

Where
the past
is present

DETROIT HISTORICAL SOCIETY

EDUCATOR LESSON PLAN

WWII: MOBILIZING INDUSTRY

INTRODUCTION

High school students will investigate how the Detroit metropolitan industrial complex was mobilized to build war materials. Students will discover the significance of William S. Knudsen in aiding the federal government's efforts to convert major industries production into war time materials.

LEARNING OBJECTIVES

Students will:

- Describe the wartime mobilization of industry, labor, scientists, and media
- Trace the efforts of the United States government to control the economy
- Outline how the United States mobilized Detroit for war after the attack on Pearl Harbor
- Support opinion based statements with data, vocabulary skills

TIME REQUIRED

Two class periods (a class period being of approximately 55 minutes)



Charles Sorensen, William S. Knudsen (in uniform) and Edsel Ford at hanger. Courtesy of the Detroit Public Library



View of fuselages for the B-24 Liberator bomber at the Ford Motor Company Willow Run Plant . Courtesy of the Detroit Public Library

Learning Standards

ERA

USHG Era 7 - The Great Depression and World War II (1920-1945)

MI GLCES

HSCE 7.2.3 Impact of World War II on American Life –

analyze the changes in American life brought about by U.S. participation in World War II, including:

- the mobilization of economic, military, and social resources.
- the role of women, African Americans, and ethnic minority groups in the war effort, including the work of A. Philip Randolph and the integration of U.S. military forces.
- the role of the home front in supporting the war effort.

College, Career and Civic Life (C3)

• History Dimension 2, Change, Continuity and Content - 9-12

Evaluate how historical events and developments were shaped by unique circumstances of time and place as well as broader historical contexts

• The Inquiry Arc of C3 Dimensions 1, 2, 3, and 4

The Detroit Historical Society would like to thank Heather Rivard for her generous support of this program.

Where
the past
is present

DETROIT HISTORICAL SOCIETY

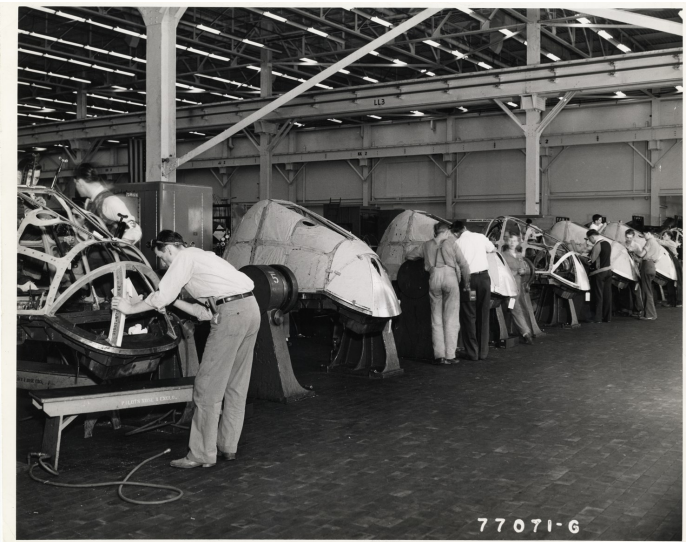
EDUCATOR LESSON PLAN

MATERIALS USED

- Classroom chalk board or a smart board
- Newsprint paper
- Lined paper
- Pencils
- Books, media center, or access to computers/ internet

LESSON PREPARATION

- See lesson plan as resources for students' content reading of Arsenal businesses and leaders.
- See LOC Sound and manuscript Analysis Sheets: <http://loc.gov/teachers/usingprimarysources/guides.html>



Men assembling pilot's enclosures at the Willow Run plant, c. 1943. Courtesy of the Detroit Public Library

LESSON SEQUENCE

Day One Activity

1. The instructor reads in advance the Joel Stone article "Detroit: Arsenal of Democracy." This article provides necessary background information for pre-WWII (1940), bio of William S. Knudsen, and the beginning of Detroit's heavy industrial complex mobilizing for war production. The teacher may also want to read the excerpts from Arthur Herman's book *Freedom's Forge*. These excerpts offer both positive and controversial materials about Knudsen and Ford.

Note: Instructor will want to inform students of the importance of using primary sources to analyze history. <http://loc.gov/teachers/usingprimarysources/>

Optional preliminary activity –

The teacher may consider reviewing textbook materials and comparing and contrasting the federal government's control of the economies during WWI and WWII.

The students use their prior knowledge of the United States' mobilization for the Great War discussing the following topics:

- Impacts war had on household incomes
- What were the important consumer goods at that time?
- Domestic life styles of Detroiters during World War I.
- How people showed patriotism
- Changes in individual rights during war time

2. The teacher has the students listen or read FDR's "The Arsenal of Democracy" address given as a fire side chat on 29 December 1940 to the nation and the world.
3. Instructor uses the LOC Speech Analysis sheet located in LOC resources. A class discussion or reflective/formative writing follows. The instructor may want to begin discussion with such questions as:

- What was the purpose of the speech?
- What is FDR attempting to say to England, Germany, Japan, and Italy?
- What has happened in the World up to this point, 29 December 1940?
- Was this speech necessary? Yes or No? Explain your answer.

Note: the teacher may want to have the students' role play while listening to this speech as – a teenager, an auto worker, an auto executive, a steel worker, and a mother.

4. Finally, have students define the term – "Arsenal of Democracy"

Suggestion:

- Review attached excerpt from Davis book, pages 13 – 17 to introduce the Detroit industrial leaders.
- Watch or listen to FDR's fireside chat <https://www.americanrhetoric.com/speeches/fdrarsenalofdemocracy.html>

LESSON SEQUENCE

Day Two Activity

1. Teacher highlights the efforts of Henry Ford and William S. Knudsen, asking students why two automotive giants would support and involve their companies in the war effort.

Reference Additional Resources in this document for more information on connections

2. Teacher has the class research Henry Ford and William S. Knudsen to gather background materials on the products that companies made, where new facilities were built and why, the cost and profits that came from these government contracts. Students will construct a vocabulary list of new terms, names, places based on analysis.

See attached PDFs at the end of the lesson for *Arsenal* article and *Arthur Herman's Freedom's Forge: How America's Business Produced Victory in WWII*



Uncle Sam WWII Poster c. 1943. Courtesy of the Library of Congress

Where
the past
is present

DETROIT HISTORICAL SOCIETY

EDUCATOR LESSON PLAN

3. Have students role play as leaders in the automotive, steel, chemical, and rubber industry developing a national plan to mobilize their industries to produce more military goods.

Possible Synthesis Questions for the group activity:

- Can you formulate a plan to ...?
- What facts can you compile to support your plan?
- Can you think of an original way for the government to mobilize the nation's industries?
- Can you propose an alternative plan to the mobilization of WWII?

Groups present their plans. Class votes on the best plan of action.

4. Teacher presents several questions to the class in conclusion, such as:
 - Define the term "hero".
 - Define the term "patriot".
 - What is an arsenal?
 - What is democracy?
 - What is common good?

Discussion follows and terms defined.



Army & Navy, *E for Excellence* pin. Given to exemplary employees c. 1941



Warren Tank Arsenal c. 1942. Detroit Historical Society Collection

EVALUATION

1. Students are presented with either a group assessment or an individual assessment to the following:
 - Analyze how Henry Ford and William Knudsen actions contributed to WWII. Support and extend or challenge this position.
2. The following evaluation questions can be used to guide the students' critical thinking:
 - What information would you use to support your view...?
 - What would you cite to defend the actions of Henry Ford and William Knudsen?
 - Can you assess the value or importance of Henry Ford and William Knudsen to the success of the American Arsenal of Democracy?

Where
the past
is present

DETROIT HISTORICAL SOCIETY

EDUCATOR LESSON PLAN

ADDITIONAL RESOURCES

Books, article and printed materials:

United States History Modern American by Prentice Hall

The American by McDougall Littell

The Americans: Reconstruction to the 21st Century by
McDougall Littell

Henrickson, Wilma W. *Crossroads and Turning Points*.
First ed. Detroit, MI: Wayne State University Press, 1991.
401--409.

Herman, Arthur. *Freedom's Forge: How America's
Business Produced Victory in WWII*. first ed. New York,
NY: Random House Trade Publications, 2012. 1-400.
Print.

Davis, Michael W. *Images of America: Detroit's Wartime
Industry- Arsenal of Democracy*. first ed. Charleston,
South Carolina: Acadia Publishing, 2007. 7-126.

Teacher Resources and Strategies:

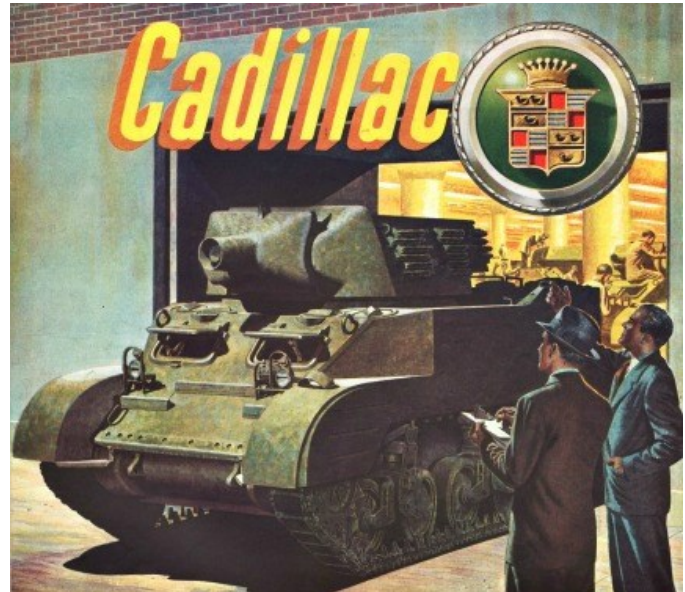
Marzano, Robert J., Debra J. Pickering, and Jane E.
Pollack. *Classroom Instruction that Works: Research-
Based Strategies for increasing Student Achievement*.
First ed. Danvers, MA: Association of Supervision and
Curriculum: McREL, 2001. 1-180. Print.

Marzano, Robert J. *What Works in Schools: Translating
Research into Action*. First ed. Alexandria, VA:
Association for Supervision and Curriculum
Development, 2003. 1-216.

Gallery Walk Teaching Strategy:
[http://www.facinghistory.org/resources/strategies/
gallery-walk-teaching-strateg](http://www.facinghistory.org/resources/strategies/gallery-walk-teaching-strateg)

LOC Teacher page: <http://loc.gov/teachers/>

LOC Teacher's Guides and Analysis Tool: [http://loc.gov/
teachers/usingprimarysources/guides.html](http://loc.gov/teachers/usingprimarysources/guides.html)



Cadillac Advertising during WWII c. 1943.
Courtesy of General Motors Archives

Looking to delve into WWII history the whole semester?

Detroit is full of businesses that contributed to the war effort. For high school classes looking to study this topic we'd love to support you and your students work!

Your students can submit their findings and research to be reviewed and their findings showcased on an interactive map on the Society's website. Through this inquiry-based, authentic learning process, students will develop valuable college and career readiness skills, including research, interpretation, communication, problem-solving, time management, goal setting, self-awareness, persistence, collaborative learning and technology proficiency.

**Check out the project at wwii.detroithistorical.org or
contact our team at 313.833.1419**

Detroit: The Arsenal of Democracy

Joel Stone

Detroit Historical Society

In December 1940, President Franklin Roosevelt declared that America must become the “Arsenal of Democracy” to support European and Asian nations at war against the Axis alliance of Germany, Italy and Japan. The people of Detroit and the manufacturing might of southeast Michigan accepted the challenge and produced thirty percent of the war materiel generated by the United States before the end of World War II in 1945. It took ingenuity and perseverance under difficult circumstances, but Detroit came through to lead the country as *THE* arsenal of democracy.¹

Detroit’s industrial infrastructure adapted and grew to produce airplanes, tanks, vehicles, boats, weapons, ammunition, electronics, clothing, food – everything necessary to assist the military efforts at home and overseas. Detroit executives served as leaders of government production agencies. Detroit engineers designed materiel and methods of production that sped needed arms and armament to troops, and saved America millions of dollars. Detroit assembly line workers provided the muscle, and Detroiters of all ages pitched in to make the war machine operate smoothly.

While Detroit helped change the character of the war, the war had significant repercussions on the city as well. Besides sending about two hundred thousand young men and women into the military, over seven hundred thousand residents toiled in factories – many for the first time. People came from all over the country to fill job vacancies. The burgeoning population put a strain on municipal services, while overwork, overcrowding and rationing put a strain on the people.²

Unlike any other city in the nation, Detroit became a war production boom town. Often compared to a “frontier town of the gold rush period,” Detroit maintained a delicate balance between virtue and vice. Citizens did what they needed to do, and their vigilance played a major role in the successful outcome of the war. Victory despite adversity was a source of pride for all Detroiters.³

In the grand scheme, it was the industrial facilities and skills based in the Detroit area that proved most important to the country and her allies. Prior to the war, the United States Army ranked nineteenth in the world in terms of manpower,

¹Dominic J. Capeci Jr. ed., *Detroit and the ‘Good War’: The World War II Letters of Mayor Edward Jeffries and Friends* (Lexington: University of Kentucky Press, 1996), 1.

²“Detroit: Six Months After” LIFE, February, 1943; Arthur M. Woodford, *This is Detroit, 1701-2001* (Detroit: Wayne State University Press, 2001) . 152.

³William Lovett to Oswald Villard, 20 Jan. 1943, in Capeci, 15.

and was woefully short of arms and munitions of all kinds. This “terrifying weakness of America’s military preparedness” was recognized by President Franklin Roosevelt and many in Washington. As American involvement in the war became a probability, they turned to Detroit. The city’s automobile manufacturers led the world in vehicle production, and the pharmaceutical and chemical plants were also leaders in their respective markets. These manufacturing giants, along with hundreds of other local firms, allowed the nation to quickly match and pass the industrial might of the Axis powers, particularly Germany.⁴

Curiously, German leaders did not give the United States much credit in this regard. In September 1942, Reichmarschall Herman Goring, commander of the Luftwaffe and head of Germany’s industrial output, brushed off warnings with the comment that “Americans only know how to make razor blades.” This attitude decried the facts. That year Germany produced 7,200 vehicles and 15,556 aircraft. Comparatively, the United States churned out 24,000 and 45,000 respectively – a large percentage coming out of Detroit.⁵

While the war in Europe and Asia began in 1939, the United States was not drawn into the conflict until the end of 1941. However, many of the main armaments of the war – the M-1 rifle, and the B-17 and B-24 bombers – were under development in the 1930s. The needs of England, Russia and China for military materiel began to be addressed by American manufacturers beginning in 1940. In May of that year, President Franklin Roosevelt asked Congress to approve \$1.2 billion* in defense spending, the largest peace time appropriations request ever. Later that month he contacted General Motors president William Knudsen.⁶

Knudsen, a Danish immigrant who had worked his way up from shop floor to front office, worked at Ford Motor Company before joining GM. Because he understood all aspects of the manufacturing process and knew most of the automotive industrial leaders, Roosevelt made him a point man for production of vehicles, tanks, aircraft, weapons, ammunition and uniforms. Knudsen was an initial member of the National Defense Council’s Advisory Commission, the director of the Office of Production Management and the Air Technical Command. Eventually promoted to Lieutenant General, Knudsen was charged with focusing America’s manufacturing might on its wartime needs.⁷

⁴ V. Dennis Wrynn, *Detroit Goes To War*, (Osceola, WI: Motorbooks International Publishing, 1993), 15; Lt. Col. Eddy Bauer, *History of World War II*, (New York: Galahad Press, 1966), 194.

⁵ Bauer, 251.

⁶ Wrynn, 15; Michael W.R. Davis, “The Speed-Up King” *World War II*, Jan-Feb 2010, 44. – *This figure is Davis’s and needs to be confirmed or defined. Beasley, 235, cites a *New York Times* article from May 28, 1940 claiming the request was for \$3B emergency preparedness program funds, and \$700B for U.S. rearmament – Wrynn, 15, notes the \$7B approved for Lend-Lease in March, a figure confirmed by Sulzberger in the American Heritage volume on WWII.

⁷ Davis, 45-47; Letter from the CND to Roosevelt in: Norman Beasley, *Knudsen, a Biography*, (New York: McGraw-Hill Book Company, Inc., 1947), 240.

He called the directors of the American Automobile Manufacturers Association (AAMA) together in October, 1940, and convincing them of the serious work to be done. Over the course of the war, many of them were tasked with shepherding various projects to fruition. K.T. Keller, president of Chrysler Corporation, was placed in charge of the yet-to-be-built tank arsenal in Warren. The Tank-Automotive Center, responsible for “the design, production, delivery and servicing” of every vehicle in the military, was moved from Washington, D.C. to the Union Guardian Building in Detroit and placed under the direction of Brig. Gen. Alfred Glancy, another GM executive. George Romney, spokesman for the AAMA, became managing director of the Automotive Council for War Production in 1943. Alvan Macauley, chairman of Packard Motor Company, facilitated that company’s aircraft engine production. Albert Kahn’s architectural firm, creators of Ford’s Rouge Plant, designed factories, offices and airfields all over the country, eventually overseeing \$200 million in wartime government contracts.⁸

Dozens of manufacturing executives entered the ranks of the “Dollar-A-Year Men” – production experts who worked for the government to expedite factory output. Later in the war, many of these individuals were commissioned with the rank of General, in order to give them clout within the military chain of command. While some of these executives donated their salaries to the war effort, most remained on the payroll of their former employers, while at the same time exhorting the firms to meet production quotas.⁹

Additional appropriation requests were rapidly approved, and the Lend-Lease program was launched in early 1941. Over the course of the war, Britain, the Soviet Union, China and other allies received in excess of \$20 trillion worth of armament and munitions – enough to equip two thousand infantry divisions. Detroit businesses alone accounted for almost \$7 trillion of that. Nearly every manufacturing facility, large and small, was processing military orders. The numbers are staggering and are included in an appendix to this paper.¹⁰

Much of the direction for spending the massive government appropriations was determined by gathering over fifteen hundred companies at the former Graham-Paige auto plant. Thousands of the needed parts were displayed, and manufactures, tool makers, designers – anyone with production capability – bid on contracts and subcontracts.¹¹

These government contracts prompted companies to begin manufacturing war materiel, even as they were continuing to produce automobiles and other consumer goods. As early as September 1940, Ford Motor Company had contracts to build Pratt & Whitney aircraft engines. As the Rouge facility remained occupied with car assembly, a special building was constructed in

⁸ Michael W.R. Davis, *Detroit’s Wartime Industry: Arsenal of Democracy*, (Chicago: Arcadia Publishing, 2007), 29,33; LIFE, 1943; Wrynn, 71; Beasley, 265; Don Lochbiler, “Architect of Victory” *Detroit News*, 10 Dec., 1973, 5D.

⁹ Wrynn, 75.

¹⁰ Bauer, 336.

¹¹ Woodford, 153.

Dearborn over the winter, and manufacturing began in April. The demand created an explosion in production capability throughout the region. The government finally ordered non-military output ceased in December 1941, and the last civilian vehicle – a Ford – rolled off the line in on February 2, 1942.¹²

Ford was approached to build B-24 Liberator bombers designed by California-based Consolidated Aircraft Company, who was already producing them at the rate of one and a half per day. Charles Sorenson, a Ford executive, thought they could be produced at a rate of one an hour. To accomplish this, the government hired Albert Kahn to design the Willow Run plant. Covering eighty acres near Ypsilanti, the plant employed over forty thousand people. Curiously, Kahn built his reputation bringing air and light to factory spaces but had to create this building with no windows in order to meet wartime security requirements. A shortage of tooling and supplies prevented the plant from reaching full production until 1943, prompting the nickname “Willit Run.” But Willow Run eventually fulfilled Sorenson’s prediction, and brought the cost per unit down from \$238,000 to \$137,000. By 1945, 8,685 bombers were produced at the factory.¹³

On the other side of the city, the Army and Chrysler were building another Kahn factory to mass produce tanks - the Detroit Tank Arsenal in Warren. Construction began in September 1940, and the first tanks rolled off the line seven months later. Covering over a million square feet, the factory was the largest such facility in the world. Within a year it had produced two thousand M3 “General Lee” tanks and was the first plant to be awarded the armed forces “E” flag for excellence in production. In 1942, the plant began producing M4 Sherman tanks, and in 1943 delivered 6,612 units. Toward the war’s end, workers assembled the M26 Pershing, the last of three models and 22,234 tanks manufactured at the site.¹⁴

Similar stories were created across southeast Michigan, as old factories were repurposed, and new facilities were created in record time. General Motors became the premier supplier for the United States government, dedicating ninety-four plants nationwide to war production, and manufacturing over 2,300 different items from tiny ball bearings to massive tanks. Packard Motors turned its attention to engine production early in the war, and by 1945 had produced 55,523 Rolls Royce Merlin 12-cylinder aircraft engines used in several aircraft, including the agile P-51 fighter. It also produced 14,000 marine engines used in PT and fast attack boats. McCord Radiator and Manufacturing Company became the leading manufacturer of helmets for GIs, producing over twenty million, in addition to millions of other pieces of ordnance. Detroit’s automotive

¹² Ford R. Bryan, “Some Contributions to World War II” *The Dearborn Historian*, vol.43 no.3(Summer 2003), 67-68; Wrynn, 51.

¹³ Bryan, 69-71; Wrynn, 79, W. Hawkins Ferry, *The Legacy of Albert Kahn*, (Detroit: Wayne State University Press, 1970), 26.

¹⁴ Ann M. Bos, and Randy R. Talbot, “Enough and On Time: The Story of the Detroit Tank Arsenal” *Michigan History Magazine*, vol.85 no.2 (March/April 2001), 26-39; Davis, *Detroit’s Wartime Industry*, 46-52.

suppliers of all stripes turned out tools, dies, grinding equipment, drills, specialty metals and tubing, and rivets by the billions.¹⁵

It should be noted that it wasn't just automobile manufacturers that were involved. Firms that once made household goods turned out everything from bullets to gas masks. The Detroit Tank Arsenal used parts made by over seven hundred suppliers, many of them local shops and foundries. Recreational boat manufacturers Chris-Craft and Hacker Boat Company sent the Navy thousands of landing crafts and patrol and rescue boats. Parke-Davis Pharmaceutical Company provided penicillin, dried blood plasma, vaccines, serums, ointments, germicides, field dressings and gauze. Industrial film maker Jam Handy created training films. Advertisers and media writers boosted moral and production with persuasive and patriotic propaganda. Printing plants churned out tons of instructional booklets and technical manuals. Educators were brought in to teach Army and Navy recruits at facilities run by General Motors and Ford Motor Company. Farmers coaxed maximum yields from the land surrounding the city in order to feed hungry workers and their families.¹⁶

Not every project met with success. Hudson Motors lost a lucrative electronics contract when it fell behind production schedules. More notably, some attempts to apply automotive manufacturing principles to airplane construction simply did not work. Both Ford and General Motors found many of their machines and tools inadequate on both ends of the spectrum – parts required were too large, and tolerances were too fine. Because airplanes were markedly more complicated than automobiles – a ratio of 15:1 in terms of parts alone – simple design changes affected entire assemblies and required long delays for retooling.

In September 1941, General Motors hired respected aircraft designers and proposed creating a new fighter for the Army. To speed development, elements of existing aircraft were to be assembled around a new fuselage to create the P-75 – a miracle craft. What appeared practical on paper did not translate on the shop floor. The project was plagued with delays and redesigns from the beginning, and it soon became clear that the aircraft would never deliver the tremendous performance that had been promised. The program was cancelled by October 1944.¹⁷

General Motor had success in airplane construction, generally by using the designs and techniques of aircraft manufacturers like Grumman and GM's Eastern Aircraft Division. In Detroit, most of the output consisted of engines and

¹⁵Woodford, 154; <http://www.outlawpulling.com/PDF/Packard%20Marine%20Engine.pdf>; http://www.toppots.net/main.php?do=clientsitecontent&action=home&link_id=140.

¹⁶ Woodford, 151-155; Jeffrey L. Rodengen, *The Legend of Chris-Craft*, (Ft. Lauderdale: Write Stuff Syndicate, 1988), 130-142; Clive Goodhead, <http://ezinearticles.com/?Chris-Craft---A-Brief-History-of-the-Classic-Boat-BUILDER-From-1930-to-the-Present-Day&id=4789838>; James P. Barry, *Hackercraft*, (St. Paul, MN: MBI Publishing, 2002), 99-101; *Golden Book of American Industry*, (Palisades Park, NJ: Industrial Publishing Co., 1945), 46-47, 221-222.

¹⁷ I.B. Holley, "A Detroit Dream of Mass-Produced Fighter Aircraft: the XP-75 Fiasco" *Technology and Culture*, vol.28 no.3 (July 1987), 578-593.

sub-assemblies. Even Ford's shining success at Willow Run was tempered by the fact that two and a half years after Pearl Harbor the factory had not reached a production rate of fourteen aircraft a day – far short of Henry Ford's early "1000 planes a day" prediction. Perhaps some of this is attributable to the mass-production mentality voiced by Ford, "The manufacture of airplanes, if agreement is had upon just what is wanted, becomes simply an assembly problem." The Army, attempting to address changing battlefield needs, constantly changed "just what was wanted," the efficiencies inherent in economies of scale were lost.¹⁸

Despite this, Detroit successfully answered the nation's hunger for war materiel. Plants throughout the city strove to support the needs of the nation's military and the needs of our allies. Additionally, facilities around the country responded to decisions made by local corporate leaders and military procurement experts. The War Production Board's Detroit District, which included most of the manufacturing in Michigan and Toledo fulfilled contracts valued at almost \$24 trillion. The Detroit area (Detroit and Willow Run) received contracts throughout World War II totaling \$16,777,923,000.¹⁹

This influx of federal funds succeeded in speeding the regions recovery from the Great Depression. Factories were busy, workers employed, and disposable income flowed through the local economy. The flood of war dollars had both positive and negative repercussion, and the city's role as the Arsenal of Democracy left a lasting legacy. Detroit's industrial and physical landscape and infrastructure was changed forever. Additionally, the way Detroiters viewed their city and their fellow citizens was affected.

As the war became increasingly intense in Europe and Indo-China, it captured the interest of the people in Detroit. Many were anxious to assist those countries affected by Axis aggression, for personal or humanitarian reason. Many others preferred to remain out of the fray, either for personal or political reasons. This polarity can be explained in part by Detroit's ethnic diversity, but also by a residual isolationism fostered by memories of World War I.

Ethnically, old Detroit families had French and British roots, and more recent immigrants came from Poland, Russia, Greece, Hungary, Czechoslovakia, Austria, Serbia and other nations threatened by German and Italian incursions. Large German and Italian neighborhoods were equally interested in the changing politics of their native countries, but less inclined to rush to war. The strong Irish constituency had little interest in assisting Britain, while a great many Canadian immigrants could not understand any hesitation to commit.

¹⁸ Robert G. Ferguson, "One Thousand Planes a Day: Ford, Grumman, General Motors and the Arsenal of Democracy" *History and Technology*, vol.21 no.2 (June 2005), 149-154.

¹⁹ War Production Board, *War Supply and Facility Contracts by State, Industrial Area and County*, 1 Nov, 1945, 5.

A great number of Detroiters, of all ethnic backgrounds, felt that this was Europe's problem. Historian Arthur Woodford states, "Many had come to accept the theory that American participation in World War I had been a great mistake,...and that the United States should stay out of this new war. [M]ilitary aid, given to the Allies, was all that would be needed to defeat the Axis powers." Henry Ford went a step further and flatly refused to assist with any war materiel that wasn't strictly defensive, even though his lieutenants, Edsel Ford and William Sorenson, saw opportunity in lucrative military contracts.²⁰

No matter the attitudes, Detroit began to feel the effects of the conflict many months prior to America's official entry into the war. With Roosevelt's reelection to a third term in 1940, the country was told that America's best defense was "the success of Britain defending herself." The Lend-Lease program was instituted, as described above, and efforts to rebuild the United States armed forces were accelerated.

The government began doling out military contracts, and Detroit manufacturers ramped up production capability. This increased the need for manpower at the same time that Congress passed the Selective Training and Service Act in 1940 – America's first peacetime draft. Over seventeen million men were required to register nationwide, and millions were soon drafted into active service. Following the Japanese attack on Pearl Harbor, volunteer enlistments into all branches of the armed services soared. Over the course of the war, however, two-thirds of the troops were drafted.²¹

In Detroit, many men received draft deferments because of the roles they played in wartime production. Skilled engineers, chemists, efficiency experts, machinists, trainers and others were retained by their firms to support the war effort. Despite this, almost thirty percent of local factory workers were lost to the military. With factories often working around-the-clock shifts, manufacturers soon began to run short of qualified men to keep up with production quotas. As a result, several non-traditional groups entered the workforce, notably women, African Americans, and handicapped and elderly workers.²²

Labor shortages and efforts to address them caused major changes to life in Detroit, which resulted in occasional friction and conflict. The influx of hundreds of thousands of workers, mostly from rural Michigan and Southern states, caused housing shortages, fomented racial tensions, and changed the demographic make-up of the city. The need for workers and high production demands led to a heightened level of union activity. Women on the shop floor changed the all-male orientation of those organizations and impacted life at home. African American workers experienced discrimination and violent opposition to their hiring and promotion, which sparked a focused activism in search of wage parity and job equality.

²⁰ Woodford, 151; Wrynn, 10, 15.

²¹ Stuart A. Kallen, *The War at Home*, (San Diego:Lucent Books, 2000), 20-23.

²² Steve Babson, *Working Detroit*, (Detroit:Wayne State University Press, 1986), 114.

Perhaps the most critical employment issue related to Detroit's industrial future was growth of union influence in the manufacturing equation. The labor shortage gave workers leverage when negotiating wages, hours, working conditions and benefits. Despite a patriotic promise by some organizations to avoid work stoppages, strikes were common. In the first ten months of 1942, there were more than seven hundred unauthorized "wild cat" strikes in Detroit. Ford Motor Company, which until this point had been able to stifle union organizing efforts, was forced to negotiate with CIO-UAW for the first time to end a strike in April 1941. Labor historian Steve Babson notes, "Detroit, once the Open Shop capital of the United States, was now the nation's leading Union Town."²³

From a societal perspective, the entrance of thousands of women into the work force changed many aspects of life in Detroit. This newly empowered class of employee, formerly relegated to clerical work and menial tasks, became a significant presence in factories – forty percent in many aircraft plants – changing the social dynamics overnight. While creating the iconic persona of Rosie the Riveter, women working as industrial laborers also altered the perception of traditional home life. With both parents out of the home, children spent more time being cared for by grandparents or taking care of themselves. Extended School Service programs were developed nationwide to helping parents manage. In Detroit, the Merrill-Palmer Institute partnered with education students from Wayne State University to teach children how to garden, shop for food, prepare meals and clean house.²⁴

The physical demands of factory work altered accepted norms regarding women's fashion. Trousers proved more practical than dresses, and long hair styles, dangerous around tools and moving parts, either were trussed in bandanas or gave way to shorter cuts. Long hours spent standing or moving around demanded sturdy, comfortable shoes, or even steel-toed boots. After the war, a woman in slacks with low heels and a modest hair cut had become socially acceptable.

Southern whites came to Detroit by the tens of thousands. They brought a folksy culture that was not understood or accepted by the locals. They had difficulty finding housing and encountered rental signs dictating that "No Southerners" need apply. They were relegated to the poorest under-developed suburbs, often in field sheds and tents near the newly constructed mega-factories. One thing that many locals and "hillbillies" had in common was their common prejudice against African Americans.²⁵

War time employment allowed black Americans to gain "a degree of economic independence...heretofore unavailable to them." However, as a group blacks in

²³ Wrynn, 27, 52; Babson, 112-. Within 48 hours of Pearl Harbor, both UAW and CIO volunteered a no-strike pledge. See Woodie Guthrie song in NPS article, p.85 and Babson, 114.;

²⁴ Marilyn M. Harper, ed. *World War II & the American Home Front: A National Historic Landmarks Theme Study*, (Washington, D.C.: National Parks Service, Department of the Interior, 2007), 67-68.

²⁵ Babson, 115.

the workplace met more resistance than women or southern whites. Certain ethnic groups, notably the established Polish and Italian laborers, “were particularly hostile to the African American newcomers, whom they both feared and hated.” Detroit’s Ku Klux Klan and Black Legion legacy was revisited, creating difficult conditions for blacks, both in the workplace and at home. Ford Motor Company had employed blacks for several years, generally in the hardest or most menial jobs. During the war, over ten thousand worked at the Rouge, many in skilled positions. Beyond that, manufacturing remained closed to them until the demands of war production required their hiring. Several work-stoppages occurred when blacks, both men and women, were hired or promoted. Notably, Packard Motors was the scene of several such actions.²⁶

African Americans also suffered to a greater degree from the shortage of housing. The tremendous influx of workers put housing throughout southeast Michigan at a premium. For example, 40,000 people were employed at Willow Run every day, but local housing – quickly and crudely built – was available for only 14,000. Buildings of all kinds were converted to homes, with extended families and boarders often sharing cramped quarters. 50,000 black newcomers, relegated by laws and restrictions to the poorest neighborhoods, endured Detroit’s most decrepit living conditions. As one housing official put it, “There’s no money in housing the poorest people well.”²⁷

Additionally, an effort to provide federally funded housing for African Americans at the Sojourner Truth Housing Project, built in a white Polish neighborhood, was so badly handled that it resulted in a number of protests and minor riots in February 1942. Thereafter, Mayor Edward Jeffries refused any further federal involvement. This reaction was seen as favoring the white majority.²⁸

At a time when the nation was calling on its citizens to defend sacred democratic principles, this racism, both overt and perceived, spurred African American activism. The National Association for the Advancement of Colored People (NAACP) saw their membership balloon fivefold during the war. With the support of the unions, black Detroiters staged numerous walk outs and demonstration marches, declaring that “full and equal participation of all citizens is fair, just, and necessary for victory and an enduring peace.”²⁹

One interesting attempt to organized blacks in Detroit involved recruitment for the “Development of Our Own” movement. With the purpose of getting blacks to revolt against Whites, this movement was instigated by Satohasi Takahashi’s

²⁶ Wrynn, 115, 83; Harper, 54, 85; Babson, 17.

²⁷ Bryan, 71; Wrynn, 83 – 50.2% of Black housing was sub-standard, as opposed to 14% for Whites; Harper, 55.

²⁸ Harper, 116; Capeci, 15-16.

²⁹ Wrynn, 126, Harper, 97- In 1941, black Dodge factory workers walked out three times. The following year, over a hundred black women occupied the personnel office at Ford. In 1943, 1,000 Ford foundrymen quit for three days. Soon afterward, “an integrated crowd of 10,000...marched to Cadillac Square” for a demonstration.

Black Dragon Society. The black-owned *Michigan Chronicle* exposed Takahashi's subversive activities, and he was arrested by the FBI.³⁰

As the war progressed, sacrifices demanded of Detroiters increased, while patriotic empathy and patience waned. Poor housing conditions, racial tensions, along with a shortage of consumer goods and a strained infrastructure, finally came to a violent climax. On a hot Sunday in June 1943, a number of fights and beatings broke out on Belle Isle between blacks and whites. Rumors of fictitious atrocities spread throughout town, enraging both factions. Gangs attacked innocent people, looted businesses and burned automobiles, streetcars and buildings. After a day and half, six thousand troops quelled the riot. Thirty four people died, eight hundred were injured, and nearly a thousand were arrested.³¹

This incident exemplified the tensions that had developed over time in a region whose citizens and infrastructure had been pushed to the breaking point. Unfortunate as it was, the participants and attitudes that sparked the 1943 riot did not represent all, or even a majority, of the people of Detroit. Overall, the city was proud of its contributions to the war effort, and enthusiastically supported the sacrifices needed to bring about victory.

Workers supported the war in numerous ways outside of their employment. Citizens of all ages endured long lines, increasingly stringent rationing schemes, and a shortage of consumer goods. Despite this, Detroiters avidly supported bond drives, scrap drives, farming programs and other voluntary services.

Residents were concerned about changes in their lifestyle and loved ones serving in the military but enjoyed several positive aspects of the war. Payrolls doubled nationally during this period, and with unemployment down dramatically, there was lots of disposable income – even in the poorest neighborhoods. Dance halls, amusement parks, cruise ships and movie theaters did a booming business. Movies and advertising appealed to people's patriotic fervor, and initially the city pulled together.³²

More than 100,000 adults were trained as air raid wardens, medical service volunteers, special police and auxiliary firefighters. Black-out drills and air raid tests were coordinated, anti-aircraft batteries popped up in parks around town, and everyone was on the lookout for saboteurs. USO lounges at transportation centers were staffed by volunteers, often young college women who accept this duty with civic pride. As the war progress, families planted Victory Gardens, and children collected scrap paper, metal, rubber and animal fat. People embraced the slogan, "Use it up, wear it out, make it do or do without."³³

³⁰ Wrynn, 60-61.

³¹ Warren, 116-117.

³² Wrynn, 28, 56, 65 – While almost 12 million American served in the military, only 20% were assigned to combat units, and only 700,000 were in the front line infantry.

Total American losses were 405,400 killed (80% infantry), 670,850 wounded. 50,000 air crew casualties- Europe. 30,000 air crew casualties – Pacific. 78,000 MIA – soldiers, sailors and air crews. Wrynn, 156.

³³ Woodford, 152, Wrynn, 135.

Wartime rationing was inevitable. Even before the attack on Pearl Harbor, people who remembered World War I began hoarding sugar. Silk and nylon for lady's stocking disappeared for use in parachutes. By 1942, major restrictions were instituted. In February, the country turned their clocks to War Time, similar to Daylight Savings Time, to save electricity. By April, sugar was rationed, followed by red meat, butter, and canned vegetables. School teachers were mobilized to direct registration for the ration program. Ration stamps attempted to assure fairness in the process. Meatless Tuesdays, powdered milk, and Spam became common. Liquor shortages boosted beer and wine sales. Cigarette shortages prompted a resurgence of pipe smoking. Metal shortages created restrictions on products as varied as toothpaste tubes, coat hangers, bicycles, and refrigerators.³⁴

Because Japan controlled natural rubber supplies, the use of automobiles – and therefore tires and inner tubes – was discouraged. Gas station hours were curtailed in 1941, and the maximum speed limit was reduced to thirty-five miles per hour. Tire and gas rationing began in early 1942. Most families got “A” stickers, allowing them only five gallons per week. People whose job demanded more could apply for increased allotments. While the State of Michigan lost gas tax revenues, accident rates dropped, and local food markets benefitted.³⁵

Restrictions on auto usage place a greater burden on public transportation. Neglected during the Great Depression, outdated bus and trolley stock was required to handle an increased ridership. This was fueled by the growing population, increased employment at far-flung factories, and military personnel on the move. According to historian Dominic J. Capeci, ridership on Detroit's public transportation almost doubled, rising from 30.8 million in 1940 to 57.2 million in 1944. Arguments and fights became common among frustrated and overworked riders.³⁶

Additionally, the expansion of new communities and over-crowding in old neighborhoods overburdened much of the city's infrastructure. Besides a shortage of housing and transportation, schools, stores and entertainment venues were crowded. Water, sewage and electrical systems were pushed beyond their limits. While the federal government offered to build new facilities to handle the overload, local communities feared being left with empty or redundant structures – ghost towns – after the war, and reluctantly declined the help.³⁷

Rationing and shortages resulted in inflated prices and an active black market for the most desirable goods. The government instituted price controls, and patriotic posters appealed to folks to “accept no rationed goods without giving

³⁴ Wrynn, 53, 64, 84, 124-126.

³⁵ Wrynn, 49, 59 – “B” stickers allowed enough gas for people to get to work and home, “C” stickers were for people who drove for a living, “E” stickers covered emergency personnel and doctors, and “X” stickers were for unlimited fuel, generally government use and legislators.

³⁶ Capeci, 18.

³⁷ Wrynn, 81.

up ration stamps” and “pay no more than ceiling price.” While most people followed the rules, illicit activity was common. At least seven percent of Detroit businesses were charged with violations, and up to twenty percent received warnings.³⁸

There were other elements of “the wild west town” that were hard to avoid. Single factory workers with extra spending money supported a large number of new saloons and beer halls. Daily Variety magazine described Detroit as “the hottest town in America.” Over-exuberant indulgence led to an increased number of brawls and fights, an absentee rate that reached 17% at some factories, and a significant employee turnover rate. A phenomenon known as the “V-Girl” emerged – young ladies whose company a soldier (or any other young fellow) could buy for the price of a dinner and dancing. Such “aggressive promiscuity” resulted in a growing venereal disease problem and an increase in unplanned births.³⁹

Detroit’s government, under four-term mayor Edward J. Jeffries, attempted to address many of the issues facing the city. As a moderate reformer, Jeffries called on citizens to unite in the pursuit of victory. He hired a black housing commissioner and increased the number of blacks on the city payroll. However, Jeffries was a pragmatic politician. His policies tended to favor industrial interests, and he charged blacks and union leaders with trying to disrupt production. He gave the police a free hand to deal with uprisings and corruption, and the force developed a reputation for brutality and bigotry. With municipal coffers filled with fresh tax dollars, the mayor refinanced the city’s debt and began developing transportation and urban renewal projects that guided Detroit’s future, while choosing to leave racial issues to be settled after the war.⁴⁰

World War II changed life in Detroit forever. It pulled local manufacturing out of the post-Depression doldrums and rapidly took it to production levels never seen before. Labor demands swelled the population, and a majority of the newcomers never left. After the war, unions fought to retain wartime prosperity at a time when the number of available workers was peaking. New infrastructure expanded the metropolitan area beyond the city’s limits.

When wartime manufacturing ended, Detroit rapidly retooled for auto production. Most 1946 models were simply new 1941 models, but people bought them as fast as Detroit could make them – the first cars off the Cadillac line had wooden bumpers. Gradually, new materials like synthetic rubber and plastics were incorporated into the manufacturing process, and styling changes brought a new era to automobile design.⁴¹

³⁸ U.S. Office of Economic Stabilization posters, DHS collection; Wrynn, 115.

³⁹ Babson, 122; Wrynn, 83, 115.

⁴⁰ Capeci, 6-7, 17-19.

⁴¹ Wrynn, 156-157.

Pent up demand for consumer goods of all kinds kept factories busy for a few years, but competition eventually forced some firms out of business. Hudson and Nash-Kelvinator merged into American Motors in 1954, eventually incorporating Kaiser's Jeep brand. When Chrysler took over only Jeep remained. Additionally, mighty Packard Motors would not survive the 1950s, DeSoto was discontinued by Chrysler in 1960, and Briggs Manufacturing was among several large plants that closed. The east side of the city lost seventy thousand jobs during the 1950s.⁴²

Many defense plants never found viable products for peacetime production and sat idle. The massive Willow Run facility was sold by the government to ship-building wizard Henry Kaiser, who producing automobiles there for only nine years. The University of Michigan bought the Willow Run airfield for a dollar, and operated it as the major airfield in southeast Michigan until Metropolitan Airport opened in 1965. Conversely, the Army's Tank Arsenal remained the center for United States military vehicle development, and operated as such into the twenty first century.⁴³

Wartime migration was staggering. By 1945, one of every five Americans had moved to another location as a result of wartime production labor needs. Studies showed that eighty percent remained in their adopted towns after the war. In Detroit, the city's population peaked in 1950 at almost two million, and regionally at over three and a quarter million. Veterans returning from the European and Pacific theaters swelled the ranks of labor, many temporary workers were laid off, and unions battled to maintain wages. While there was a period of adjustment, and brief economic downturns in 1947 and 1954, Detroit's industrial base thrived. A decade after the war ended, real wages had risen by forty percent. The "boom town" era gave way to the "baby boom" era.⁴⁴

The level of education enjoyed by Detroiters was at its apex. The specialize production needs during the war meant that people in the skilled trades had gained cutting edge experience, making the labor pool one of the finest in the world. Veterans took advantage of the GI Bill to get advanced degrees which benefitted all aspects of the city's economy. A 1949 millage increase allowed the Detroit Public Schools system to begin a new building program, and changes in the composition of the School Board marked the beginning of a more liberal teaching agenda. Critics say it marked the beginning of the system's decline.⁴⁵

The physical nature of the city changed. During the war, transportation engineers had developed roads to speed the movement of men and materials. The Davison Freeway, the city's first sub-grade freeway, and the Detroit Industrial Highway, between the Rouge Plant and Willow Run, became

⁴² Woodford, 162.

⁴³ Bryan, 71; Boz/Talbot, 44-47, Woodford, 163.

⁴⁴ Warren, William M. Tuttle, Jr., 51-52; Wrynn, 157, Babson, 131.

⁴⁵ Wrynn, 157; Jeffery Mirel, *The Rise and Fall of an Urban School System: Detroit 1907-81* (Ann Arbor: University of Michigan Press, 1999), 201-202, 229.

blueprints for a rapid transit system that would transform metropolitan Detroit. Mayor Jeffries' vision of the future city, in harmony with President Dwight Eisenhower's national highway initiative, allowed several freeways to be built and encouraging movement from the city's core. These expressways also separated neighborhoods and destroyed cultural ties that were decades old.⁴⁶

The 40th Anniversary edition of the *Detroiter* magazine in 1943, published by the Detroit Board of Commerce, proclaimed "Victory is Detroit's Business." Detroit manufacturing certainly embraced the war's challenges. They brought to the table everything necessary to make the city's response successful – supply chain and production expertise, engineering and architectural know-how, a skilled and eager workforce, and a commercial infrastructure that could be quickly adapted and expanded. Most of the players were in the automotive sphere and intensely competitive. Yet they came together in a spirit of cooperation with one goal in mind – American and Allied victory. For five years, victory was Detroit's business.⁴⁷

Detroiters of all classes and backgrounds put forth their best effort, whether in a factory, laboratory, office, farm field or home. They worked hard, played hard, and overcame obstacles presented by overcrowding, product shortages and fatigue. They enjoyed some of the best dance music and some of the sappiest movies ever made. And they pulled together when violence and vice threatened to divide them. Through it all, the people of Detroit made sure the war machine kept churning out the tools America's soldiers needed to win.

In William Knudsen's assessment, "While we had troubles in both material and labor, on the whole there was an enthusiasm and patriotism displayed which would warm anybody's heart, and bolster up the faith in our country and its immense resources to finish the job."⁴⁸

⁴⁶ Peter Gavrilovich and Bill McGraw, *Detroit Almanac*, (Detroit: Detroit Free Press, 2001), 234; Woodford, 163, Capeci, 19-20.

⁴⁷ *The Detroiter*, June 28, 1943, found at www.detroitchamber.com/

⁴⁸ Beasley, *Knudsen*, 357.

1. "500 Planes a Day"

Victor G. Reuther

Months before Hitler's armies marched east into Poland, Walter and I had a conversation with Ben Blackwood, a trusted aide in the General Motors Department [of the UAW] and himself a skilled toolmaker, about Roosevelt's call for aid to Britain and the kind of help America was best equipped to give. Because of the unremitting Luftwaffe offensive, it was obvious that England needed planes, not only guns and tanks, for her defense. As toolmakers we knew it would be many years before American industries turning out civilian goods could be tooled to produce weapons in any quantity. But, as Walter said, we should not romanticize about the nature of the airplane, though the aircraft industry had for so long made a fetish of the highly special-

From *The Brothers Reuther* by Victor Reuther. Copyright © 1976 by Victor G. Reuther. Reprinted by permission of Houghton Mifflin Company.

401

ARSENAL OF DEMOCRACY

ized expertise involved. A plane was made of steel and aluminum, like other vehicles, and its component parts could be manufactured by essentially the same kind of machines and machine tools that stamp and turn out the parts of an automobile. We had seen the conversion of peacetime tools—and helped make it—in the Gorky plant, when Russia was arming itself against the inevitable German invasion.¹

Of course, the automobile manufacturers, asked to take on enormous defense contracts, assumed that they would gradually close down their automobile plants, keeping them on a standby basis, while the government proceeded to build and put at their disposal spanking new factories, equipped with millions of dollars worth of machine tools, most of which would be duplications of the tools sitting idle, or about to sit idle, in the automobile plants as we moved into an all-out war effort.

A careful survey taken by Ben Blackwood and me in GM plants all over the country corroborated Walter's hypothesis and became the basis of his proposal for a "500-planes-a-day" program, to be undertaken by the automobile industry. He had informal meetings with R. J. Thomas and Philip Murray about his plan.² They were both enthusiastic, and Murray submitted it to President Roosevelt on December 20, 1940. . . .

Roosevelt responded with interest, and sent a memo to Knudsen, co-director with Sidney Hillman of the Office of Production Management. . . .

William Knudsen, though deeply devoted to FDR and to the defense effort, must nevertheless have felt put out that Walter Reuther, the "red-headed upstart" who had so often clashed with him across the General Motors bargaining table, should presume to tell the nation what the automobile industry could do about mass tooling for aircraft production. Yet an editorial in Knudsen's home town newspaper, the *Detroit News*, stated on January 6, 1941, that "no industrial leader has paralleled Reuther's initiative and ingenuity in presenting such a plan for consideration."

There was a meeting of top officials of the OPM [Office of Production Management], the Air Force and the Navy, Knudsen, Hillman, R. J. Thomas and Walter. A courtesy call was paid on the President after the discussion. . . .

402

Walter had made a public appeal on the radio the week before. It was a long speech and an emotional one. Some of it is well worth remembering:

In London they are huddled in the subways praying for aid from America. In America we are huddled over blueprints praying that Hitler will be obliging enough to postpone an all-out attack on England for another two years until new plants begin to turn out engines and aircraft.

Packard has just finished pouring the concrete for its new engine factory and Ford may soon be ready to begin digging ditches in which to sink the foundations for his. Not until the fall of nineteen forty-two, almost two years hence, will these bright, shiny new factories actually begin to turn out the engines. This is small's pace production in the age of lightning war. . . .

We believe that without disturbing present aircraft plant production schedules we can supplement them by turning out five hundred planes a day of a single standard fighting model by the use of idle automotive capacity. We believe that this can be done after six months of preparation as compared to the eighteen months or two years required to get new plane and engine factories into production. . . .

Fortunately, despite the headlines which tell us of unfillable orders and labor shortages, we have a huge reservoir of unused machinery, unused plants, unused skill, and unused labor to fall back upon. . . . The tool and die workers. . . are also partially idle. . . .

The plane, from certain points of view, is only an automobile with wings. Our greatest need is for plane engines. . . . The plane engine is the more delicate and compact combustion engine but it is still a combustion engine, containing the same parts. . . . There stand idle in the Cleveland Fisher Body plant toggle presses huge enough to hold and operate a draw or flange die weighing seventy to eighty tons. Such a machine can stamp out airplane parts as well as automobile parts. . . .

It would take years to install in new aircraft plants the same type of presses which now stand idle fifty percent of the time. . . .

Equipment at the Chevrolet Drop Forge plant in Detroit operates at sixty percent of capacity even at this time, which is a peak period for the automobile industry. The machines and hammers in this plant could produce all the drop forgings required for five hundred planes a day and still supply the Chevrolet Company with sufficient forgings for one million cars during the coming

year. Labor asks: Why not use this equipment instead of duplicating it?

Labor's plan springs from the pooled experience and knowledge of skilled workers in all the automotive plants, the same skilled workers who are called upon year by year in the industry to produce new machine marvels. Each manufacturer has the benefit of his skilled workers. We of the United Automobile workers, CIO, have the benefit of the skilled manpower in all the automotive plants, not just in one of them.

Labor asks only in return that its hard-won rights be preserved. . . . only that it be allowed to contribute its own creative experience and knowledge and that it be given a voice in the execution of its program. . . .

No question of policy needs to be settled. The President has laid down the policy. We must have more planes. . . .

Quantity production was achieved in the Reich and is being achieved in England by methods labor now proposes to apply to the automotive industry.

The difference and our opportunity is that we have in the automotive industry the greatest mass-production machine the world has ever seen. Treated as one great production unit, it can in half a year's time turn out planes in unheard-of numbers and swamp the Luftwaffe. This is labor's answer to Hitler aggression, American labor's reply to the cries of its enslaved brothers under the Nazi yoke in Europe.

England's battles, it used to be said, were won on the playing fields of Eton. America's battles can be won on the assembly lines of Detroit.

The swollen wartime bureaucracy, with its myriads of dollar-a-year men jammed into Washington, consigned many proposals to limbo, Walter's among them. It was not, of course, attractive to the automobile manufacturers, but it was both imaginative and timely, and was finally given serious consideration by the War Department. It stirred up debate in the press and even inspired Charles E. Wilson, Knudsen's successor as president of General Motors, to challenge Walter to a face-to-face verbal duel in Detroit. . . .

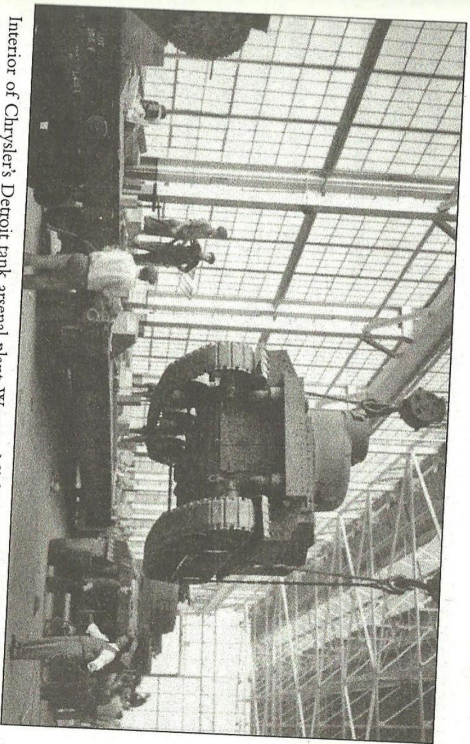
No one was more outspoken against Walter's plan than the chairman of General Motors, Alfred P. Sloan, who declared categorically on November 20, 1940, that automobile plants were not adaptable to the manufacture of any other products. "Only about

You did nothing about it. Similar plans for increasing production of steel, aluminum, copper and other materials vital to the war program were proposed. You did nothing about them. Labor is ready and determined to do its part . . . willing to accept the bitter necessities of a righteous war. Labor had the right to expect industry to do its part.

Editor's Notes

1. Victor and Walter Reuther spent a year and a half working in the Soviet Union, commencing in November, 1933. Their very understandable wish to see Soviet life at first hand was misunderstood by conservatives, even though the Reuthers were disillusioned with the Soviet government.
2. R. J. Thomas was then president of the UAW, having succeeded Homer Martin; Philip Murray was national president of the CIO.

COUNTDOWN



Interior of Chrysler's Detroit tank arsenal plant, Warren, Michigan. Courtesy of the National Automotive History Collection, Detroit Public Library

Mass production takes time to get started.

—William S. Knudsen to FDR, 1941

AT NIGHT KNUDSEN sat with his yellow legal pad and did the numbers. Despite the strikes, production was going up. A year before, no tanks were being manufactured in the United States except those hand-made in government arsenals. Now, Baldwin Locomotive had a backlog order; Chrysler was coming through with its plant, while American Car Foundry and American Locomotive were ready to turn out tanks on their assembly lines.¹

"Babe" Meigs (a nickname owing to the fact he was six foot four) had reported that total plane production was up to 1,450 a month; the goal was 2,600 by October. Knudsen estimated they would hit 3,000 to 3,500 a month before 1942 was out.² "Powder" Johnson had per-

formed miracles with the help of DuPont as well as companies with names out of Greek mythology—Hercules, Atlas, and Trojan Powder—in getting new American gunpowder and TNT plants up and operating at sites ranging from Radford, Virginia, to Sandusky, Ohio. Meanwhile—the brightest spot on the horizon—small-arms production at places like Saginaw Steering Gear and the Winchester Company was actually running ahead of schedule. Saginaw was supposed to supply the government with 280 machine guns by March 1942. When that date came, they would ship 28,728 guns.³

As for raw materials, when Knudsen had come to Washington, the country's aluminum production was barely 25 million tons. Now it was 40 million, and headed to 70 by the end of the year. Steel was showing similar numbers.⁴ If imported materials like tungsten, chrome, and rubber were still in critical short supply, once Henry Kaiser's yards began turning out ships ready to go fetch them, that would change.

At the top of the page, however, Knudsen scrawled two large numbers: 1 and 8. That was the magic number: eighteen months. That's how long Knudsen estimated it would take for American business and industry to make the arsenal of democracy a reality. One year to build new plants and retool the old ones, six months for conversion.

Everywhere he looked, that number held true. A year for tooling for airplane engines, maybe ten months with overtime. A year to tool for tanks of thirty to thirty-one tons. Nine to eleven months for a TNT plant.⁵ Then another six months before everyone would see full production—enough guns, tanks, planes, and bombs to sweep Germany and its Axis allies into oblivion.

"Everyone knows that America is the greatest mass producer in the world," Knudsen kept telling Roosevelt. "Not everyone knows that mass production takes time to get started." But "once you get going, the momentum takes you a long way"—all the way to victory.⁶

Why so long to get started? Because American assembly lines could not get moving until they had the machine tools for the job. Machine tools are the heart of the industrial process. They can drill; they can bore; they can turn steel like table legs on a lathe or slice slabs of iron like a wood plane. They take steel, cast iron, brass, and aluminum and mill, grind, shear, and press them into parts for household or industrial

goods. Their design depends on the amount of force needed behind the grinding, cutting edge.⁷

This means some machine tools are not much bigger than a bread box; others are the size of a house. In 1940 eighty-seven were necessary to make the average propeller shaft, from lathes to cut the shaft metal to machines to bore it and grinders to finish the job. The men, and later women, who ran the machine tools were the grunts, the unsung but essential foot soldiers of the modern industrial process. The machine tool makers were its elite, its master sergeants—except that they were aloof from the processes they set in motion. One admirer dubbed them the “master builders of the Industrial Revolution”—except that what they brought into being weren’t soaring cathedrals of stone but sprawling factories of iron and steel.⁸

In 1940 almost every machine tool in America came from two hundred firms. Most had barely one hundred employees; some, fewer than fifty. Most of the best firms were concentrated in New England, and three of the biggest were in Vermont, in the Black River Valley, where their origins reached back to the American Revolution.⁹ Their hands smeared with oil and aprons with grease, generation by generation they labored to create the machines that made every product from cars to refrigerators and industrial fans.

The Depression years had been hard on the machine tool makers. In 1929 total American sales were \$185 million; in 1932 they were hardly over \$22 million. Companies like Jones and Lanson of Springfield, Vermont, and Cincinnati Milling Machine had filled the gap with foreign orders—ironically, one of their best customers was imperial Japan, whose Mitsubishi and Kawasaki aircraft factories hummed to the tune of American machine tools.* When the war buildup started, Jones and Lanson’s president, Ralph Flanders, warned Knudsen and the NIDAC that the need for machine tools would be “infinite” and that they were going to find themselves up against the wall in getting enough grinders, borers, and stamping and milling machines.¹⁰ Roosevelt had put a

* Another was Stalin’s Russia. In 1938 almost one-quarter of all foreign sales were to the Soviet Union, and in 1934 Bryant Chucking Grinder saw more than half of its total sales going to the Workers’ Paradise.

halt to exports of machine tools, even to Great Britain. Then machine tool makers could only send new tools to those companies on the defense priorities list. Even so, dealing with the problem had been largely put off until now.

The first part of Knudsen’s plan had been under way since the previous June. New plant construction had been booming for almost a year, with Jesse Jones putting up more than \$33 million for new facility construction for War Department orders.¹¹ Some 784 new factories had been started and more than half were finished.¹² Thanks to miracle workers like Albert Kahn, the work went even faster than many thought possible. K. T. Keller came to Kahn on a Wednesday looking to build Chrysler a new machine shop five hundred feet wide and two-thirds of a mile long. Kahn had the plans ready by Friday morning, and ninety days later the building was going up.¹³

April, May, and June 1941 were the next critical months, when retooling around the country would kick in. To make sure that happened, Knudsen went to find Fred Geier.

Geier was president of Cincinnati Milling Machine and president of the Machine Tool Builders’ Association. Over time, as America’s manufacturing spread over the Old Northwest and across the Mississippi, two firms rose up to challenge the mighty New England machine tool empire. One was Cleveland Machine Tool; the other, Cincinnati Milling Machine. Fred had inherited the latter company from his father, a German immigrant’s son who sold Henry Ford his first machine tool before passing the firm over to his extraordinary son.¹⁴

Fred Geier did not fit the image of the hard-charging American businessman. He was soft-spoken and formally dressed (he often appeared on the golf course in a three-piece suit) and had been educated at exclusive Williams College. He could read Latin and Greek with ease and didn’t drink or smoke.¹⁵

Beginning in 1932–33, he had made several trips to Germany, which was still the Olympus of machine tool makers, and was shocked by what he saw: the persecution of Jews, the dogmatic militarism, the frantic arms buildup. It convinced Fred Geier that war was coming and that his business had better get ready for it. In 1938 he began doubling the size of his plant and put in a new foundry and a new office building—

all out of his own profits (Geier despised debt as much as he hated liquor).¹⁶

In the spring of 1941, Fred Geier was president of the Machine Tool Builders' Association, and Bill Knudsen caught up with him at the association's annual meeting at the Hotel Cleveland on May 5 and 6. Though Geier's prediction of war had been borne out by events, he was still amazed when Bill Knudsen told him he wanted production of machine tools in America to double, redouble, and redouble again—all inside a year.¹⁷

"You're crazy," Geier said good-naturedly, "but then so are we. When do you want them?"

"Right away," Knudsen answered with a straight face, "and in the ratio I mentioned." Geier knew Knudsen well enough to know he meant it.¹⁸

Geier and his colleagues did as the Great Dane asked. Over the next months, they and their factories would labor round the clock to produce a bewildering range of machine tools. In 1940 they had produced some 110,000. In what was left of 1941, they nearly doubled that number, to 185,000.¹⁹ By 1942, Geier's Cincinnati Milling Machine was making a new machine tool every seventeen minutes, seven days a week, around the clock.

One of the biggest and most important was a giant machine for boring giant naval guns. Geier had seen one in action in Germany in the thirties, and secretly bought one in defiance of Nazi export rules. He managed to smuggle it out of the Third Reich, piece by piece, through Switzerland and Italy and then reassembled it in Cincinnati. It was this mammoth machine, the pride of Geier's factories, that would bore the great sixteen-inch guns for battleships like the *Loua*, *New Jersey*, and *Missouri*.²⁰

Knudsen and Geier did not stop there. In late June they launched a nationwide survey to track down every machine tool made in America in the past ten years, especially twenty-one types that were considered critical to the defense industry. Knudsen put OPM's tool man, Mason Britton, on the scent of "idle" tools, so that used tools could be mobilized as well as new ones.²¹

The amazing machine tool production numbers fell off in 1943 and

slid back to normal by 1944. But by then the necessary machines were in the factories and doing their job. The critical fuse for the great explosion of productivity in America's defense industry after Pearl Harbor had been laid, thanks to Knudsen and the tough-minded rectoraler from Cincinnati Milling.

Still, the criticisms did not stop. One of the first, and in many ways the most perceptive, came in the pages of *Fortune* magazine in April. It charged that Washington had underestimated "the size of the effort necessary to build an armament economy without turning the civil economy inside out." The fact is, it read, "national defense is in pretty bad shape, and everyone in and out of Washington has seen the defense program drift and stumble."²²

Time had been wasted putting Bill Knudsen in charge of policy and contracts, for example, when he should have been put in charge of directing production. *Fortune's* editors blasted Stettinius for accepting the Army's estimates of how much steel would be needed, with shortages now predicted for the rest of 1941 and into 1942. It damned the administration for failing to impose stricter price controls when armaments orders piled on top of a growing civilian demand meant prices would inevitably skyrocket.

Barely 10 percent of the country's factories had converted to war production. America, it seemed, needed a Dunkirk in order to get serious about defense. "The job is plain: tool up now so that we can deliver later"—which was exactly what Knudsen was doing, although no one at *Fortune* took notice.²³

Instead, many blamed Knudsen for the delays. "Knudsen is simply not delivering the goods," Harold Ickes complained in his diary. "Big business is having too much say." Columnist Walter Lippmann accused Knudsen of organizing the entire war effort "as a kind of annex and superstructure to an immense boom in private business." Stimson himself was getting worried. "I'm afraid that Knudsen is too soft and too slow," he wrote on May 29, "because of his connection with the auto industry."²⁴ All asked the same question: When would he finally put defense ahead of business as usual?

The person who really needed to answer that question was the president, who had been so passive all spring. Finally something happened to snap Roosevelt out of his lethargy: On May 21 an American freighter, the SS *Robin Moor*, was sunk by a German U-boat inside the security zone. The Germans had allowed the crew and passengers to load into lifeboats before a torpedo sent the *Robin Moor* to the bottom, but it was two weeks before a passing steamer picked up the wretched survivors.

The president decided it was time to act. On May 27 he declared a state of national emergency, saying that "if we were to yield on this, we would inevitably submit to world domination" by Hitler.²⁵ American naval forces extended the security zone as far as Iceland and occupied that barren island country. On June 9, Roosevelt ordered federal troops in to end the strike at the North American plant. Many predicted a violent backlash. Instead, when troops arrived, workers unveiled an American flag and marched with them back into the factory.²⁶

That was the one bright patch on an increasingly dismal labor front. On June 22, Hitler attacked the Soviet Union. Some hoped this would move the Communist Party firmly into the Allies' camp, especially the CIO. Instead, Big Labor came up with another issue to fight about, unionization of all defense contractors. It found a firm new ally in the National Defense Mediation Board, whose members consistently backed every effort to enforce unionization, including walkouts by labor. Overall, 1941 was a near-record year of strikes and disputes, with more than 3,500 of them, costing 23 million man-days of labor—enough to build 124 *Fletcher*-class destroyers.²⁷

That second week in August, the strikes came with a dizzying flurry. On August 6, 16,000 CIO shipyard workers walked away from their jobs at Federal Shipbuilding in Kearny, New Jersey. The issue was not pay or conditions, but a contract with the Navy that allowed an open shop. Three tankers, two freighters, six destroyers, and a cruiser sat unfinished and useless as union stewards and management wrangled.

That was Wednesday. On Saturday fifteen hundred workers walked away from the Curtiss-Wright propeller plant in Caldwell, New Jersey, which made propellers for eight types of warplanes. That same day, carpenters struck at the Philadelphia Navy Yard, where they had been building a new dry dock. Their demand was for overtime pay on Sat-

urdays. By the time the strike was settled, almost two weeks of crucial work were gone.²⁸

Knudsen watched, helpless to stop the crumbling production effort. Roosevelt was sending conflicting signals on the seriousness of the defense effort, while the American people themselves were sharply divided. Gallup polls showed that almost two-thirds of the country opposed getting involved in the war in Europe, but almost the same number expected the country to be at war in the next year. It was not a formula for boosting morale. *New York Times* reporter Frank Kluckhohn toured the American heartland—Ohio, Minnesota, Illinois, Missouri—and of the hundreds of businessmen and working people he spoke to, only three or four actually supported entering the war. "I would do everything short of going to Leavenworth to sabotage the war if we entered," one young lawyer declared.²⁹

A *Time* reporter visited the Army's new training depots to interview eager young draftees, except that few of them were very eager. At one Mississippi camp, soldiers booed newsreel pictures of President Roosevelt and General Marshall, while excerpts from a speech by isolationist Senator Hiram Johnson drew a loud ovation. Certainly it was hard to expect American business to go full out for the war effort when the country itself was so conflicted.³⁰

The battle over raw materials bottlenecks brought all the caterwauling in Washington to a fevered pitch. Don Nelson had to report to Knudsen and the rest of OPM that his priorities system for raw materials was breaking down. As many as five thousand factories might have to close because they couldn't get adequate supplies of aluminum, copper, nickel, alloy steels, zinc, tin, and tungsten. Somewhere between one and two million workers might find themselves out of work.³¹

Clearly something had to give. What gave was the Knudsen formula for steadily growing military orders on the backs of civilian production, and letting suppliers find new ways to increase production. Instead on August 28 the president announced the creation of yet another new agency, the Supplies, Priorities, and Allocation Board, to split up available supplies of materials between military and civilian needs. "Don't worry, Bill," Roosevelt said with his engaging grin, "it'll make your job easier."

Knudsen knew better. The New Dealers had won. The membership of the new SPAB told the story. They included Leon Henderson, now head of the Office of Price Administration and Civilian Supply, who wanted deep cuts in civilian production (it puzzled Knudsen and his stalwarts that the man in charge of protecting civilian consumers from the impact of war preparation was always looking for ways Americans could do with less); Harry Hopkins sat at the table in his capacity as head of the Lend-Lease program. So did Roosevelt's vice president, Henry Wallace, the former agriculture secretary and New Deal ideologue who, like Hopkins, saw the defense buildup as a way to deepen and extend the powers of the federal government—in the words of one cynic, “as a version of WPA that Republicans will have to support.”

If Knudsen was the big loser, the winner was Donald Nelson as SPAB's executive director. The creation of SPAB involved a larger personnel shake-up. Ed Stettinius was appointed to replace Harry Hopkins in running Lend-Lease. Knudsen's right-hand man, John Biggers, was moved to London to oversee that end of the Lend-Lease knot.³² At the same time, the first round of curtailment of civilian production had begun.

First came the auto industry, with a drastic cut by more than half. Then in October nonessential construction was ordered halted, to divert materials to defense plant construction. On October 21 manufacturers had to stop using copper in almost all civilian products, followed by sharp cuts in refrigerators, vacuum cleaners, metal office furniture, and similar durable goods.³³

Yet in the end, SPAB did no better than its predecessors. The Army and Navy would fight it tooth and nail over what it saw as misplaced priorities in the allocation of materials, as they would its successor agency, the War Production Board. Don Nelson's efforts to tell them they could not have everything they wanted, exactly when they wanted it, and that a military buildup without a strong civilian sector (one with enough lumber, for example, to build houses for war plant workers or enough heavy equipment to repair roads and bridges) was impossible, would make him the most-hated man on Constitution Avenue.³⁴ As for SPAB, it became another lump in Washington's administrative alphabet soup until it was washed away by Pearl Harbor.

Sell, Knudsen could look down at his own schedule with some satisfaction. Things were on track. The critical period of retooling was almost over. Although the increase in the output of machine tools was not yet visible, by year's end the value of machine tools put out by the industry would be nearly double that of 1940—just as Fred Geier had promised. Likewise, the nation's munitions output would double in the second half of 1941.³⁵

No one who read the newspapers knew it yet, but the tap was about to be turned on. In January 1941 defense spending rose to triple what it had been during the previous six months. By July it quintupled, and December it jumped another *twelvefold*. America, the isolationist nation still at peace, was fast approaching Nazi Germany in its defense output. In 1942 it would roar past it.

Every month of the second half of 1941, \$2 billion of munitions were being stamped, milled, riveted, punched, or rolled out. While Walter Lippmann and others bayed about unreadiness and the need to move forward, and while agency heads in Washington were panicking, across the country the war production curve was moving steeply upward. America was poised to produce arms in quantities no one had ever thought possible. The explosive rate of growth Knudsen and his colleagues triggered from mid-1940 to the end of 1941 eased after 1942, although the numbers of planes, ships, tanks, and weapons would continue to explode (see Appendix A). As historian Geoffrey Perret later put it, “Without the accomplishment of those eighteen months who can doubt that the war would have lasted substantially longer than it did and taken more lives than it did?”³⁶

It was all due to Knudsen and his team. They had created, in effect, an almost self-perpetuating mechanism that fed upon its own individual dynamic elements. Theorists of the science of complexity would call it emergence. Economists have another term: “spontaneous order.” It was the most powerful and flexible system of wartime production ever devised, because in the end no one devised it. It grew out of the underlying productivity of the American economy, dampened by a decade of depression but ready to spring to life. Out of what seemed like chaos and disorder to Washington would come an explosion of innovation, adaptation, and creativity—not to mention hard work—across the country.³⁷

Now it was up to America's military to get ready to use it—and that moment was coming faster than anyone realized.

On a cold blustery Thursday evening in late 1941, Knudsen attended a dinner in the North Lounge of the Carleton Hotel. Vice President Henry Wallace of SPAB was there. So was SPAB's executive director, Donald Nelson, Lend-Lease's Ed Stettinius, and Frank Knox, the secretary of the Navy.

After dinner Knox gave a speech to the assembled distinguished guests.

"I feel I can speak very frankly, within these four walls," Knox said. "We are very close to war. War may begin in the Pacific at any moment."

It was true. In June, Roosevelt had imposed an oil embargo on imperial Japan, and in July he had frozen Japan's assets in America—a virtual *casus belli* if ever there was one for the resource-starved island nation. In October some two thousand Japanese Americans were ordered evacuated from the West Coast. American naval intelligence had discovered that the Japanese were gathering troop transports in their harbors in Indochina—possibly for a strike against British Malaya and Singapore, or the oil-rich Dutch East Indies, or possibly even farther out. On Monday the new Japanese premier, General Hideki Tojo, formally rejected an appeal from Secretary of State Hull for settling America and Japan's differences amicably.

"But I want you to know," Knox continued, striking his fist into his palm, "that no matter what happens, the United States Navy is ready! Every man is at his post, every ship is at its station. The Navy is *ready*. Whatever happens, the Navy is not going to be caught napping."³⁸

Knudsen's driver picked him up and took him back to his Rock Creek Park home. It was the evening of Thursday, December 4, 1941.

Three days later, in far-off Hawaii, the roof caved in on Knox's prediction.

America was about to begin the test of total war.