by MCUP

20 years. Fuel and food scarcities reduced the Japanese to near-starvation. A campaign of *Yase-gaman* (“strength through slimness”) was designed to cloak deprivation in a mantle of patriotism, but it inspired few. People were reduced to eating chickweed, thistle, and mugwort.

Coal, charcoal, and firewood were in short supply. Propane was not available at all. Yoshido Yamada, a retired Tokyo contractor, recalled there was insufficient fuel to cremate the dead in the last days of the war, and funerals

Figure 18.3. Japanese tanker losses



Basic data from Office of Naval Intelligence report, 29 January 1946.
Courtesy of William Morrow, adapted by MCUP

were delayed several days in contrast to the short wait at biers before Pearl Harbor.³

Gas and electricity were severely rationed, making it impossible to use space heaters to provide even minimum comfort in homes. There was no longer enough fuel to operate private baths, and public hot baths, so important to the Japanese, operated on restricted schedules.

"Toward the end of the war the bathhouses were very crowded," said Takeo Tsuji, a sixth grader when the war started. "We called it washing potatoes in a tub. Each bathhouse had several laborers who searched the streets with carts for old wood and lumber."⁴ Tsuji vividly recalled the contrast between his prewar and wartime school lunches. Before the war, he put his lunch on a steam radiator in the classroom, and the food was warm to eat. Several years into the war, the steam heat was gone.

Retired architect Kenzo Aoki recalled that near the end of the war the government forced the destruction of buildings for fire lanes to minimize the destruction from incendiary bombs, and that the lumber was distributed as fuel. "The distribution of fuel during the war was controlled by the government," said Aoki. "At first it worked well, but as time went on the officials made stricter rules and the system no longer ran smoothly. People close to the top would do things average people could not. Before the war people bought fuel from dealers according to their need. During the war the government collected and distributed a fixed amount to everyone through its own network. Those who needed less would get the same amount as those who needed more."⁵

The result was black-marketing and bartering, said both Yamada and Aoki. Yamada said his family traded human manure for fuel. "This was black market dealing but it was quite successful in the case of my family to get things from farmers outside of the city," Yamada recalled. Aoki said there was black-marketing involving firewood from trees cut in the countryside. "There were big forests and those people who knew how to cut them, who cut

³ Yoshido Yamada, interview with Joe Diele, Tokyo, 1985, hereafter Yamada interview.

⁴ Yamada interview.

⁵ Yamada interview.

trees as their profession, felled trees and brought them to towns and cities," he said. "This was a black market outside of government distribution."

Aoki said he bought a wooded area in the mountains along the national railway lines and cut trees for friends and relatives to use as firewood. Some families burned library books and private collections to keep warm.

Private cars, and there were a few, were limited even in prewar years to six gallons of gasoline a month. After Pearl Harbor, unauthorized travel by automobiles was almost completely eliminated. In the last 18 months of the war, a civilian car of any kind was a rare sight.

Streets grew empty as cars vanished. The strain on the public transportation systems in the larger cities resulted in fewer and fewer buses serving workers, and mass transit grew undependable. Bicycles were precious, and Professor H. Kawai remembered how carefully he treated his. He maintained the ailing bicycle as if it were a rare, vintage car. Kawai woke up well before dawn each morning of the war. It took him more than two hours to pedal to his college. "In the winter," he said, "it at least made you warm before going into a school building without heat."

The military made every effort to convert available resources into substitutes. Alcohol was manufactured from confiscated potatoes, sugar, and rice wine. Sake bottles were stripped from store shelves in an unannounced sweep to prevent hoarding of the national liquor. Vegetables and used fat were converted into lubricating oils. An oil substance was distilled from whatever crude rubber could be found. Substitutes were extracted from soybeans, peanuts, coconuts, and castor beans for industrial use.

No project revealed the desperate condition more than the navy's effort to build up the aviation fuel supply with pine roots. Civilians were told, "Two hundred pine roots will keep a plane in the air for an hour." The slogan was to inspire massive collection and distillation. About 36,000 kettles and stills were distributed, each designed to yield four gallons of a basic oil daily. The process involved boiling the roots for 12 hours, imposing an incredible demand for scarce fuel. It was calculated that in order to get 12,000 barrels a day, 1.25 million people would have to be devoted full-time to the project. Two of the stills were located on one of Tokyo's exclusive golf courses with Japan's social elite required to set an example for the rest of the country.

Production by this method eventually reached 2,500 barrels a day, but refining this oil proved difficult, and only 3,000 barrels of aviation gasoline were ever delivered to the navy. Soshitsu Sen, a naval aviation cadet in training at Tokushima, recalled, "The mixture was so sticky that it was almost impossible to start aircraft engines on it."⁶ Later experiments showed the pine-tar substance gummed motor engines beyond use after a tankful or two.

It was an incredible sight in 1945 to see rural roadways lined with soaring mountains of pine roots and stumps. Whole hillsides were barren, denuded of trees and saplings that would take years to restore.

The pinch for aviation fuel was first felt early in 1944. The situation grew progressively worse. New planes were not flight-tested. A 50-percent blend of alcohol was used in training that year, and in 1945 the figure climbed to 80 percent. Aviation fuel standards for combat aircraft were lowered to 87-octane from 92. Pilots were sent on operational missions with only 30 hours of training, barely enough time to learn the rudiments of flight.

At the time of Pearl Harbor, Japanese naval pilots averaged 700 hours of flying experience. That figure declined to 300 by the beginning of 1945. For the army, it was even worse. Their pilots averaged only 175 hours of flying experience when they bore the brunt of defending Japan's skies from waves of American bombers.

In combination, these factors related to fuel were mainly responsible for the appallingly high loss rate suffered by Japan's air arms. Seventy percent losses were sustained on combat missions in 1945. Even noncombatant ferrying showed 30 percent losses.

Because of the fuel situation, Japan resorted to the kamikaze one-way suicide flights. It was deemed the only possible way to launch reliable attacks with untrained pilots lacking fuel. The Japanese had methodically determined that 8 bombers and 16 fighters were required to sink an American battleship or carrier in a normal attack, but that the same job could be done with just three suicide planes.

⁶ Staff of the *Asahi Shimbun*, *The Pacific Rivals: A Japanese View of Japanese-American Relations* (New York: Weatherhill/Asahi, 1972), 100.

Lieutenant Colonel Jin, who was operations staff officer for the Japanese *Sixth Air Army*, recalled:

There was no prospect of victory in the air by the employment of orthodox means. Suicide attacks were more effective because the power of impact of the plane added to that of the bomb. Besides which the exploded gasoline caused fires. Suicide attacks provided spiritual inspiration to the ground units and to the Japanese public at large. Suicide attack was the only sure and reliable attack by airmen whose training had been limited because of the shortage of fuel.⁷

Suicide missions were not limited to aircraft. The largest battleship ever built, the 64,000-ton IJN *Yamato*, was sent to Okinawa to face certain destruction. *Yamato* and what was left of its accompanying force, a cruiser and eight destroyers, received the following orders: "Second fleet is to charge into the enemy anchorage of Kadena, off Okinawa Island, at daybreak of 8 April. Fuel for only one-way passage will be supplied. This is a special attack operation." The phrase "special attack operation" was a euphemism for suicide mission. Only after great difficulty in accumulating enough fuel were the ships on that mission filled with 21,000 barrels of black oil. It is ironic that even then there was fear the fleet would not make it to Okinawa. The ships were ordered to proceed at a restricted speed of 20 knots to save enough fuel for four hours of combat at top speed. Any survivors were to make their way ashore and continue to fight alongside ground forces. Each man on *Yamato* and the other ships was condemned to death as surely as the kamikaze pilot of a Zero.

As summarized in a postwar U.S. naval analysis, "With stockpiles exhausted, a shattered fleet lacking fuel, and air forces limited by gasoline to a final suicide effort, Japan had lost the power to wage war."⁸

Japan's plight was the inevitable consequence of an ever-tightening noose being applied by Allied naval and air forces. By seizing island bases in the

⁷ U.S. Strategic Bombing Survey, *Oil in Japan's War* (Washington, DC: Government Printing Office, 1946), 86.

⁸ U.S. Strategic Bombing Survey, *The Campaigns of the Pacific War* (Washington, DC: Government Printing Office, 1946), 382.

Mariana Islands, the United States was able to strangle the now fuel-deficient Japanese. The Mariana Islands gave U.S. submarines increased patrol times along Japan's convoy routes in the China Seas. By the latter part of 1944, five U.S. naval task forces operating out of Guam and Ulithi could reach launching distances by steaming only two days and strike anywhere in the Philippines or Ryukyu Islands. B-29s were flown in systematic bombing and mining assaults on Japanese cities, ports, and coastal routes from bases in the Mariana Islands. Other bases at Biak and Morotai permitted air strikes against the Celebes and eastern Borneo.

The crucial campaigns of 1944 were lost by the Japanese primarily because of no fuel. Failure to hold the Philippines and Marianas only compounded their oil problems. Japan had planned to beat off the American force invading the Mariana Islands with an unsparing attack involving the full *Combined Fleet*. Everything Japan had, two full battle groups and a carrier force, were to be hurled into the fight for Saipan, Guam, and Tinian. Because of a lack of fuel and a shortage of tankers, only the carriers and their planes were committed. The result was the Battle of the Philippine Sea (19–20 June 1944) and the "Great Marianas Turkey Shoot," with 243 planes from Japanese carriers shot down. With the Marianas lost, the Japanese "line of supply to the oil-rich lands of Southeast Asia was broken."⁹

After the Mariana Islands campaign, the Japanese hoped to stave off further disaster by basing the *Combined Fleet* with its two battle groups at Okinawa or in the home islands. The plan made sense except for one drawback—neither base could be utilized for a single, massed unit because fuel stocks were too low. A concentrated force, however sound strategically, could not be accommodated in direct defense of Japan proper or Okinawa if it were immobile. The *Second Fleet* was forced therefore to operate out of Singapore, near what was left of the Indies oil centers, while the *First Fleet* returned to Japan to drain the home islands' last oil stocks.

⁹ Masanori Ito, *The End of the Imperial Japanese Navy*, trans. Andrew Y. Kuroda and Roger Pineau (New York: W. W. Norton, 1962), 119.

To avoid total isolation of Japan proper meant holding on to the Philippines. When the battle for those islands began, Japan had no alternative but to send its remaining two fleets in an all-out defensive. Not since Guadalcanal had Japan committed its total naval forces in a showdown fight. Their orders were to stop the U.S. forces from landing.

When General Douglas MacArthur's troops began going ashore on Suluan Island at the mouth of Leyte Gulf on 19 October 1944, they could have been annihilated. The Japanese *Second Fleet* had been rushed from its Singapore base into the fray and was within 64 km of the invasion beaches, but instead of attacking, the ships, lacking fuel, turned north away from the action and missed an opportunity to inflict a deadly blow on MacArthur. With U.S. forces ashore, the die had been cast.

Actions in the Philippines were repeatedly affected by fuel shortages. A Japanese cruiser force sent to help fight in the Surigao Strait arrived hours after the battle, a delay caused by the slow speed required to utilize its limited fuel supply as efficiently as possible. A member of the *Combined Fleet's* staff, Captain Mitsuo Fuchida, told of another force sent to aid in defense of the Philippines:

The [battleships] *Ise* and *Hyuga* with an escort of three destroyers left the Empire and came south to Bako with the intention of joining the Philippines action. But they were so short on fuel that it was necessary to attempt to refuel at sea from tankers. The oil from the tankers being insufficient, they were unable to join the action. After the general action, they proceeded to Singapore, where they refueled and went home again.

In view of the constant fuel shortages that bedeviled the Japanese during the campaign, the question arises why the Imperial Japanese Navy was not pulled back to defend Japan itself. Admiral Soemu Toyoda explained why the Japanese fleet was committed to a hopeless war of attrition:

Should we lose in the Philippines operation, even though the fleet should be left, the shipping lane to the south would be completely cut off so that the fleet, if it should come back to Japanese waters, could not obtain its fuel supply. If it should remain in southern wa-

ters, it could not receive supplies of ammunition and arms. There would be no sense in saving the fleet at the expense of the loss of the Philippines.¹⁰

During this period, the United States maintained an unimpeded flow of supplies and equipment across the Pacific. As forward bases were occupied, the sea-lanes were longer, but transits were made by thousands of men-of-war and merchant ships without fear of enemy interception. The Japanese were preoccupied elsewhere and always short of fuel. On the other hand, American naval and air forces never lacked for oil.

The disparity between U.S. and Japanese supplies is illustrated by this comparison: When Guam became the major U.S. base for the aerial destruction of Japan, 120,000 barrels of aviation gasoline were distributed there daily. In 1944, Japan's military aircraft on all fronts consumed 20,700 barrels a day. Thus, one major American base supplied six times the fuel available to the entire Japanese air arm operating over the Western Pacific, the Asian mainland, and the home islands.

Figures for fleet operations are equally striking and further demonstrate the chasm that existed between fuel supplies and consumption by the two forces. In the summer of 1944, the U.S. Fifth Fleet launched Operation Forager to wrest control of the central Pacific and isolate the Caroline Islands. More than 600 ships were involved, including 14 battleships, 25 carriers, 26 cruisers, and 144 destroyers. Fuel consumption by the fleet, covering everything from black oil to propel the ships to lubricants of all kinds, was 93,000 barrels a day. This did not include aviation fuel. It was at the time an almost unheard of requirement for sustaining a mobile naval force. During all of 1944, for purposes of comparison, Japan's total petroleum consumption, military and civilian, in the home islands and occupied territories, was 103,000 barrels a day. Simply put, the fuel consumed by ships of the U.S. Fifth Fleet alone would have provided 90 percent of Japan's entire petroleum consumption.

¹⁰ U.S. Strategic Bombing Survey, *The Campaigns of the Pacific War*, 281.

America's oil use during that crucial year compared with Japan's is clearly illustrative of a fuel feast for one and a fuel famine for the other.

Japan was a defeated nation by January 1945. "The Southern Resources Area, the prize for which the war was fought, was gone and the American fleets sailed with impunity to the shores of eastern Asia. All hope of future resistance had depended on oil and now the tankers were sunk and the oil cut off. The surface fleet was gone, and so were seven thousand aircraft, expended in four months' defense of the last supply line."¹¹

Japan's agony unto death was prolonged, but it was a matter of how to employ the rapidly dwindling oil reserves rather than fight to preserve the petroleum lines of supply. U.S. Marines invading Iwo Jima met no naval resistance because the Imperial Japanese Navy elected to save fuel for the final defense of Japan. All ships in the home islands, which used more than 96,000 barrels during an average month, were inactivated. This extreme conservation measure resulted, for example, in the fast battleship IJN *Haruna* being used as a fixed antiaircraft defense vessel in Kure harbor. Several aircraft carriers were also kept at their berths in Kure and Beppu on Kyushu and left to foundering fates when subjected to aerial attack.

Japan's air defenses in the final months of the war were chimerical. If planes flew at all, they used a lower-grade fuel. Lieutenant General Michio Sugawara, commander of the *Sixth Air Army*, said, "Planes equipped to use 92-octane gasoline had to be supplied with 87-octane during these operations, and the quality went down steadily, shortening the planes' range, and decreasing efficiency in general."¹²

Most of Japan's remaining planes rarely became airborne at all. Lieutenant Commander Ono Kenjirō, a staff officer with the *Thirteenth Naval Air Flotilla*, summarized the position in 1945:

Shortages of fuel prevented planes from averaging more than two hours of flying time a month. It worked out that a plane was used on the average of once every three weeks. No attempt was made to keep

¹¹ U.S. Strategic Bombing Survey, *The Campaigns of the Pacific War*, 289.

¹² U.S. Strategic Bombing Survey, *Oil in Japan's War*, 87.

the engines in condition by running them every day or so and I was greatly concerned about this. Of the planes which took off on missions, I should estimate that about 20 percent would reach the target. About 70 percent would be downed by Allied action and the remaining ones would crash owing to pilot or engine failure.¹³

The final and deadliest topping of destruction came with the systematic raids of B-29s. For the final four months of the war, the bombers swept over cities and economic targets in terrifying numbers. Five hundred Superfortresses at a time flattened and burned an already writhing Japan.

Not all Allied intelligence during the war was accurate. At times, it was inconsistent. The fiery commander of the U.S. strategic air offensive against Japan, General Curtis E. LeMay, found target lists from higher commands and intelligence staffs less than useful to him. He preferred his copy of the *World Almanac* to pick out, in descending order, Japanese cities to be bombed.

LeMay, like the Royal Air Force's air chief marshal Arthur Travers Harris, was an advocate of area bombing. He preferred concentrated attacks on heavily populated industrial areas where strategic targets might or might not be destroyed. Even if specific targets were not hit, blanket bombing raids would at least cripple transportation, lower civilian morale, and otherwise make the area uninhabitable. It was natural that LeMay's prediction for this kind of bombing would lead him to incendiary attacks on Japan's cities and towns, all of which were vulnerable to fire raids because of the wooden structures characteristic to the country. Incendiary area bombing of the population centers, LeMay contended, would eventually compel the Japanese to surrender. A sound case can be made that he was probably right since Japan was reduced to military and industrial impotence months before atomic bombs were dropped on Hiroshima and Nagasaki.

In April 1945, however, U.S. military doctrine held that Japan would never capitulate by bombing alone. It was believed a large invasion force would be necessary to overpower Imperial Japanese forces on each of the

¹³ U.S. Strategic Bombing Survey, *Oil in Japan's War*, 85.

Figure 18.4. Boeing B-29 Superfortress bomber over Japan



A U.S. Army Air Forces Boeing B-29 Superfortress bomber unleashes its payload over Japan, June 1945. For four months until the end of the war, B-29 raids flattened and set ablaze Japanese cities and economic targets.

U.S. Air Force Historical Research Agency

home islands. Intelligence reports to LeMay indicated that the inevitable conquest of Japan would be easier by knocking out the overstrained petroleum facilities. Initial studies by the U.S. Strategic Bombing Survey teams in Europe indicated the adverse effect the bombing of the Reich's oil facilities was having on Germany's ability to wage war.

What the Allies did not know was that Japan's oil potential was down to zero already. When LeMay's B-29s were able to mount missions aimed at knocking out the petroleum facilities, Japan had been reduced to an output of

only 6 percent of its normal refinery yields. Virtually no fuels were being produced domestically, no supplies were arriving from Southeast Asia, and the storage tanks were mostly empty.

Since LeMay was not aware of Japan's abysmal petroleum position, he went about his mission of crippling the enemy's fuel-producing potential by assigning the Guam-based 315th Bomb Wing to this task exclusively. The wing was uniquely qualified to engage in precision strategic bombing. All of its aircraft were equipped with Eagle radar antenna systems developed by the Radiation Laboratory at MIT and the Bell Telephone laboratories. The devices gave the B-29s 10 times more "seeing" power than other Superfortresses. Crews of the 315th Bomb Wing were specially trained to wipe out what was left of Japan's oil industry.

On the night of 16 June 1945, the first of the Eagle-equipped B-29s hit the Utsube oil refinery at Yokkaichi, targeted in previous raids but still standing. Even one precision bombing was not enough. The B-29s returned on 9 July to finally reduce the refinery to rubble and abandonment by the Japanese.

Other targets included the Nippon Oil Company's plant at Kudamatsu, the Maruzen refinery, and the Ube coal liquefaction facilities. The Ube plant was one of the last turning out fuels. It was finally destroyed on 5 August.

By the end of the war a month later, bombers of the 315th Bomb Wing had conducted 15 strikes on oil-related targets. More than 9,000 tons of bombs were dropped in 1,300 sorties. Only three aircraft were lost, a reflection of the helpless state of Japan's air defenses.

After the war, it was determined that those raids destroyed storage facilities capable of handling 6 million barrels of oil. It was also learned that practically every one of those tanks was already empty.

Typical of the destruction wrought during the oil bombings was the 11 August attack on the Kansai refinery outside of Osaka. Only the report of the Twentieth Air Force pilots, "Sighted refinery; sank same," was fancifully out of the ordinary, though completely accurate. The refinery was built on reclaimed mud dredged from Osaka Bay. Dikes were built to protect the facility from flooding during storms. These dikes were breached during the raid, and reconnaissance photographs showed the 26-acre site completely submerged under several feet of water and totally inoperable.

At the time of the attack, the Kansai refinery was of little use to Japan anyway. It was reduced to processing oil received from the pine-root program. In 1938, Kansai was refining 3,100 barrels of California crude daily into aviation fuel and motor gasoline. As many as 250 workers were employed in its peak production years. Only 40 remained by 1945.

When destroyed, the plant was handling a mere 50 barrels a day of pine-root crude, which yielded miniscule amounts of the gumming raw gasoline and, surprisingly, a product that when mixed with alcohol was perfect as a fuel for jet aircraft. Japan, of course, had no jet aircraft.

After the war, the U.S. Strategic Bombing Survey prepared a detailed report on the 11 August raid on Kansai that illustrates the extent of Japan's helpless condition in the closing months of the conflict. Ninety-five B-29s of the 315th Bomb Wing dropped 3,608 bombs weighing 902 tons on the site. The attack, which began shortly after midnight, lasted 102 minutes as successive waves of aircraft swept over the target.

Kansai was defenseless. The Imperial Japanese Army had a pair of 13-mm machine guns mounted on the plant until July, but they were removed when the weapons proved ineffective in two previous raids. No other antiaircraft weapons were available. Nor were there any interceptor aircraft to help ward off the American planes. The nearby Itami airfield had a few fighters left, but they rarely challenged the bombers, and never during the night.

Kansai had no firefighting equipment. Two hand-drawn water pumps previously at the site had been removed by the army to help combat blazes in crowded Osaka. Fire was actually less damaging than the direct hits of the B-29s' high-explosive bombs, however, because there was virtually no oil in the refinery left to burn. About three tons of bombs fell on each acre of the refinery, knocking out about 500,000 barrels of storage capacity. In all, 75 percent of the plant was destroyed. It was written off after the raid as beyond repair, a heap of scrap metal buried underwater.

CHAPTER 19



OIL IN FUTURE WARS

The world will witness a growing struggle for secure access to oil through the end of this century and into the next.

**~ The Geopolitics of Oil, U.S. Senate Committee
on Energy and Natural Resources**

The Party has put forward responsible tasks aimed at the acceleration of the development of our economy, and I shall tell you flatly that in order to be able to perform them, the country must have at its disposal the necessary resources of both oil and gas . . . oil and gas will always be the object of our constant concern.

**~ Soviet Communist Party chairman Mikhail Gorbachev,
speech delivered 6 September 1985, Tyumen,
Western Siberia**

He was frail and only five feet tall. Barefoot and dressed in loose-fitting work trousers and an undershirt, he hacked with a hoe in a potato patch in the miniature backyard of his Tokyo residence. Vice Admiral Takeo Kurita, once commander in chief of the Imperial Japanese Navy's *Second Fleet*, was home from the war.

Since Japan's surrender, officers of the Naval Analysis Division of the U.S. Strategic Bombing Survey had been searching among their defeated foes for senior officers, like Kurita, to hear their views on why they lost the Pacific War. Like many of the dispersed fleet officers, Kurita was located through the files of the Japanese War College.

With Kurita's address in hand, a young American naval officer got out of a jeep and spotted the unimposing figure tending to his garden chores. Years later, he still vividly recalled the moment: "It really made an impression on me. The war was just over. Less than a year before Kurita had been in command of the largest fleet that was ever put together and there he was out there chopping potatoes."¹

So began long sessions of questioning the Japanese naval leader. Most of the time was devoted to hearing Kurita's account of the Battles of the Philippine Sea and Leyte Gulf in June and October 1944, when the admiral's fleet was decimated. Repeatedly, Kurita referred to a lack of fuel as the key element in his actions:

- He brought his ships into Leyte Gulf without knowing whether there was enough fuel to return to base after engaging the Americans. "The point was that the tankers could not supply the ships [with] enough fuel for long distance voyages at high speed and they had to save their fuel for the trip back to Brunei," he said.
- Kurita ordered a dangerous night passage through the San Bernardino Strait because "I was low on fuel. . . . If and when brought under air attack on the following day in the passage through the island, I would have to use extra fuel in dodging and maneuvering. Therefore, fuel was a very important consideration—the basic one."
- Tanker losses affected operations. "One tanker, having received a hit, fled away to the northwest. Another tanker was sunk in Balabac Passage [Strait] and still another escaped in Paitan Bay. [Other] tankers followed, and when passing Balabac Passage each was torpedoed by submarine."
- "Sudden attacks from your carrier task forces everywhere prevented or impaired our air operations, and submarine attacks on our trans-

¹ Interview with Adm Thomas H. Moorer, USN (Ret), Washington, DC, 16 January 1986, hereafter Moorer interview.

portation system, of airplanes and fuel, these were the principal reasons for the loss of our air power.”²

As the U.S. Navy commander listened to Kurita’s answers, he formed a lasting impression. “Have you ever read *Gone with the Wind*? When Scarlett was out in that damn field trying to dig up a turnip and she said, ‘Let God be my witness, I’m never going to be hungry again.’ That’s what Kurita was doing out there, digging up a turnip, except it was a potato.” The American officer was Thomas H. Moorer, who rose to become an admiral and chairman of the U.S. Joint Chiefs of Staff.

“What I learned then,” said Moorer, “was never lose a war, and the way to lose a war is to run out of oil.”³ It has been said the only lesson we learn from history is that we learn nothing from history. Admiral Moorer, now retired, and many others hope that is wrong and that the United States will awaken to the possibility of an oil predicament that could jeopardize its national security.⁴ The risk of repeating the mistakes of Germany and Japan and suffering similar consequences are real and threatening. Without secure and adequate sources of oil, a nation is hobbled.

Since World War II, oil has been a pivotal factor in determining national policies, and it has been the fate of oil-poor countries to adjust or abandon out of economic necessity plans and programs favorable to them. Without oil, national wills can be easily frustrated. The geopolitics of oil have played major and forceful roles on the world stage for several decades now, and foreign policies are dictated increasingly by oil. It is not surprising that until the United States began cumulating a strategic petroleum reserve, only Japan and

² Statements by Admiral Takeo Kurita, IJN (Ret), are contained in transcripts seen in U.S. Strategic Bombing Survey, *Interrogations of Japanese Officials* (Washington, DC: Government Printing Office, 1945), Interrogation No. 9.

³ Moorer interview.

⁴ Moorer died in 2004.

West Germany systematically acquired oil stocks for emergencies. Neither had forgotten the bitter lessons of World War II.⁵

Stockpiling by itself probably contributes little to sufficiency, however. The balance of petroleum power shifts, and the U.S. experience is a case in point. Earlier in the twentieth century, American oil production easily met domestic needs, and at the end of World War II in 1945, the United States produced 70 percent of the world's oil. From there, U.S. wells were down to 16 percent of the world total 40 years later. New drilling has not resulted in discoveries large enough to meet increasing consumption. Only 4 percent of the world's proved reserves are now in the United States. The country fell from self-sufficiency to importer by 1970, and it could be dependent on foreign oil for two-thirds of its petroleum needs by 1995.

Having lost the capacity to supply its allies with their fuel needs and even the ability to take care of its own needs, the U.S. outlook is bleak: "Furthermore, as seen consistently throughout history, wartime needs are dramatically larger than those under peacetime conditions. As an increasingly large percentage of total U.S. oil production must be devoted to peacetime military consumption in the next decades, grand U.S. strategy may be severely constrained by both logistical and social problems during crises or even war."⁶

Once able to use oil as a political weapon, the United States is now vulnerable to the kinds of pressures it exerted as recently as 1956. Then, President Dwight D. Eisenhower forced Britain, France, and Israel to give up their occupation of the Suez Canal and the Sinai Peninsula by cutting off oil shipments from the Western Hemisphere to Europe. Britain was down to a month's supply of fuel for its industries and transportation systems: "Under orders from the President, U.S. officials refused to talk to British officials about oil or credit until the British agreed to a ceasefire. Under such devastating U.S. pressure,

⁵ In 1986, Japan and West Germany were reported to have stockpiled 100 million and 55 million barrels, respectively. The U.S. Strategic Petroleum Reserve was 500 million barrels, then equal to 90 days of imports.

⁶ David A. Deese, "Oil, War and Grand Strategy," *Orbis* 25, no. 3 (Fall 1981): 525–55.

the British and French agreed to a ceasefire and began withdrawing their troops.”⁷

What has happened to the United States since World War II is the result of soaring domestic consumption while reaching a production plateau well below demand. In 1945, American petroleum output was 4.7 million barrels a day. A production peak was reached in 1970 at 9.6 million barrels daily. Since then, a level of about 8.9 million has been maintained. At the same time, consumption has jumped from 4.7 million barrels a day in 1945 to 17.5 million barrels daily in 1986. Imports have filled the widening gap between domestic production and use. There is no longer easy-to-find cheap oil in the United States. Abundant, inexpensive oil is now in the Middle East.

The United States is not the only country using more oil. In 1986, total world consumption reached an annual rate of 61 million barrels each day. The entire world used only 7.7 million barrels daily in 1946, the first year of peace after World War II. In 1986, producing countries used 29 million barrels of their own oil daily and traded 28 million barrels, the latter by nations with enough surplus to sell. The sellers were largely the OPEC (Organization of Petroleum Exporting Countries) nations.

Table 19.1 shows who commands the world’s oil. It is evident that for decades to come, the Middle East and Africa will be the source of oil for those countries that don’t produce enough of their own. Petroleum self-sufficiency is rare among industrialized nations in 1986. Canada, Norway, and Britain are among the few that can presently meet their own demands.

As table 19.2 illustrates, oil consumption follows a pattern that does not match production. OPEC, with its seemingly inexhaustible supplies, is sure to remain a dominant force well into the twenty-first century. Members of the cartel “hold practically all of the reserves that are relatively inexpensive to develop and bring to market,” and if prices remain relatively low, “exploration and development outside the OPEC area would dwindle and the industrial-

⁷ Joseph C. Harsch, “Two Different Stories,” *Christian Science Monitor*, 10 May 1983. More comprehensive accounts are contained in Robert R. Bowie, *Suez 1956: International Crisis and the Role of Law* (Oxford, UK: Oxford University Press, 1975); and Selwyn Lloyd, *Suez 1956: A Personal Account* (London: Mayflower Books, 1978).

Table 19.1. Command of world's oil

Production (in million barrels a day)		Proven reserves (in billion barrels)	
USSR	11.9	Saudi Arabia*	169
United States	8.9	Kuwait*	89
Saudi Arabia*	3.3	USSR	61
Mexico	2.8	Mexico	49
Iran*	2.3	Iran*	48
United Kingdom	2.5	Iraq*	44
Venezuela*	1.7	Abu Dhabi*	31
Canada	1.5	U.S.	28
Iraq*	1.4	Venezuela*	26
Nigeria*	1.4	Libya*	21
Indonesia*	1.2	China	18
Libya*	1	Nigeria*	17

*Member of OPEC

Courtesy of William Morrow, adapted by MCUP

Table 19.2. Consumption of world's oil

(in million barrels per day)	
United States	17.5
Eastern Bloc nations	13.2
Western Europe	12.4
Asia	8.8
Latin America	4.5
Mideast	1.9
Africa	1.7
Canada	1.5

These figures are estimates based on information from the Central Intelligence Agency; the Energy Information Administration of the U.S. Department of Energy; and the *Oil and Gas Journal*, 1984 through 1986.

Courtesy of William Morrow, adapted by MCUP

ized nations once again would become dependent on the Middle East for energy supplies.”⁸

Policies pursued by nations with a heavy dependence on Mideast oil reveal the influence of these imports in specific actions. For example, when the United States sought direct help, or even public approval, for counterterrorism air strikes against Libya in 1986, Western European allies balked. Italy, France, West Germany, and Spain had been receiving 262,000; 49,000; 205,000; and 66,000 barrels, respectively, of oil a day directly from Libya. These amounts represented varying but important percentages of their total oil needs, and in addition, there were probably large indirect shipments of Libyan-originated petroleum that was refined elsewhere into gasoline and other products. There is little doubt that not offending Libya was more important to Western Europeans, though also the victims of terrorism, than granting overflight rights to U.S. aircraft or supporting the American action in international forums.

The situation was reminiscent of the U.S. experience during the Arab-Israeli war of 1973. None of the North Atlantic Treaty Organization (NATO) allies allowed American planes to land in their territories while flying equipment to Israel. The year before, when terrorists stormed the Olympic Village in Munich, Admiral Moorer happened to be in West Germany. When it became known that some of the terrorists had fled to Algeria, Admiral Moorer asked a West German minister, “What are you going to do to Algeria for giving sanctuary to people who commit murder in your country?” The minister replied, “We’re not going to do anything. We can’t do without the oil.”

Admiral Moorer concludes: “The Europeans act the way they do [about Israel and the Arabs] because they fear the loss of oil, the fear of no access to energy. That’s what it is all about.”⁹

Britain’s support in the U.S. antiterrorist attacks on Libya was in some measure reciprocal, stemming from Washington, DC’s direct help in the defeat of the Argentine force on the Falkland Islands in 1982. The United States

⁸ H. Erich Heinemann, “A Threat to Supplies,” *New York Times*, 3 March 1986.

⁹ Moorer interview.

provided tankers and fuel for the British force that sailed thousands of miles to reoccupy the territory.

Oil was also pivotal in the U.S. decision to overthrow the extreme leftist government of Grenada in 1983. Although the fact was almost entirely ignored in the press, the U.S. intervention was in large part undertaken because of a giant stockpile of jet fuel that the Cubans and Russians had shipped in for use by Soviet planes on the newly extended Grenadan airfield. Fifty percent of all U.S. oil imports at the time moved north through Caribbean shipping channels, primarily from Venezuela. Half of Alaska's oil moved to Gulf of Mexico refineries through the Panama Canal, only 1,930 air km from Grenada. Hostile aircraft operating out of Grenada would have been within minutes flying time from those shipping lanes, the same lanes that Nazi submarines menaced in World War II. Since large supplies of jet fuel could be stored on Grenada, the logical conclusion was that U.S. interests were imperiled. NATO naval forces were also potentially threatened because stockpiles of fuel for NATO ships are scattered along the Gulf of Mexico ports of the United States. Communist aircraft operating out of Grenada and Cuba could possibly deny access to those storage facilities. The Soviet strategy has been described as "a long-term effort to bring about political changes along the littoral of the trade routes in the Indian Ocean, the Caribbean, [the] Western Pacific and the South Atlantic."¹⁰

Russia has remained energy self-sufficient since World War II, but recent trends indicate the Soviet Union could sometime in the future become an importer of oil. It is staggering to think of the two world superpowers locked in a deadly struggle for oil supplies. It is an eventuality to be considered if both countries find they must import vast amounts of petroleum to keep dominant economic and military positions.

Even though the Soviet Union is now the biggest oil producer in the world, it faces a crisis. In 1984, its output declined after increasing every year since World War II. There is every indication the downturn will continue, and by the end of this decade Soviet output could drop to 85 percent of current produc-

¹⁰ G. Henry M. Schuler and Henry Ferdinand Keplinger, *Persistent Oil Vulnerability and the U.S. Energy Response* (Washington, DC: Center for Strategic and International Studies, Georgetown University, 1985), 3.

tion. As the *Washington Post* observed, “The Soviets may now be approaching a time in which the struggle to maintain oil production joins their agricultural system as a source of perennial strain in the economy.”¹¹

Conservation, fuel-switching, heavy exploration, and a cutback in exports could postpone the day when the Soviets have to rely on imported oil, but it is a vexing political dilemma for Communist Party officials. Economic growth is already threatened. Unknown factors, such as the nuclear disaster at Chernobyl, may have an impact on available Soviet oil for export as well. When 20 graphite-type atomic plants were closed after Chernobyl, the Soviets had to divert nearly a million barrels of oil a day to generate electricity. Kremlin leaders must decide if they will continue to export oil, especially to the West, for money to buy imports essential in other fields—high-tech, for example. If all domestic oil production is retained, the Soviets would lose the hard currency they need for world trade. Eighty percent of Soviet hard currency earnings are from exporting oil. Without this income, the Kremlin would be hard-pressed to buy equipment and food from the West.

When Russian oil production peaked in 1983 at 12.4 million barrels a day, about 3.2 million of those were exported. Half went to Western Europe, half to Eastern Bloc nations. Priority went to the providers of hard currency in the West even though five of the six Soviet Bloc countries depend on Moscow for practically all their oil. If Soviet oil production slips further, and less oil is shipped to the Eastern Bloc, the Soviets will have lost a political weapon. In January 1980, for example, Romania abstained on a United Nations (UN) General Assembly vote calling for the withdrawal of Soviet troops from Afghanistan. All other Eastern European states joined the Soviet Union in voting against the resolution. Moscow was outraged. Foreign Minister Andrei A. Gromyko hurried to Bucharest and wrested a statement from the Romanians supporting Soviet armed intervention because of “imperialistic machinations” in Afghanistan. “Probably as a quid pro quo, [Romania] received almost 1.5 million tons of Soviet petroleum during calendar year 1980.”¹²

¹¹ “Soviet Oil,” *Washington Post*, 6 April 1985.

¹² Richard F. Starr, “Soviet Policies in East Europe,” *Current History* 80, no. 468 (October 1981): 317–20.

If the Russians thought they were blackmailed by the Romanians, they also got what they wanted because of disposable oil. They apparently did not forget the incident, however, or other overly independent actions by Bucharest, because Russia now provides Romania with only 7 percent of its petroleum consumption while selling Bulgaria, Czechoslovakia, East Germany, Poland, and Hungary 90 percent or more of the oil they use.

Romania, once oil-rich and the center of much attention before and during World War II because of its petroleum, has slowly been reduced to a cold, power-poor nation without its own oil. Romania now lives with numbing shortages, forcing a home or apartment thermostat down to a maximum winter setting of 60 degrees Fahrenheit (16 Celsius), giving rise to such humor as “Don’t open the window. People on the street will catch cold and die.” During the severe winter of 1985, “gasoline was at such a premium that use of [Romania’s] few private cars was banned for more than two months.”¹³

A Brookings Institution study by Ed A. Hewett on Soviet energy prospects observed, “No one knows how far [the Soviets] can cut oil imports to Eastern Europe and still maintain political stability. They are going to find out.”¹⁴

Given its oil crisis, it is not surprising that the Soviets are deeply interested in the oil of the Middle East. A Central Intelligence Agency (CIA) study in 1977 suggested that dwindling Soviet oil production might lead them to take over the Persian Gulf militarily. Events in Iran and Afghanistan followed, prompting President James E. “Jimmy” Carter Jr. to proclaim: “An attempt by any outside force to gain control of the Persian Gulf will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force.”¹⁵

Even though such a Soviet attack seems more remote now, “it is hard to find a target that is more valuable to Moscow than control of the Persian Gulf. Moscow would probably be happy to trade Cuba for the Persian Gulf, for ex-

¹³ *Wall Street Journal*, 10 April 1985.

¹⁴ Ed A. Hewett, *Reforming the Soviet Economy: Equality vs. Efficiency* (Washington, DC: Brookings Institution Press, 1988).

¹⁵ James E. Carter Jr., “Address by President Carter on the State of the Union before a Joint Session of Congress” (speech, Washington, DC, 23 January 1980).

ample.”¹⁶ A study for Harvard University’s Energy and Research Project concludes, “The Soviets are likely to play a patient and persistent game in the Persian Gulf, seeking to accumulate a political advantage over time rather than seize it in a single stroke. They will pressure existing regimes, exploit regional tensions, and carry out subversion in an attempt to expand their influence gradually while weakening that of the United States. . . . The Soviet interest in the gulf is not oil per se, but the manipulation of Western dependence on oil. More important than disrupting the oil supply and wrecking the West, the Soviets hope to use their influence in the gulf to gain leverage over the West, especially Europe. . . . They believe that time is on their side.”¹⁷

Soviet policy seems not to have changed since 1973, when the late Soviet party chairman Leonid Brezhnev declared: “Our aim is to gain control of the two great treasure houses on which the West depends: the energy treasure house of the Persian Gulf, and the mineral treasure of southern Africa.”¹⁸

If there are those who still wonder why the Soviets committed themselves to such a costly military venture in Afghanistan, part of the answer can be found in great accessibility to the Persian Gulf. The Afghan air base at Shindand, near the Iranian border, is 805 km from the strategically important Strait of Hormuz at the southern tip of the gulf. About 20 percent of the world’s transported oil passes through that narrow body of water. Soviet Sukhoi Su-24 Fencer and Tupolev Tu-26 Backfire bombers are easily within range from Shindand. Not only is the strait less than an hour’s flying time away, but production, refining, and terminal facilities all along the Persian Gulf are within attack range.

The Soviet Navy maintains a fleet of more than 30 ships in the Arabian Sea and the Indian Ocean, and they operate within easy distance of the Strait of Hormuz and the Persian Gulf. Soviet naval bases in the nearby Horn of Africa provide the Russians with a permanent and threatening presence.

¹⁶ Thomas L. McNaugher, *Arms and Oil: U.S. Military Strategy and the Persian Gulf* (Washington, DC: Brookings Institution, 1985), 20.

¹⁷ David A. Deese and Joseph S. Nye, eds., *Energy and Security* (Cambridge, MA: Ballinger, 1981), 103.

¹⁸ *Hearings on Military Posture and H.R. 2614 and H.R. 2970 (H.R. 3519) and Consideration of Report on the First Concurrent Resolution on the Budget for Fiscal Year 1982 before the Committee on Armed Services, House of Representatives, 97th Cong., 1st Sess., Part 1 (1981).*

It is interesting to note how Soviet leaders have learned the lessons of World War II. The former commander in chief of the Soviet Navy, Admiral Sergey G. Gorshkov, wrote a book, *The Sea Power of the State* (1977), in which he devoted considerable attention to the failure of the Germans to bring Britain to its knees by cutting off its supplies, particularly fuel, early in the war. Implicit is that the Soviets would aim early in any future conflict to break their enemy's supply lines. Submarines have been playing a larger role in Soviet maritime thinking. U.S. Navy rear admiral Ernest M. Eller, former director of the Naval History Division, makes the interesting observation that the United States is less prepared to counter likely Soviet naval strategy than it was Nazi Germany's: "For every one German submarine [in World War II] there were 25 Allied ships and 100 Allied aircraft; the Western powers could muster today, at best, perhaps a 2:1 surface ship-tosubmarine advantage and a maximum effort 10:1 aircraft-tosubmarine advantage."¹⁹

There have been hundreds of limited and conventional conflicts since World War II, and a continuation of this pattern is more likely than a large war. Logistics of the future are likely to remain the constants of bulk and weight. The difference is that greater loads will be necessary in the future. New technologies since World War II have produced equipment that demands enormous increases in fuel consumption. More than twice as much fuel must be available to power today's jets than was needed for the piston planes of the 1940s.

Today's U.S. military uses close to 500,000 barrels of petroleum products daily. It is only slightly less than the amount used by the American armed forces in the final stages of World War II. The difference is that, in 1945, the oil maintained a force of 14 million men and women engaged in worldwide combat. Currently, only 2 million Americans are in uniform, and there are proportionately fewer ships and aircraft than there were at the height of World War II.

Peacetime use of petroleum by the U.S. military is broken down in table 19.3. The U.S. military used 520,523 barrels a day in 1945, and that represented 29 percent of total U.S. oil consumption. Today, the military uses only 3 percent. A peacetime force obviously uses far less than Services at war, so any kind of

¹⁹ *Sea Power*, December 1979.

mobilization or operational involvement on a major scale for a prolonged period of time would at least double or triple consumption.

Table 19.4 illustrates the military's growing share of available oil during World War II. Oil and war are more inextricably linked today than in World War II. The problems experienced by the United States during that conflict were nothing compared to those being experienced today, and the present problems are not helped by temporary gluts and price instability. George P. Mitchell, chairman of a Texas oil company, summarized the complexities of the situation when he said, "Our national security is threatened, our balance of payments deficit is headed toward deeper waters—as much as \$130 billion by 1990 for petroleum alone—and the nation's banking system is under pressure."²⁰

There is a finite supply of oil. The world burns it up at a rate of 900 billion gallons a year.²¹ At current consumption rates, it will last until the year 2045. That is a consensus estimate. Exploration, according to the U.S. Geological Survey, has already discovered two-thirds of the oil that will ever be discovered. There will be a few expensive discoveries ahead, but not enough of them to delay a switch to other forms of energy before the middle of the twenty-first century. In the meantime, competition for oil in peace and war will be fierce.

As one scholar put it, "The crucial link between oil and national security, once solely the concern of the military and government officials, has become a matter of public discourse. It is a time of decision, as the American people and their leaders engage in a great debate over national energy policy."²²

May the lessons of World War II be part of that debate.

²⁰ *Journal of Commerce*, 27 May 1986.

²¹ The figure is almost beyond comprehension. Put another way, 900 billion gallons of oil stacked in gallon containers end to end would reach to the sun and halfway back to Earth. The amount is also 150 times greater than all the beer consumed by Americans in one year.

²² Michael B. Stoff, *Oil, War, and American Security: The Search for a National Policy on Foreign Oil, 1941–1947* (New Haven, CT: Yale University Press, 1980), ix.

Table 19.3. U.S. military consumption in peacetime

(in barrels per day)	
Air Force	279,330
Navy	152,490
Army	41,180
Marine Corps	11,150
Total	484,130

Data from the Defense Fuel Supply Center, 1986.
Courtesy of William Morrow, adapted by MCUP

Table 19.4. U.S. military consumption, 1940–45

	<i>Total U.S. usage</i>	<i>Military usage</i>	<i>Percent military</i>
	(in barrels per day)		
1940	1,400,000	14,252	1
1941	1,600,000	26,642	1.6
1942	1,500,000	92,910	6
1943	1,600,000	207,749	13
1944	1,700,000	431,289	25
1945	1,800,000	520,523	29

Courtesy of William Morrow, adapted by MCUP

EDITOR'S NOTE



In the 34 years since *Oil & War's* original publication in 1987, much has changed in the international community regarding the production and consumption of oil as well as individual countries' own oil reserves. As mentioned earlier by the authors, oil production in the United States reached a peak in 1970. The nation, however, did eventually awaken to the "predicament that could jeopardize its national security." Since this book was first published, the United States has become the world's leading producer of oil, producing 19 percent of the worldwide total in 2019 and nearly three-quarters as much as the five leading OPEC nations together.¹

According to the U.S. Energy Information Administration (EIA), the United States in 2019 produced 19.51 million barrels of oil per day, comprising 19 percent of the worldwide total of 100.63 million barrels per day. Subsequent countries with the highest production were Saudi Arabia (11.81 million barrels per day), Russia (11.49 million), Canada (5.5 million), China (4.89 million), Iraq (4.74 million), United Arab Emirates (4.01 million), Brazil (3.67 million), Iran (3.19 million), and Kuwait (2.94 million). Five of those countries are members of OPEC and located in the Middle East. The EIA also states that the United States in 2017 consumed 19.96 million barrels of oil per day, comprising 20 percent of the worldwide total of 98.76 million barrels per day. Succeeding countries with the highest consumption were China (13.57 million barrels per day), India (4.34 million), Japan (3.92 million), Russia (3.69

¹ "What Countries Are the Top Producers and Consumers of Oil?," U.S. Energy and Information Administration, accessed 9 September 2020.

million), Saudi Arabia (3.33 million), Brazil (3.03 million), South Korea (2.63 million), Germany (2.45 million), and Canada (2.42 million).²

These statistics suggest that the United States consumes approximately 450,000 more barrels of oil per day than it produces. Of the top 10 oil producers worldwide, the United States was just one of two countries to consume more than it produced in recent years. Saudi Arabia, for example, consumed just 3.33 of its 11.81 million barrels produced per day, while Russia consumed only 3.69 of its 11.49 million barrels.³

Moreover, the EIA outlines that the United States in 2018 possessed a reserve of about 42 billion barrels of oil, ranking 10th among all countries in the world and comprising about 2.5 percent of the worldwide total of more than 1.7 trillion barrels. The countries with higher oil reserves were Venezuela (302 billion barrels), Saudi Arabia (266 billion), Canada (171 billion), Iran (157 billion), Iraq (149 billion), Kuwait (102 billion), United Arab Emirates (98 billion), Russia (80 billion), and Libya (48 billion).⁴

The EIA also notes that the United States in 2019 imported approximately 9.14 million barrels per day of petroleum, 74 percent of which was crude oil, from nearly 90 countries. That same year, it exported about 8.47 million barrels per day of petroleum, 35 percent of which was crude oil, to some 190 countries, resulting in a net import of 670,000 barrels per day. The countries that exported the most petroleum to the United States were Canada (4.43 million barrels per day), Mexico (650,000), Saudi Arabia (530,000), Russia (520,000), and Colombia (370,000). Those that imported the most U.S. petroleum were Mexico (1.19 million barrels per day), Canada (1.04 million), Japan (580,000), South Korea (560,000), and Brazil (470,000).⁵

As it has since World War II, the U.S. military continues to consume a great deal of oil today. According to a 2014 study conducted by the Union of Concerned Scientists, a nonprofit organization based in the United States, the

² “What Countries Are the Top Producers and Consumers of Oil?”

³ “What Countries Are the Top Producers and Consumers of Oil?”

⁴ “International Energy Statistics,” U.S. Energy and Information Administration, accessed 25 November 2019.

⁵ “How Much Petroleum Does the United States Import and Export?,” U.S. Energy and Information Administration, accessed 9 September 2020.

U.S. Department of Defense is the largest institutional consumer of oil in the world, using more than 100 million barrels each year. To put that figure into perspective, the Department of Defense consumes approximately as much oil each year as all of Austria. The lion's share of those 100 million barrels is used by the U.S. Air Force and Navy to power their advanced aircraft and warships. This dependency on oil presents a significant problem, since the U.S. military could be badly hindered or even prevented from achieving its missions if its supply of oil was blocked by enemy action or simply ran dry. Fortunately, the Services are experimenting with innovative ways to consume less oil, such as introducing hybrid-electric and biofuel technology to new aircraft, warships, and vehicles. In the event that the United States someday becomes a major combatant in a large-scale conflict, these innovations will no doubt prove their worth.⁶

At the time of this book's original printing, the Cold War between the United States and the Soviet Union was continuing with no clear conclusion in sight, and the lessons of World War II were on the minds of many in positions of power on both sides. The role of oil in a tense arms race between two global superpowers can hardly be understated, especially when one considers the vital impact that oil had on the Allied victory in World War II just several decades before. The Cold War did, however, come to a decisive end in 1991 with the peaceful dissolution of the Soviet Union, swiftly and suddenly terminating the perilous, decades-long rivalry between the first and second worlds.

In the three decades since the Cold War's end, the United States has remained the world's only major superpower and has developed and implemented its foreign and domestic defense strategies accordingly. Today, it experiences increasing political, economic, cultural, and military competition from great powers such as Russia and China, which has paved the way for a new era of great power competition that is projected to affect much of the world. The role of oil in influencing future international affairs and national security policies remains as significant now as ever before, and the important

⁶ "The U.S. Military and Oil," Union of Concerned Scientists, 30 June 2014.

relationship between oil and war may someday again, as it did during World War II, spell the difference between victory and defeat.

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APPENDIX

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ADDITIONAL TABLES

Table 20.1. World crude oil production, 1938–45

	1938	1939	1940	1941	1942	1943	1944	1945
	(average daily barrels)							
Canada	19,085	21,474	23,472	27,764	28,540	27,540	27,593	23,241
Mexico	105,496	117,529	120,317	115,605	95,384	96,337	104,380	119,307
United States	3,327,000	3,466,000	3,697,000	3,842,000	3,799,000	4,125,000	4,584,000	4,695,000
Argentina	46,783	50,995	56,309	59,927	64,942	75,929	66,202	62,688
Bolivia	619	589	787	644	844	915	858	1,047
Colombia	59,129	65,362	69,926	67,268	28,732	36,332	60,904	61,504
Ecuador	6,153	6,337	6,418	4,266	6,241	6,342	8,107	7,299
Peru	43,395	37,008	33,131	32,699	37,340	40,148	39,314	37,655
Trinidad	48,595	52,795	60,730	56,181	60,463	58,589	60,489	57,789
Venezuela	515,545	565,671	507,022	625,836	404,589	486,660	702,311	885,359
Albania	2,060	2,559	4,090	3,655	4,386	2,742	915	732
Austria	1,049	3,397	7,672	11,611	16,162	20,488	22,454	8,422
Czechoslovakia	356	329	445	501	742	547	505	249
France	1,405	1,370	1,355	1,134	1,268	975	820	553
Germany	10,578	12,293	20,139	17,268	14,222	13,625	16,814	10,780
Hungary	789	3,022	5,139	8,721	13,800	17,390	17,150	13,748
Italy	277	249	232	260	277	236	150	145

Table 20.1. World crude oil production, 1938–45 (continued)

	1938	1939	1940	1941	1942	1943	1944	1945
	(average daily barrels)							
Poland	10,310	10,680	10,631	4,912	7,655	9,589	8,197	2,055
Romania	132,841	125,063	117,945	111,005	115,326	107,348	71,560	95,266
United Kingdom	—	—	339	611	1,658	2,299	1,920	1,458
USSR	571,992	605,112	608,197	663,424	634,164	563,699	765,027	424,529
Yugoslavia	25	27	27	27	27	27	601	548
Bahrain	22,734	20,792	21,049	18,614	17,099	18,005	18,344	20,025
Egypt	4,332	12,784	17,773	23,414	22,671	24,529	25,727	25,770
Iran	214,718	214,112	181,194	139,115	197,961	204,416	278,811	357,605
Iraq	89,432	84,359	66,189	34,658	54,044	68,351	82,090	96,197
Saudi Arabia	1,356	10,778	13,866	11,808	12,411	13,337	21,295	58,386
Brunei	18,940	19,444	19,254	18,805	8,219	12,329	16,393	5,753
Burma	20,652	21,570	21,123	21,266	6,850	2,740	2,049	1,986
China	—	11	27	238	932	1,225	1,380	1,326
Dutch East Indies	157,036	170,101	169,429	147,134	65,753	132,312	60,820	20,822
India	6,816	6,375	6,290	7,942	7,649	6,918	7,607	6,474
Japan*	6,879	7,271	7,210	5,455	4,658	4,836	4,484	4,260
World daily average	5,447,000	5,715,000	5,874,000	6,084,000	5,734,000	6,183,000	7,083,000	7,109,000
U.S. production as percent of world total**								
	61.8	60.6	62.9	63.1	66.3	66.7	64.7	66
*Includes Taiwan								
**Includes miniscule production from other countries such as Cuba, Brazil, Algeria, and Morocco.								

Basic data from annual reports of the U.S. Bureau of Mines and summarized in editions of *Twentieth Century Petroleum Statistics* (Dallas, TX: DeGoyler and MacNaughton). Courtesy of William Morrow, adapted by MCUP

Table 20.2. World refining capacity, December 1940

	Barrels per day	Percent of world total
	Axis-controlled	
Austria	10,000	0.1
Denmark	12,200	0.2
France	151,600	2
Germany	68,800	0.9
Italy	57,300	0.7
Netherlands	15,000	0.2
Norway	1,200	—
		4.1
Allied-controlled		
Canada	221,900	2.9
India	37,000	0.5
Middle East	426,500	5.5
United Kingdom	144,100	3
West Indies	588,500	1.9
		21.5
Officially neutral		
Latin America	321,900	3.2
United States	4,461,100	58.1
USSR	899,700	11.7
		73

Courtesy of William Morrow, adapted by MCUP

Table 20.3. World tanker fleet, 30 June 1938

	Number	Gross tons	Percent of world total
United States	418	2,759,642	25.8
United Kingdom	410	2,672,219	24.9
Norway	262	1,972,469	18.4
Netherlands	112	561,946	5.2
Italy	78	380,488	3.5
Panama	49	450,261	4.2
France	40	241,896	2.3

Table 20.3. World tanker fleet, 30 June 1938 (continued)

	Number	Gross tons	Percent of world total
Japan	39	345,849	3.2
Germany	31	202,221	1.9
Canada	28	124,727	1.2
USSR	27	123,209	1.1
Sweden	17	144,899	1.4
Spain	16	76,925	0.1
Denmark	14	106,786	0.1
Belgium	9	64,923	0.1
Others	105	487,220	4.5
Totals	1,655	10,715,680	

Basic data from *Lloyd's Register of Shipping, 1941–42* (London: Lloyd's of London, 1941). Includes tankers of more than 999 gross tons.
Courtesy of William Morrow, adapted by MCUP

Table 20.4. World tanker fleet, 1940–45

	1940	
	Number	Tonnage
Japan	57	574,827
Germany	33	262,981
Italy	81	432,491
United States	383	2,824,160
United Kingdom	450	3,324,852
Norway	262	2,073,771
Netherlands	107	544,462
Panama	64	555,734
France	56	385,117
USSR	17	113,050
Sweden	21	183,206
Others	106	555,522
World Total	1,637	11,680,173

	1941	
	Number	Tonnage
Japan	59	532,947
Germany	38	326,485
Italy	80	429,094
United States	379	2,824,128
United Kingdom	417	2,975,688
Norway	255	2,055,254
Netherlands	101	514,512
Panama	71	588,323
France	46	328,980
USSR	17	113,050
Sweden	24	205,187
Others	102	517,100
World Total	1,589	11,242,773

Table 20.4. World tanker fleet, 1940–45 (continued)

	1942	
	Number	Tonnage
Japan	61	544,860
Germany	40	353,276
Italy	45	242,353
United States	389	2,931,193
United Kingdom	411	2,930,844
Norway	231	1,882,687
Netherlands	97	482,956
Panama	77	630,426
France	43	318,497
USSR	16	106,493
Sweden	28	244,061
Others	112	575,127
World Total	1,550	11,242,773
	1944	
	Number	Tonnage
Japan	59	503,753
Germany	55	461,742
Italy	30	171,383
United States	556	4,784,954
United Kingdom	353	2,521,751
Norway	166	1,370,174
Netherlands	77	374,090
Panama	76	539,783
France	29	209,430
USSR	24	154,563
Sweden	32	279,528
Others	99	518,409
World Total	1,556	11,889,560

	1943	
	Number	Tonnage
Japan	62	548,787
Germany	48	414,212
Italy	34	171,383
United States	366	2,901,748
United Kingdom	355	2,534,899
Norway	186	1,523,062
Netherlands	80	389,442
Panama	72	551,694
France	16	305,158
USSR	16	106,126
Sweden	32	282,411
Others	96	500,826
World Total	1,388	10,252,380
	1945	
	Number	Tonnage
Japan	63	478,987
Germany	44	364,081
Italy	23	131,549
United States	780	7,084,022
United Kingdom	380	2,685,010
Norway	163	1,364,567
Netherlands	67	333,830
Panama	68	502,473
France	17	122,063
USSR	24	171,560
Sweden	38	336,380
Others	101	527,883
World Total	1,768	14,012,405

Table 20.4. World tanker fleet, 1940–45 (continued)

	1 September 1945	
	Number	Tonnage
Japan	63	478,987
Germany	40	332,741
Italy	22	126,591
United States	907	8,379,542
United Kingdom	399	2,800,789
Norway	165	1,393,138
Netherlands	65	322,138
Panama	72	522,607
France	15	109,241
USSR	22	161,356
Sweden	37	325,113
Others	104	552,986
World Total	1,898	15,440,116

Basic data from *Lloyd’s Register of Shipping, 1941–42* (London: Lloyd’s of London, 1941).
Courtesy of William Morrow, adapted by MCUP

Table 20.5. Changes in U.S. tanker fleet, 1939–45

	1 September 1939		Additions		Deductions		30 September 1945	
	Number	Tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage
	(1,600 gross tons and more)							
New construction	—	—	721	—	—	—	—	—
Transfers	—	—	2	—	42	291,957	—	—
Lost at sea	—	—	—	—	123	978,273	—	—
Miscellaneous	—	—	3	—	1	7,952	—	—
Total	389	2,836,792	726	7,100,249	166	1,278,182	949	8,658,859

Basic data from U.S. Maritime Commission.
Courtesy of William Morrow, adapted by MCUP

Table 20.6. Germany’s fuel position, 1939

	Projected wartime consumption			Stocks on hand	Monthly wartime consumption could be met by stock drawdowns and domestic production
	(barrels per day)		Domestic production	(1 August 1939)	
	Military	Civilian	(barrels per day)	(in barrels)	
Aviation fuels and oils	43,000		13,600	4,800,000	4.8
Gasoline	32,400	19,720	33,000	2,958,000	5.2
Diesel fuel	9,750	25,750	11,250	2,310,000	3.2
Industrial fuel oil	—	6,250	1,340	335,000	2.6
Naval fuel oil	30,600	—	7,150	1,742,000	6.4
Naval diesel oil	—	—	1,575	3,750,000	6.4
Miscellaneous motor oils	5,000	2,500	2,500	743,600	13
Totals	123,150	53,720	70,415	16,638,600	

Adapted from “Oil as a Factor in the German War Effort,” *Report of the C.O.S. Technical Sub-Committee on Axis Oil* (London: Offices of the Cabinet and Minister of Defence, 1946). Courtesy of William Morrow, adapted by MCUP

Table 20.7. Oil production in Greater Germany, 1940–45

	Synthetic processes	Crude refining*	Total
	(barrels per day)		
1940	73,834	29,120	102,954
1941	90,982	32,372	123,354
1942	107,396	34,722	142,118
1943	129,066	38,819	167,885
1944	86,786	33,105	119,891
1945	(data incomplete)		
*Includes imported crude oil refined in Germany.			

Basic data from “Oil as a Factor in the German War Effort,” *Report of the C.O.S. Technical Sub-Committee on Axis Oil* (London: Offices of the Cabinet and Minister of Defence, 1946). Courtesy of William Morrow, adapted by MCUP

Table 20.8. Romanian oil, 1938–45

	Crude oil production	Refinery output	Domestic consumption	Exports
	(barrels per day*)			
1938	132,743	127,973	34,397	92,661
1939	125,313	119,938	36,678	85,849
1940	116,359	112,131	38,156	71,578
1941	111,998	107,979	37,212	83,671
1942	113,766	107,609	43,110	69,329
1943	105,753	100,747	41,240	64,726
1944	71,560	N.A.	N.A.	N.A.
1945	95,266	N.A.	N.A.	N.A.
(Ploesti was occupied by Russian forces on 22 August 1944.) *Crude oil calculated at 7.33 barrels per metric ton but oil products at 7.5.				

Basic data from “Oil as a Factor in the German War Effort,” *Report of the C.O.S. Technical Sub-Committee on Axis Oil* (London: Offices of the Cabinet and Minister of Defence, 1946) and *Twentieth Century Petroleum Statistics* (Dallas, TX: DeGoyler and MacNaughton).
Courtesy of William Morrow, adapted by MCUP

Table 20.9. Romanian oil exports, 1938–43

	1938	1939	1940	1941	1942	1943
	(barrels per day*)					
Germany**	20,806	26,760	29,690	60,076	37,942	37,387
German Army	—	—	—	715	7,693	14,903
Italy***	11,670	13,104	7,121	15,859	17,952	8,149
Bulgaria	1,660	1,952	1,976	1,105	904	449
Greece	4,169	1,568	3,889	212	638	541
Switzerland	1,850	2,370	1,920	2,236	1,830	2,000
France	1,024	4,957	1,810	404	1,716	305
Turkey	1,116	633	3,087	1,206	30	266
Hungary	4,139	1,900	720	—	—	—
Other countries	34,223	25,884	18,907	2,610	1,200	1,246
Bunker fuel	7,004	5,573	3,014	323	299	1,176
*Bunker Oil calculated at 6.7 barrels per metric ton; other petroleum products averaged at 7.6 barrels per metric ton. **Includes Czechoslovakia. ***Includes Albania.						

Basic data from “Oil as a Factor in the German War Effort,” *Report of the C.O.S. Technical Sub-Committee on Axis Oil* (London: Offices of the Cabinet and Minister of Defence, 1946).
Courtesy of William Morrow, adapted by MCUP

Table 20.10. Civilian consumption of motor fuel, 1938–41

	1938	1939	1940	1941
	(thousands of barrels daily)			
France	24,000	22,000	9,800	3,000
Germany	25,900	24,200	14,000	7,000
Italy	5,000	5,700	2,500	2,100
USSR	27,000	28,000	29,500	23,000
United Kingdom	45,000	44,000	22,000	13,000

Basic data from Foreign Oil Department, Cities Service Oil, contained in *Petroleum Facts and Figures*, 8th ed. (Washington, DC: American Petroleum Institute, 1947).
Courtesy of William Morrow, adapted by MCUP

Table 20.11. Civilian consumption of all petroleum products, 1938–41

	1938	1939	1940	1941
	(thousands of barrels daily)			
France	49,100	44,200	21,500	10,000
Germany	56,700	54,000	35,000	21,000
Italy	20,500	21,800	14,050	14,180
USSR	164,500	170,600	180,000	138,500
United Kingdom	90,300	88,200	50,000	32,000

Basic data from Foreign Oil Department, Cities Service Oil, contained in *Petroleum Facts and Figures*, 8th ed. (Washington, DC: American Petroleum Institute, 1947).
Courtesy of William Morrow, adapted by MCUP

Table 20.12. U.S. petroleum exports, 1940–45

	1940	1941	1942	1943	1944	1945
	(in barrels)					
Crude oil	51,495,494	34,483,877	35,560,048	43,312,762	34,802,219	35,353,023
Natural gasoline	1,703,571	1,150,867	1,168,785	598,647	671,956	878,852
Aviation fuel	29,992,457	6,180,260	22,331,941	33,498,700	60,920,220	32,454,414
Gasoline	16,478,005	15,545,434	8,387,814	11,695,379	33,633,995	49,673,598
Blending agents, mineral spirits, etc.	291,673	1,361,300	1,137,686	2,326,716	3,224,212	2,958,797

Table 20.12. U.S. petroleum exports, 1940–45 (continued)

	1940	1941	1942	1943	1944	1945
	(in barrels)					
Gas oil and distillates	17,564,545	14,934,170	20,229,948	22,686,999	41,413,712	31,754,034
Residual fuel	11,879,914	10,330,310	8,650,384	13,402,164	9,427,454	7,158,304
Lubricants	10,332,543	9,393,379	7,973,871	8,542,231	8,563,573	6,431,922
Total	115,877,702	95,370,890	107,939,855	140,502,014	197,327,728	172,586,387
Average barrels per day	316,606	261,290	295,726	384,937	539,147	472,839

Basic data from the U.S. Bureau of the Census.
Courtesy of William Morrow, adapted by MCUP

Table 20.13. Military consumption of U.S. petroleum, 1940–45

	Total U.S. usage	Military usage	Percent military
	(barrels per day)		
1940	1,400,000	14,252	1
1941	1,600,000	26,642	1.6
1942	1,500,000	92,910	6
1943	1,600,000	207,749	13
1944	1,700,000	431,289	25
1945	1,800,000	520,523	29

Basic data from the U.S. Defense Fuel Supply Center.
Courtesy of William Morrow, adapted by MCUP

Table 20.14. Sources of petroleum in Japan proper, 1938–45

	Crude oil imports	Refined imports	Domestic production	Synthetics and substitutes	Total
	(in barrels per day)				
1938	50,422	38,477	6,753	912	96,564
1939	51,625	32,378	6,389	2,011	92,403
1940	60,411	41,398	5,652	3,984	111,445
1941	8,576	14,361	5,318	5,159	33,414

Table 20.14. Sources of petroleum in Japan proper, 1938–45 (continued)

	Crude oil imports	Refined imports	Domestic production	Synthetics and substitutes	Total
	(in barrels per day)				
1942	22,318	6,515	4,630	7,345	40,808
1943	26,981	12,745	4,970	5,551	50,247
1944	4,496	9,334	4,342	5,693	23,865
1945*	0	0	4,432	4,874	9,306
*First half.					

Courtesy of William Morrow, adapted by MCUP

Table 20.15. Fuel and performance data, selected World War II tanks

	Weight	Horsepower	Maximum speed	Fuel capacity	Fuel endurance*
	(long tons)		(miles per hour)	(U.S. gallons)	(miles)
France					
Renault R-35	9.9	82	12.5	45	50 – 86
Char B-1	31	270	17.5	—	125
SOMUA S-35	19.7	190	25	109	80 – 160
Germany					
Panzer II	9.3	140	25	45	77 – 118
Panzer III	21.9	300	25	86	109 – 60
Panzer IV	24.6	300	24	179	131 – 200
Panther	40.6	700	24	193	62 – 124
Tiger	56	650	23	150	42 – 73
Tiger II	66.8	600 – 700	26	227	74 – 106
Fighter Panther	44.8	700	28	190	50 – 100
Elephant	66.9	640	22	290	49
Chaser	15.7	150	26	85	80 – 130

Table 20.15. Fuel and performance data, selected World War II tanks (continued)

	Weight	Horsepower	Maximum speed	Fuel capacity	Fuel endurance*
	(long tons)		(miles per hour)	(U.S. gallons)	(miles)
M-13/40	13.7	105	20	42	124
United Kingdom					
Matilda Mark II	26.5	95	15	56	80 – 160
Crusader II	19.7	340	27	168	200
Valentine II	16	131	15	43	90
Cromwell IV	27.5	570 – 600	38	139	81 – 174
Churchill III	38.6	350	15	219	120
United States					
M3 A1 (Stuart)	12.7	250	37	56	60 – 100
M3 A2 (Lee)	26.9	340	26	174	187
M4 A3 (Sherman)	31	450	32	168	130
M-24 (Chaffee)	18.1	220	34	—	100
M-26 (Pershing)	41.1	500	20	—	92
USSR					
KV-1	46.2	600	25	159	124 – 208
T-34/76A	26.6	500	33	162	250
T-34/85	30.8	500	32	147	155 – 250
JS-1A	44	600	22	—	100
*Where two figures are given, the first is cross-country ranger, the second over normal roads. Single-figure entries cover only normal road range.					

Courtesy of William Morrow, adapted by MCUP

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The late NBC News correspondent **ROBERT GORALSKI** saw service with the U.S. Navy in the Pacific during World War II. He later covered the Korean and Vietnam conflicts as a journalist. He is the author of the *World War II Almanac* and wrote and lectured on military affairs and energy. He died in 1988 in McLean, Virginia.

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Front cover

A U.S. Navy Douglas SBD Dauntless dive bomber flies patrol over a naval task force at sea during World War II.
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