

Chapter Seven – Chrysler Goes to War

When the new job called for equipment Chrysler didn't have on hand, tool engineers simply remade the old equipment. They even turned drills into lapping machines, a press into a broach, a turret lathe into a boring mill, to get production fast.

“Motor Cars to Munitions,” *American Machinist*, June 11, 1942

When the Japanese launched a surprise attack on Pearl Harbor on December 7, 1941, the United States was already preparing for war. It was openly providing supplies and equipment to the European Allies, who had been fighting since 1939. Armaments were pouring out of many of the nation's factories. The year before, in 1940, Congress had passed the first peacetime draft in the country's history, and the armed forces were rapidly expanding. For months, the government had been waging an undeclared war against Germany in the Atlantic. And yet, the American public remained deeply divided over the drift of U.S. policy toward declared war. The surprise attack ended debate, and a united America entered the war. Congress granted President Franklin Delano Roosevelt unprecedented powers to wage global war, and he used them with grim determination to complete the mobilization of the nation.

The Second World War was the great, central, cataclysmic event of the 20th century, and it changed everything, including the automobile industry. During the First World War, American automobile manufacturers had produced war matériel as a “side-business” while continuing their normal civilian car production. The impact of the Second World War on the automakers, however, was drastically different. They ceased civilian production entirely and instead operated hundreds of plants manufacturing specialized war-related products previously unfamiliar to them.

The conversion to the making of military matériel for the war effort had a profound impact on the entire auto industry, Chrysler Corporation included. Designing and manufacturing aircraft engines, aircraft wings and fuselages, large guns, ammunition for small arms, gyroscopes, radar equipment and scores of other kinds of weapons presented enormous problems for Chrysler's engineers, managers and production workers.

Manufacturing under government contracts created a new set of operating conditions

as well. Chrysler's managers and engineers were forced to cooperate with government procurement officials, military planners and outside firms in ways entirely unprecedented during peacetime. Much of the work took place in government-owned plants.

The war changed also the face of Chrysler's work force. For the first time, large numbers of African Americans and women began to work in Chrysler's plants and offices.

The Switch to War Work

In 1939, 1940 and 1941, before the U.S. had officially entered the war, Chrysler and the other automobile companies were understandably reluctant to give up lucrative automobile production to make unfamiliar war goods. They knew that military contracts would bring government controls, and they worried that such contracts would reduce their profits.

However, the auto industry had a friend in Washington in the person of William S. Knudsen, former president of General Motors, who had left the auto company in May 1940 to accept President Roosevelt's appointment as chair of the National Defense Advisory Council. In January 1941, Knudsen became the co-director of the Office of Production Management (OPM), which controlled war production. Knudsen protected the automakers throughout 1941 from the demands of Roosevelt's advisors that the automotive industry convert to full war production immediately. In mid-April 1941, Knudsen announced that the industry would reduce car production by only 20 percent that year, and the cutbacks would not begin until August. Even with Knudsen running OPM, the American auto industry as a whole staunchly resisted efforts to force it to reduce civilian automobile production to convert to war work. As late as November 1941, the auto industry still had not significantly reduced production for the civilian market.

When the war suddenly arrived, Detroit's production and management know-how, its strong credit lines and its reputation for industrial might made the automobile corporations the obvious choice for defense contracts. Certainly most Americans after Pearl Harbor looked to Detroit to furnish the tools of war. *Time* magazine summed it up: "The U.S. need only step on the gas." But even following the devastating attack on Pearl Harbor and the subsequent Declaration of War by Congress, Knudsen allowed civilian production to continue until January 31, 1942, and granted some exemptions through February 15. Chrysler continued passenger car production through January 31 and light truck assembly through February 10.

When President Roosevelt created the War Production Board to manage all

defense production in January 1942, he named Donald M. Nelson its head, ending what had been a cozy relationship between Knudsen and the automakers. As it turned out, Detroit's fears about government control and low profits failed to consider the sheer extent of the crisis. Cost-plus government contracts guaranteed large profits with few risks, and given such sure-fire incentive, American big business, led by the auto industry, worked production miracles that astonished the nation, its allies and its foes.

Chrysler and the other car companies already had some experience with war contracts before the United States entered the war. As early as 1939, they had begun to make military products at little risk to themselves through "educational orders" from the government. The Educational Order Act of 1938 permitted the federal government to award contracts to select companies to manufacture small volumes of war-related items as a learning exercise. The government supplied the necessary machinery and raw materials and guaranteed a modest profit for the manufacturer. The manufacturer then had to share its new expertise with other firms. In September 1939, Chrysler agreed in principle that in case of war, it would manufacture 75mm artillery shells, 75mm cartridge cases for field guns and howitzers, fuses for M-46 and M-100 bombs and recoil mechanisms for 155mm field artillery pieces.

For example, on March 4, 1940, the Ordnance Department awarded Chrysler an "educational order" to produce 5,000 75mm cartridge cases, followed by a second order on May 3 for 10,000 cases, and a third contract for 868,000 cases in late September. As part of the contractual arrangement, Chrysler had to share the expertise it gained in production with another auto parts manufacturer, the Motor Products Company of Detroit.

But Chrysler and the Ordnance Department would not always come to an agreement on such "educational orders." Between October 1941 and April 1942, the government rejected Chrysler's proposals to make 11 different products ranging from canteen covers to incendiary bombs. In some cases, it declined because Chrysler did not fulfill the government's requirement that it award at least 60 percent of the value of the contract to subcontractors. In other cases, it was Chrysler that declined. In May 1940, the government asked Chrysler to manufacture Rolls Royce aircraft engines for the British government, but after Chrysler's engineers and production managers examined the engine and its blueprints, they decided that converting the engine to U.S. standards for mass production involved insurmountable obstacles. Chrysler's headman, K. T. Keller, simply rejected the proposal.

In any case, well before the official American entry into the fray, Chrysler was gearing

up some of its plants for war production. In August 1940, Chrysler agreed to manufacture medium tanks for the U.S. Army at a government-owned tank arsenal. By mid-June 1941, the automaker was purchasing machinery to produce three more important items for the war effort — nose and center fuselage sections for the Martin B-26 Marauder bomber, the Bofors 40mm antiaircraft gun and aluminum forgings for various applications.

While Chrysler was an experienced truck manufacturer and tanks are vaguely automotive in design, most of the other important war contracts pushed Chrysler into unfamiliar ground. Aluminum aircraft fuselages, for example, are not at all like steel automobile bodies. Keller committed Chrysler to building an aluminum forging plant and then spent three days with his engineers studying the Cleveland, Ohio, manufacturing facility of the Aluminum Company of America (ALCOA).

After Chrysler's engineers first examined the Swedish-designed Bofors gun in early January 1941, the Navy awarded the Company a contract to redesign the gun for mass production. The automaker had to convert the original specifications from meters to inches and from European to American metallurgical standards. Chrysler designed a twin-mounted version for the Navy and a single-mounted version for the Army. On February 4, 1942, a little more than a year after the original contract award, the first mass-produced Bofors guns came off Chrysler's assembly lines. A gun that the Swedes had taken 450-man hours to build was churned out by relatively unskilled Americans in 10 hours.

War Production: The Big Picture

Once the United States was fully in the war, Chrysler began a rapid conversion to full war production. That included altering existing machinery and reallocating floor space for the production of the new materials, occupying additional factory space constructed by the Defense Plant Corporation (DPC) and acquiring new machinery purchased by the government.

By early May 1942, Chrysler was using 20 million square feet of space in 19 plants for war work and had shifted 78 percent of its machine tools and 40,000 employees to defense-related activities.

By mid-November 1943, some 18 months later, Chrysler's defense operation had expanded enormously. The automaker was using 17 million square feet of its own space, 1.5 million square feet of leased space and 11.5 million square feet of space in government-owned plants, or 30 million square feet in total, for war work. Chrysler employed 17,909 of its

own machine tools and 19,277 government-owned machine tools for war production.

Summarizing Chrysler Corporation's war production is at best a daunting task. The corporation itself produced several lists of its principal war products and identified about 50 major products or significant components manufactured for other firms. Chrysler's war production can be broken down into a few broad categories: trucks and tanks; aircraft parts and components; guns, ammunition, rockets and bombs; a variety of goods that were not weapons per se but were still a vital part of military operations, and other materials that enhanced war production but were not used on or near the field of battle.

The Dodge truck plant in Warren, Michigan, assembled 403,515 military trucks. A three-quarter-ton 4 X 4 model accounted for 255,193 of the total, but Dodge also produced at least six other models, including a three-ton 4 X 2 model built for the Chinese army. Chrysler's Windsor, Ontario, plant assembled an additional 180,214 trucks for the Canadian government. The Chrysler Tank Arsenal produced a total of 22,235 new tanks, in four separate models, but with several different engines and main guns, resulting in dozens of distinct tanks. Chrysler also completed major modifications to an additional 3,272 tanks and manufactured 18 pilot and experimental models.

Chrysler's production of aircraft parts and components for various companies involved about half of all of its factories. An important part of that aircraft work was the manufacturing and assembly of the Wright Cyclone engine used in the Boeing B-29 Superfortress long-range bomber. Between January 1944 and September 1945, Chrysler's Dodge-Chicago plant produced more than 18,000 of the engines.

But, Chrysler also mass-produced nose sections, engine cowlings and leading wing edges for the B-29; some 5,669 center wing sections for the Curtis-Wright Helldiver, a Navy dive bomber; nearly 1,600 nose and center wing sections and 1,895 sets of wing flaps for the B-26 Martin Marauder bomber; 4,100 cockpit enclosures for the Douglas B-17 Flying Fortress bomber; cockpit flight stations for the Lockheed PV-2 Ventura bomber; more than 10,000 sets of landing gear and arrester mechanisms for the Chance-Vought Corsair, a carrier-based Navy fighter plane; and 163,290 ski pedestals for amphibious aircraft.

The numbers alone do not show the size and complexity of aircraft component work. For example, the final assembly of the center wing section for the Curtis-Wright Helldiver included more than 10,000 parts. The mid-wing section included the retractable landing gear and the hydraulic controls to retract the gear, the bomb bay doors and their hydraulic equipment, fittings for bombs, extra fuel tanks and miles of hydraulic tubing and electrical

wires. Five Chrysler plants completed aluminum forgings and stampings for this job or did machining on parts, while 464 subcontractors provided various components.

The Bofors antiaircraft gun was one of Chrysler's major contributions to the war effort. By the end of the war, the Company had produced 30,095 single guns and 14,442 pairs, all assembled at the Plymouth Lynch Road plant in Detroit. Chrysler made more than 120,000 Bofors gun barrels, including replacements. Twelve Chrysler plants were involved in the Bofors project, along with more than 2,000 subcontractors.

Chrysler made 101,232 incendiary bombs (many of which were dropped on Japanese targets by Chrysler-powered B-29s), 328,327 4.5-inch rockets, 20mm practice shells (3 million), 20mm projectile balls (nearly 20 million), 20mm armorpiercing shot (almost 2 million) and armor-piercing cores for .50-caliber machine gun cartridges (222 million).

Chrysler's Evansville, Indiana, factory literally produced "bullets by the billions," including some 485 million cartridges for .30-caliber carbines and nearly 2.8 billion cartridges for .45-caliber carbines. Just as Chrysler prepared for production at its Evansville plant in July 1942, the Ordnance Department ordered the automaker to substitute steel for brass for the cartridge cases. Although this last minute change required Chrysler to retool much of the plant, full-scale production began in October.

Chrysler produced a wide range of war-related goods that were not weapons in the usual sense but were nevertheless a vital part of military operations. The Dodge Main plant made two products that were perhaps the furthest from the automaker's "normal" production. The first was a complicated piece of equipment called a "gyrocompass." On February 5, 1942, the U.S. Bureau of Ships asked Chrysler to consider mass-producing the delicate object as originally designed by the Sperry Gyroscope Company. In about a week, after examining a sample and the blueprints, Chrysler agreed to make the device. The Company delivered the first compass on September 11, 1942, and by the end of the contract (February 1945), Chrysler had produced 5,500 compasses, three times more than Sperry thought possible.

The second exotic product involved the mechanical components for the antenna mount for mobile short-range radar units. Chrysler did this work as a subcontractor for General Electric under an agreement signed on September 22, 1942. The Company completed the first production unit in February 1943 but did not achieve quantity production until May. When the contract ended a year later, in May 1944, the Dodge Main plant had turned out 2,098 sets of radar equipment. The basic radar antenna mount included the radar

dish, the intricate gearing mechanisms used both to elevate and to turn the dish and the pedestal supports. Chrysler also designed a special semi-trailer to house the mobile radar unit, but, because Dodge's truck plant was already overcommitted, the Fruehauf Corporation built it.

The Chrysler Jefferson Avenue plant in Detroit produced an interesting mix of goods for the war effort. Chrysler had long experience with only two of these, industrial engines (producing 119,814) and marine engines (21,131). This plant also made 9,002 steel pontoons and a curious but useful hybrid marine vehicle, the marine tractor, more commonly known as the "sea mule."

Chrysler Division President David A. Wallace first proposed the unique design of the sea mule. By modifying one or more pontoons and equipping them with an engine and steering equipment, Chrysler produced an extremely reliable and inexpensive tugboat. Development of the sea mule began in January 1942, and pilot production started in July, with full-scale work underway by October. Chrysler assembled sea mules on site and launched them into the Detroit River at the back of the factory. By the end of the war, the Jefferson plant had assembled 8,229 sea mules in 15 different types, with engines producing up to 560 horsepower.

Jefferson Avenue also manufactured 253 machines that artificially generated smoke screens used to conceal ships and amphibious troops from the enemy's view, as well as 20,404 heavy-duty fire pumps powered by Chrysler industrial engines, 352 air raid sirens, 1,994 special submarine nets and 1,550 searchlight reflectors.

Many of the items designed by Chrysler's fabled engineering staff were innovative and unique. Chrysler designed a light-weight submarine netting that allowed an enemy submarine to penetrate it and then released flares to pinpoint the submarine's position. When the Navy needed parabolic reflectors for its searchlights polished with great accuracy to increase the operating range, Chrysler used its "superfinishing" process to create reflectors that gave the searchlights a range of more than 30 miles.

Finally, Chrysler played an important role in the development of the atomic bomb. On April 2, 1943, a delegation from the Manhattan Engineer District, the code name for the atomic bomb project, met with the top Chrysler officials. The delegation asked Chrysler to manufacture large metal diffusers required for the gaseous diffusion process used to separate U-235, the raw material for one type of atomic bomb, from uranium ore. The diffusers had to be made of nickel, the only metal capable of resisting the corrosive effects of the hexafluoride

gas produced in the diffusion process.

Rather than make the equipment of solid nickel, which would have exhausted the existing national supply, Chrysler instead carefully, and successfully, nickelplated the diffusers. Government experts had claimed that nickel-plating the diffusers was technically impossible since each of the diffusers was riddled with hundreds of thousands of precisely drilled holes. The manufacturing operations, code-named “X-100,” took place at the Plymouth Lynch Road plant in Detroit. Chrysler made four types of diffusers, which they shipped to the U-235 plant in Oak Ridge, Tennessee, on more than 1,000 railroad cars. To ship these fragile units safely, Chrysler designed a new railroad flatcar suspension system.

Two of Chrysler’s wartime operations deserve a closer look: the production of tanks and the manufacture of Wright Cyclone engines for B-29s. In both cases, manufacturing took place in new plants built and owned by the federal government. These were newly engineered products that were still under development when Chrysler agreed to make them. Because of its engineering and manufacturing experience, Chrysler quickly “moved up the learning curve” and exceeded the government’s expectations in making both products. By any measure, the tanks and B-29 engines were Chrysler’s most important wartime products. Of the total value of Chrysler’s wartime production — some \$3.5 billion — contracts for tanks, tank modifications and spare parts accounted for more than \$1.7 billion, or nearly half the total. Contracts for the B-29 engines amounted to \$872 million, so the two products together made up three-quarters of Chrysler’s wartime revenues.

Tank Production

William S. Knudsen first contacted K. T. Keller about the possibility of Chrysler’s manufacturing tanks in early June 1940. Keller agreed in principle to make tanks for the Army, but only in a government-owned plant. A group of Chrysler engineers then viewed a prototype of the 20-ton model M2A1 tank at the Army’s arsenal at Rock Island, Illinois. In mid-June, the Army shipped a complete set of blueprints to Chrysler, so the automaker could estimate the cost of producing it. A team of 197 men worked 15-hour days for more than a month to develop cost estimates. Chrysler’s pattern shops also made a full-scale mockup of the tank in wood and shellacked each part to check the “fit” of the components.

Chrysler Corporation gave the Army its proposal on July 19, 1940. For the initial contract period, running from July 1941 through June 1943, Chrysler would produce either 1,000 tanks at \$33,500 each or 2,000 tanks at \$31,500. On August 15, 1940, the Army

awarded Chrysler a contract for the lower quantity and authorized the automaker to build a tank plant at a cost of about \$200 million. Chrysler had already selected a 113-acre site in rural Warren Township, 17 miles from downtown Detroit, and immediately began to collect the needed machinery and tooling to start production. The Army scuttled these efforts by announcing on August 28 that it decided that the M2A1 tank was obsolete and that it would soon develop a replacement model.

Groundbreaking for the new Albert Kahn-designed plant took place on September 9, 1940, even though designs for the replacement tank were not complete. The contractor began erecting steel in mid-November and finished the work by the end of January 1941. Roughly one-third of the building had windows by then, and a steam locomotive temporarily provided heat so that machinery installation could begin in the dead of winter. The main assembly building, steel-framed and encased in glass, measuring 500 feet by 1,380 feet, was completed in mid-March 1941.

The Army had finished the design of the new tank, the 28-ton M3, later named the General Grant, on October 4, 1940, and Chrysler had already placed orders for many of the machines and tools it needed to produce it. Chrysler and the Army completed final blueprints and a final parts list for the M3 in early February 1941, while machinery installation continued through March. The plant assembled the first “pilot” tank on April 12, and Chrysler delivered the first M3 tank to the Army on April 24. At that time, the plant had only 230 hourly workers, and full-scale production was still four months away. The Tank Arsenal completed only seven tanks in July but then increased production to 192 in November 1941 and 237 the following month. The first six months yielded 729 tanks, well above Chrysler’s original projections.

Production of the M3 tank was barely underway when the Army decided that it was obsolete as well. The General Grant had two major design flaws — a riveted body and a main gun (75mm) mounted on the side of the hull, giving it a limited angle of fire. The replacement was the 32-ton M4 General Sherman tank, the first American tank with an all-welded body. Its main gun, also 75mm, was mounted on a turret that rotated a full 360 degrees.

The Aberdeen Proving Grounds sent Chrysler the drawings for the M4 in early October 1941, only a year after finishing the design of the M3. Chrysler quickly agreed to make the new model and in March 1942 signed a contract to produce 1,000 M4s a month.

The Company bought another 40 acres of land at the plant site and added 500,000 square feet of floor space. With this addition, the building measured 600 feet by 1,880 feet. The

construction along with the dies, jigs, tools and machines cost nearly \$23 million. Chrysler finished the first hand-built version of the M4 on June 27, 1942, and the first production model a month later. Assembly of the M3 ended on August 3, after the Tank Arsenal had completed a total of 3,352.

Chrysler developed a new engine for the M4 at the request of the Army. Rather than trying to develop a new engine from scratch, normally a three-year process for automobile engines, Chrysler's engineers created an innovative new engine using existing proven components. They cobbled together five 200-horsepower, six-cylinder engines around a common crankshaft, creating a 1,000-horsepower multibank engine that eventually powered 7,500 M4 General Sherman tanks. Army personnel called this unusual engine the "Egg Beater" and the "Dionne Quints" (the latter a reference to the internationally known, identical, female quintuplets born in Canada in 1934). The unconventional design proved reliable and durable.

Military and civilian authorities recognized Chrysler's achievement in tank production. The Army awarded the Tank Arsenal the Army-Navy "E" Pennant for production excellence on August 10, 1942, the first presented to an American defense plant. President Franklin Roosevelt made a secret tour of U.S. defense plants in September 1942, and the Chrysler Tank Arsenal was his first stop. Roosevelt, accompanied by Mrs. Roosevelt, Donald Nelson of the War Production Board and K. T. Keller, toured the plant on September 18. The president observed gear-cutting, an engine being dropped into a tank chassis and 50 tanks completing maneuvers on the test track next to the plant.

Chrysler never produced the projected 1,000 tanks a month, largely because the War Production Board never supplied the Company with enough machine tools to do the job. Still, the Tank Arsenal delivered 896 tanks, the peak monthly production, in December 1942. Chrysler proudly proclaimed that the plant produced "tanks by the trainload." By June 1944, Chrysler had converted the Tank Arsenal into an assembly facility with five parallel assembly lines by moving most manufacturing operations to other plants. Roughly 5,500 men and women worked at the Tank Arsenal in 1944, but another 14,000 employees worked on tank components in other Chrysler facilities. By June 1944, when the Company used 3.2 million square feet of floor space for tank production, the Tank Arsenal in Warren, Michigan, accounted for only 1.3 million square feet of the total.

By the end of the war, the Tank Arsenal had produced a grand total of 22,235 tanks, with the M3 accounting for only 3,352 of the total. Almost all of the rest, a total of 17,948

tanks, were six different versions of the M4 General Sherman, equipped with several different combinations of engines and main guns. The largest runs of tanks were the Shermans equipped with a 75mm gun and the multibank engine (7,500 in total) and Shermans powered by Ford engines and equipped with 76mm guns (4,017) and 105mm guns (3,039). At the very end of the Second World War, the plant built 685 45-ton General Pershing tanks. Chrysler accounted for nearly half of the auto industry's tank output of 49,058 units and more than one quarter of total American production of 86,000 tanks from all sources.

The end of the war brought the immediate cancellation of the tank contracts and a quick end to work at the Tank Arsenal. Cutbacks were already under way before the war concluded. When the last Sherman tanks came off the line on June 7, 1945, Chrysler immediately laid off 1,500 of the 5,000 employees. Even with production of the General Pershing tank continuing, employment slipped to 2,000 in mid-September and by October 19 was a mere 520. Finally, on October 26, 1945, the Chrysler Corporation officially transferred the Tank Arsenal to the Detroit Ordnance District of the U.S. Army.

Cyclone Engine Production

The second major Chrysler wartime success story was the production of the Wright Cyclone engine for the Boeing B-29 Superfortress. This was an air-cooled 3,350 cubic inches of displacement (cid) engine that developed 2,200 horsepower and had 18 cylinders arranged in a radial configuration. Four Wright Cyclones were to be mounted on each B-29 long-range bomber.

The Wright Aeronautical Corporation and the War Production Board first approached Chrysler in late December 1941 about a possible contract to make Cyclone engines. After looking at existing factory space in several Midwestern cities, the War Production Board concluded that Chrysler would need an entirely new plant, which would be located in Chicago because of that city's large labor force. The Defense Plant Corporation (DPC) would build the plant at a site in southwest Chicago, with Albert Kahn as the architect. Because of the enormity of this project, K. T. Keller created a separate Dodge-Chicago Plant Division of the Chrysler Corporation to manage it and named Lester Lum (Tex) Colbert as general manager.

The Army Air Force changed its contract with Chrysler dozens of times during the war, as its perceived needs changed and as supply conditions shifted. The first supply contract with Chrysler, signed in late February 1942, called for the production of 10,000 engines, with deliveries starting in March 1943. Peak production would reach 1,000 engines

a month in January 1944. The estimated cost to the government for engines and parts was just under \$297 million. The DPC authorized expenditures of nearly \$104 million for land (375 acres) and buildings to provide 3.3 million square feet of floor space and machinery. In early April, the Army Air Force increased the peak production requirements to 1,500 engines a month, so Chrysler could make two versions of the engine. The contract changes required an additional 120 acres of land and 2 million square feet of additional plant space. The Army Air Force increased the original supply contract by \$57 million to reflect the new provisions.

The George S. Fuller Company of Chicago, the general contractor for the plant, broke ground for the first building in early June 1942. Fuller had 7,000 construction workers on the job in mid-August and more than 16,000 in November 1942. This was an enormous plant by any measure. The main building, housing the machining and assembly operations, enclosed 3.6 million square feet of floor space under one roof. The complex included large aluminum and magnesium foundries, two forges, heat-treat and die shops, a set of 50 large test cells for engine testing, two boiler houses, a tool shop and a variety of other administrative buildings. The Fuller Company completed the 16 major buildings of the Dodge-Chicago plant in April 1943, but Chrysler needed another nine months to begin quantity production of the Cyclone engine.

Finishing construction of this massive plant turned out to be the simplest, most straightforward part of the effort to make Cyclone engines. Chrysler had to struggle with two daunting problems — an unfinished and flawed engine design and extraordinary delays in getting the machine tools needed to start production. Chrysler's engineers were prepared to mass-produce this engine by March 1943, based on the Wright Aeronautical Corporation's blueprints and specifications, but discovered to their horror that the engine design was not finished. Wright was slow to provide drawings, and when Chrysler's engineers finally disassembled some of the Wright engines, they discovered that the parts did not follow the tolerances specified in the drawings and were not interchangeable. These were hand-fitted engines unsuitable for mass production. In time, the two engineering staffs worked together to improve the engine design to make it suitable for mass production.

The entire defense industry faced severe shortages of machine tools throughout 1942 and 1943. With design of the Cyclone engine still undergoing significant revisions throughout 1942, the War Production Board simply diverted machinery to other war plants that were closer to starting production than the Dodge-Chicago plant. The Company had planned to have a production "pilot line" in operation by December 1942, with full-scale

production by March 1943. But long delays in receiving the machine tools pushed back the pilot line for a full year, and mass production did not begin until January 1944.

The engine plant assembled only 15 engines in January 1944 but increased production quickly to 507 in July. The plant turned out 1,327 engines in January 1945, only a year after it came on line, and then reached a peak output of 1,697 engines in July 1945.

Employment at Dodge-Chicago jumped from 10,104 in late August 1943 to 19,245 by December 1943. Employment climbed to 31,828 in December 1944 and peaked at 33,245 in February 1945. Chrysler struggled to maintain an adequate work force, but high turnover rates were a major problem. Between November 1943 and the end of June 1944, Dodge-Chicago hired 23,404 employees, but 10,493 — 45 percent — left for military service or for other jobs.

Managing the production of the Wright Cyclone engine at its Dodge-Chicago plant was the most frustrating wartime experience Chrysler faced. For one thing, Wright and the Army Air Force constantly changed the engine design, in part to correct defects discovered in combat. Chrysler's engineering and manufacturing staff had to incorporate 6,274 design changes to the engine, each involving dozens of parts, resulting in 48,500 "change notices" from Engineering to the Planning and Production divisions in the plant. Originally, Chrysler was to make 110 of the engine's parts, but difficulties in finding reliable suppliers resulted in the Company's manufacturing 160 parts instead.

At the end of the war, the Army Air Force canceled the engine contract with Chrysler on August 15, 1945, but some final assembly continued into early September. The labor force, some 28,543 strong on the day the contract ended, fell slowly to 22,594 on September 5, but the next day dropped to 5,949. By early December, only 2,660 employees, mostly salaried workers, guards and maintenance workers, remained at work.

The Dodge-Chicago record was impressive — between January 1944 and September 1945, it built a total of 18,413 Cyclone engines, or 60 percent of American production. The total included 16,427 carburetor engines and 1,986 fuel-injected engines. The heroic efforts of the Chrysler Corporation at the Dodge-Chicago plant made a major contribution to the war against Japan, where success depended on effective B-29 attacks on Japanese industries and cities.

Labor in the War

With the onset of large war contracts, Chrysler's labor force grew considerably, despite the loss of nearly one-third of its prewar work force to military service. In December 1941,

Chrysler employed 71,600 workers, down from its peak peacetime level of 82,243. With the end of civilian production in January 1942 and the dismantling of existing Chrysler plants, employment fell to 50,700 in March 1942. By November 1943, the numbers more than doubled to 106,600, far exceeding the maximum peacetime numbers, and finally peaked at 125,481 in January 1945. The layoffs of experienced workers during the first half of 1942 and the loss of 23,431 men to military service made this quick expansion of the labor force even more remarkable.

The enlarged labor force was the result of tremendous growth in a few plants. The Chrysler plant at Evansville, Indiana, which made ammunition, saw its work force jump from 650 in 1941 to 12,560 in September 1943. The Tank Arsenal employed about 5,500 for much of the war, but tank contracts involved 20,000 workers, counting all the factories. The Dodge-Chicago plant reached its maximum employment of 33,245 in February 1945, but given the high rate of turnover, Chrysler hired more than 70,000 to work there during the course of the war. In 1944 alone, Chrysler hired 60,000 new workers to staff its operations.

Chrysler's expertise in mass production enabled it to use large numbers of inexperienced, unskilled workers in its war plants. To meet its labor needs, Chrysler, like the other automakers, turned to two large, untapped sources of labor — women and African Americans.

Chrysler's female work force jumped from 6,160 (7.5 percent of the total) before the war to 35,223 in March 1945, more than 29 percent of the total. Before the war, women primarily did office work, wiring assembly and installation, sewing in the seating and trim departments and some inspection work. During the war, women worked in most factory operations outside of the foundries. Of the 11,500 new workers Chrysler trained to assemble bomber airframes, 70 percent were women. Chrysler's Engineering Division, historically an all-male bastion, hired hundreds of women as laboratory technicians and draftspersons in the blueprint department. Mary (M. Virginia) Sink, Chrysler's first female engineer, supervised these employees and taught evening courses in technical subjects for female students.

Similarly, Chrysler employed only 1,978 African-American men (2.4 percent of the total) before the war, primarily as foundry workers and janitors. Their numbers grew to 18,148 by March 1945 (15 percent of the work force) and included 5,160 African-American women. While the vast majority of African Americans worked in Detroit-area plants and in Chicago, they could be found in other Chrysler plants as well. A report on the Evansville,

Indiana, ordnance plant indicated that women made up 60 percent of the work force of 12,000 and African Americans, mostly women, roughly 6 percent.

The onset of the war did not end labor unrest. Ten days after Pearl Harbor, representatives from labor and industry met in Washington and agreed to a “no strike, no-lockout” policy for the duration of the war. Many industries were largely strike-free, but the automobile, rubber, aircraft and coal mining industries had hundreds of strikes. Labor unions, including the UAW, feared that wartime controls on wages, their limited ability to strike and the influx of thousands of inexperienced workers would weaken their organizations and their ability to protect their members.

The UAW held a special War Emergency Conference in early April 1942 to clarify union policies about the war. The UAW reaffirmed the “no-strike” pledge and agreed to eliminate premium pay rates for weekend and holiday work. Chrysler would pay overtime rates only for work beyond eight hours per day and 40 hours per week. These concessions were part of the UAW’s larger “Victory Through Equality of Sacrifice” program, which included rigid limits on profits and executive salaries. The auto companies, including Chrysler, took advantage of the “no-strike pledge” to avoid serious negotiations with the UAW on a wide range of grievances and standards.

The underlying tensions in several Chrysler plants, especially at Dodge Main, bubbled to the surface in May 1943 in the form of a corporation-wide strike. During the war, management stalled grievances in the bargaining machinery largely because it did not fear general strikes and could use wildcat strikes to embarrass the UAW. Hundreds of grievances were simply forwarded to the National War Labor Board (NWLB), which faced an enormous backlog. The UAW wanted to include an impartial arbitrator to settle all remaining disputes, but Chrysler adamantly opposed the idea.

The immediate, and symbolic, cause of the May 1943 strike was the Dodge Main manager’s hiring of six outside workers for well-paying jobs without first offering the work to employees already in the plant, as required by the contract. Starting on May 20, workers at Dodge Main and other Chrysler plants walked off their jobs, closing the automaker’s Detroit operations. The walkout of 27,100 workers lasted four days, ending only after the NWLB promised fast action in reforming the grievance machinery at Chrysler. In the short term, the new jobs at Dodge Main went to workers already employed there, and Chrysler reinstated all the strike leaders. On August 27, 1943, the NWLB ordered Chrysler to add an impartial arbitrator at the final appeal stage for grievances, to enforce union security and to collect union

dues through the check-off — that is, automatically deducting a worker's dues from his or her pay.

The last corporation-wide strike during the war also started at Dodge Main. On February 7, 1945, management introduced new work standards for oil pump gear cutters, increasing the daily production standard from 150 to 184 parts. Seven machinists who refused to work to the new standard received three-day suspensions, and the entire department work force of 1,100 men also struck for three days. Before the grievance involving the seven men reached the final stage of the grievance process, management fired the machinists, touching off a plant-wide strike on February 21. When the truck drivers moving parts and materials between Chrysler's Detroit plants also failed to report to work, the ripple effect spread quickly, with 19,000 workers on strike and another 5,250 laid off by March 1.

The Dodge strikers returned to work after 11 days, but only after the NLRB agreed to set up a special inquiry into the production standards and to allow the UAW to use its own time-study experts to examine the job. In the end, Chrysler won its production standard of 184 units, but the UAW won the concession that management could not unilaterally impose production standards. By the end of the war, prospects that relations between the Company and the union would be any less bitter and confrontational than before were slim.

Keller, the Chrysler Corporation and the War Record

Chrysler Corporation's leaders, particularly K. T. Keller and B. E. Hutchinson, were justifiably proud of the Company's record in war production. Starting in January 1942, *Chrysler Motors Magazine* changed its name to *Chrysler War Work Magazine*. This monthly in-house magazine for all Chrysler employees ran articles highlighting the war goods Chrysler manufactured, the various war bond drives held in the plants and former Chrysler workers who had died in the war. The automaker published two glossy paperback booklets, *Peacetime Enterprise Put to War Work* (1942), a 64-page publication dominated by photographs and drawings, and *Chrysler Division at War* (1943).

Following the war, Chrysler commissioned Wesley W. Stout to write a series of seven books celebrating the Company's war production accomplishments. K. T. Keller wrote forewords for all seven volumes. The first of these, *A War Job "Thought Impossible"* (1945) considered the production of the Sperry gyrocompass. Three volumes appeared in 1946: *The Great Detective*, dealing with mobile radar units; *Bullets by the Billion*, about the Evansville Arsenal, and *"TANKS are Mighty Fine Things,"* covering the Tank Arsenal.

Chrysler published the last two volumes of the series in 1947 — *Great Engines and Great Planes*, which was the second-longest book in the series (133 pages) and considered all of Chrysler's aircraft manufacturing work, and *Secret*, which outlined Chrysler's work on U-235 gaseous diffusion equipment for U-235 separation. The last of these books cleared the U.S. Army Corps of Engineers censors before publication. The longest book in the series, *Mobilized* (216 pages), published in 1949, outlined the role played by Chrysler Engineering in the war and included discussions of significant war production not covered in the other volumes.

Shortly after the end of the war, Chrysler commissioned 16 artists who had actual battlefield experience to paint battlefield episodes or other war scenes they had personally witnessed. Chrysler hired Lieutenant Colonel Charles Baskerville to select the artists and direct the entire project. The oil paintings, all completed in 1947, decorated the walls of the executive level of Chrysler's main office building in Highland Park until the automaker donated them to the City of Detroit for the Veteran's Memorial Building. The City of Detroit transferred 14 of the paintings to the Detroit Historical Museum in 1986. Chrysler also reproduced the paintings in a book, *Significant War Scenes by Battlefield Artists*. All 16 views showed at least one Chrysler war product in the battle scene.

Chrysler's leaders entered the fall of 1945 with a sense of pride in their accomplishments of the previous four years. At the same time, management and workers faced refitting for civilian vehicle production with legitimate concerns over how long and costly the re-conversion might be. In many respects, returning to civilian production would prove more difficult than converting to war production in 1942.