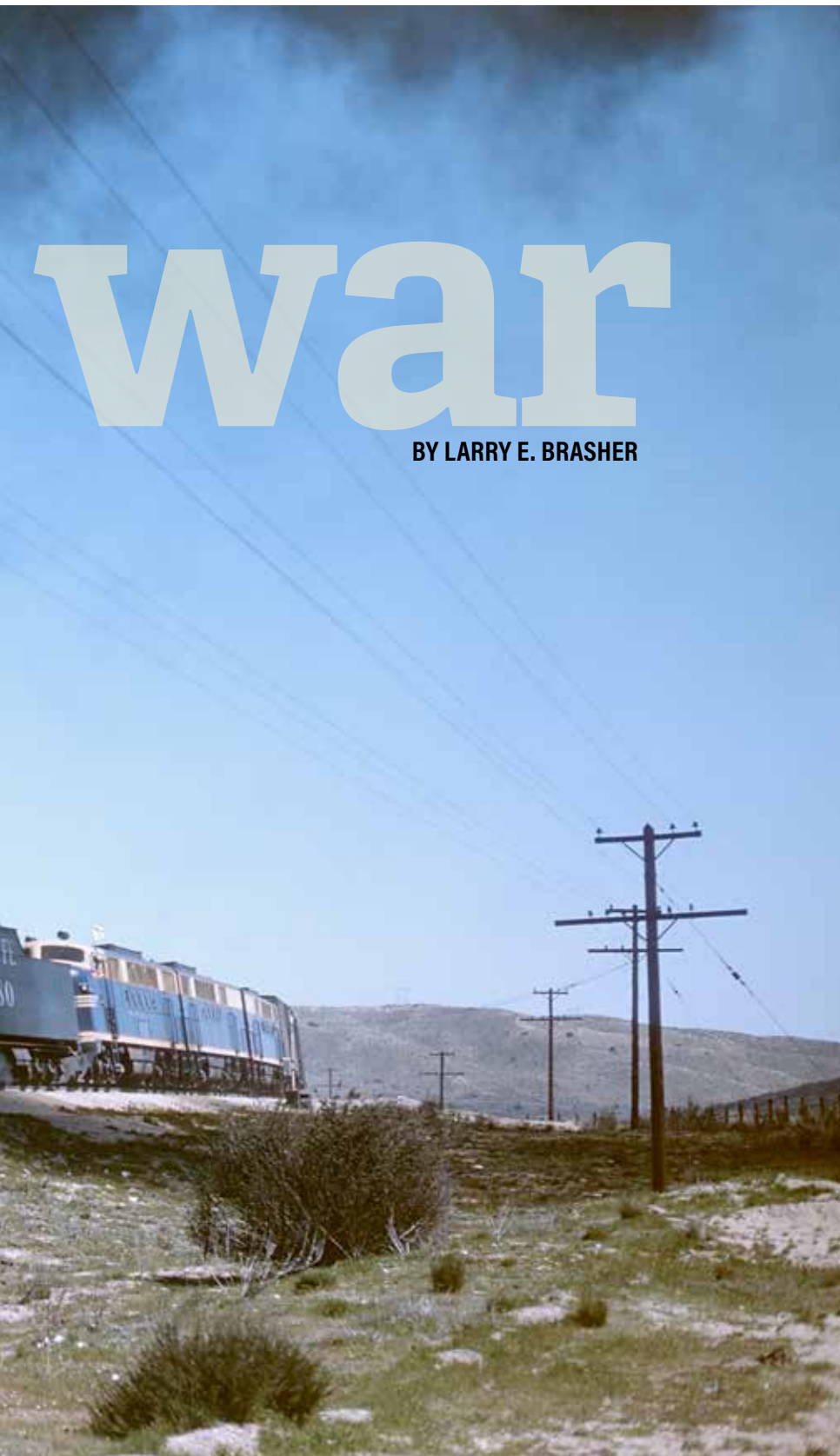


Santa Fe goes to



When World War II brought a **flood of traffic to the California**, the carrier met the challenge



war

BY LARRY E. BRASHER

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The year was 1940. Europe was engulfed in war, but in the United States, continued peace was anticipated. The Great Depression's persistence was worrisome. The steepest drop in industrial production ever recorded came in 1937, and by January 1938 the unemployment rate was back up to 17.4 percent. Like most railroads, the Atchison, Topeka & Santa Fe was reaching for an elusive prosperity.

Despite the concerns brought about by the effects of the secondary depression, the programs begun under Santa Fe President Samuel T. Bledsoe's leadership were continued by his successor Edward J. Engle, working in concert with Vice President Fred G. Gurley. Gurley joined the Santa Fe in 1939, provided much of the executive leadership during the World War II years, and became president in 1944.

New diesel-powered lightweight passenger-train service was expanded, modernization of existing steam locomotives was ongoing, and right-of-way and service improvements were well in hand. These enhancements, initiated when traffic was at a low ebb, would soon prove invaluable when the nation was thrust into a two-ocean world war, and the Santa Fe was asked to carry unimagined volumes of freight and passengers.

Even so, the increase in traffic that would come about as a result of world conditions that had been deteriorating, and then utterly collapsed when war broke out in Europe in September 1939, had been anticipated to some extent, and plans were in hand to cope with the projected new demands. Santa Fe management had been aware of the potential effect on operations and traffic imposed by

Power that won a war: 2-10-2 No. 3880, from Santa Fe's largest class of heavy freight locomotives, assists three FTs, from America's first fleet of road-freight diesels, at Lugo, Calif., on the east side of Cajon Pass, in 1945.

Frank Peterson, Tom Gildersleeve collection

only railroad linking Chicago and
with modern motive power and line improvements



Pacific 3447, rebuilt with new drivers and other improvements in 1944, hurries west at Holliday Kans., with a long, all-heavyweight passenger train. It's November 1946, and the flood of demobilizing troops is subsiding.

C. H. Kerrigan



With the fireman or brakeman standing on the tender, war baby 4-8-4 No. 2925 departs Amarillo with empty reefers heading back to California in 1953. Restrictions on materials made the 2900s the heaviest of all 4-8-4s.

Stan Kistler

emergency conditions even before the country's entry into the conflict, and it took steps to prepare.

The war's effects were felt even before Pearl Harbor. Passenger ridership increased in 1940, when the domestic economy was picking up, Europe was at war, and Asia was threatened. Santa Fe attributed the growth to an increased number of people enjoying a greater in-

come traveling in the United States rather than going overseas. Passenger-miles increased again in 1941 as civilians and military personnel traveled on defense-related business.

Freight traffic ramped up too, as the aircraft, munitions, shipbuilding, and other conflict-related industries expanded output. Additionally — albeit non-war related — increased rainfall across the

system finally brought about significant recovery from the terrible drought of the 1930s. In Kansas, the 1940 wheat harvest was forecast to be less than 60 million bushels, but it actually came in at 123 million bushels. All other crops made significant gains as well. In California, citrus, other fruits, and vegetable crops also benefited from greater precipitation, yielding bountiful harvests. In response to the growing traffic, in 1941 Santa Fe issued trust certificates to fund the purchase of 2,000 boxcars, 300 ballast cars to support right-of-way improvements, 450 gondola cars, 50 flatcars, and 20 streamlined passenger cars.



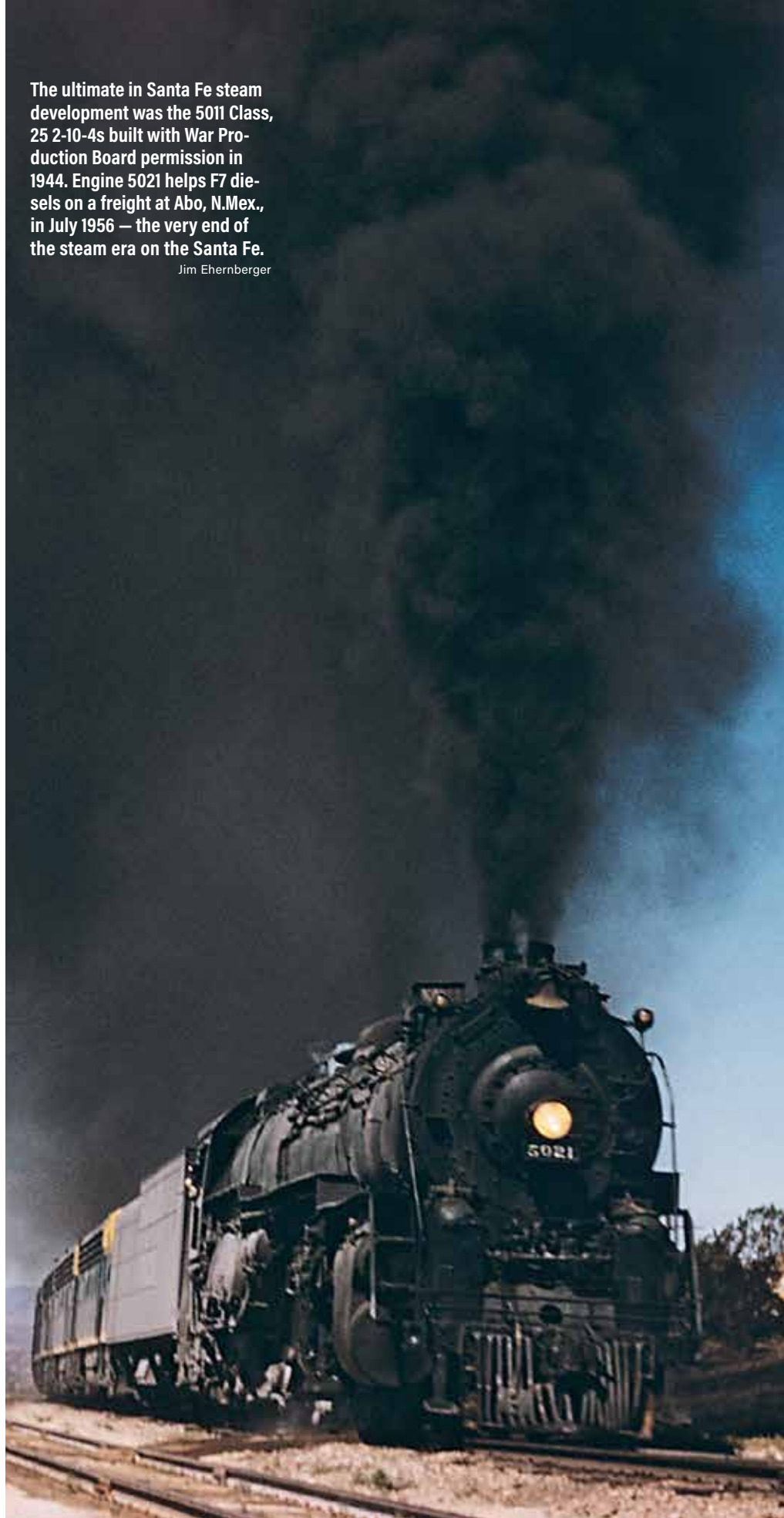
The ultimate in Santa Fe steam development was the 5011 Class, 25 2-10-4s built with War Production Board permission in 1944. Engine 5021 helps F7 diesels on a freight at Abo, N.Mex., in July 1956 — the very end of the steam era on the Santa Fe.

Jim Ehernberger

The first full year of the war, 1942, also saw bumper crops in Santa Fe territory. The increased movement of agricultural products, coupled with the huge traffic increases due to war production, resulted in an increase of revenue ton-miles of 50 percent over 1941. Passenger traffic, spurred by troop movements, gas- and tire-rationing, and curtailment of airline service, jumped 127 percent over 1941. These figures continued upward as the war progressed and the military focus shifted from Europe to the Pacific.

SANTA FE'S ARSENAL

Although the challenges were great, the Santa Fe had powerful tools with which to meet them, including a potent arsenal of steam locomotives. Most numerous among mainline freight engines were 229 2-8-2 Mikados in the 3160 Class (128 engines, built 1917–20) and the heftier 4000 Class (101, 1921–26). The road that pioneered the 2-10-2 Santa Fe type also rostered the most, 342; the backbone of the fleet was the 140-strong 3800 Class (built 1919–27). In 1941 the Santa Fe's top freight engines — in terms





Diesels enabled engine runs unimaginable with steam. In August 1942, E6A No. 15 and a B unit bring the streamlined *Chief* into Streator, Ill., 90 miles into its 2,227-mile dash to Los Angeles. The hood over the headlight was a requirement for locomotives operating on the Pacific Coast.

H. W. Barber, Bill Barber collection

of speed and power if not quantity — were the 10 5001 Class 2-10-4s of 1938; their 74-inch drivers and 93,000 pounds of tractive force were ideally suited to fast freight work.

Pacifics still accounted for the lion's share of the passenger-engine fleet in 1941, topped by the 3400 Class, of which 50 were built during 1919–24; an extensive rebuilding program greatly enhanced their capabilities, but not all had been modified when America's entry into the war curtailed the work. The railroad's 51 4-8-2s (3700 Class, 1918–24) could out-pull the 4-6-2s, but their 69-inch drivers were not suited to the accelerated timetables introduced in the mid-1930s. Unusually for a western carrier, Santa Fe had 4-6-4s, albeit not many: 10 in the 3450 Class (built 1927, rebuilt for higher speeds 1936–39), and the six 3460s of 1937, whose 84-inch drivers made them real ballast-scorchers.

Three classes of 4-8-4s — “heavy Mountain” types in Santa Fe parlance — were the premier passenger steam locomotives at the time of Pearl Harbor. The 14 3751 Class engines, though dating from 1927–29, had been rebuilt with roller bearings, larger drivers, higher boiler pressure, and other improvements. More formidable still were the 11-strong 3765 Class of 1938 and the 10 nearly identical

3776 Class engines, delivered in 1941.

Steam was the king of most passenger, mail, and express trains. Virtually all regular freight service also was in the hands of steam. But diesels were already playing important roles on the Santa Fe, and the road had big plans for the new form of motive power.

Santa Fe was an early adopter of diesels for all types of service. In 1935 it acquired the first of more than three dozen pre-war switchers built principally by Electro-Motive, Baldwin, and Alco. Much more in the public eye were the road's passenger diesels, beginning with the box-cab “One-Spot Twins” built in 1935 for the original, heavyweight *Super Chief*, launched the following year. Santa Fe's signature image of “Warbonnet” cab units pulling stainless-steel cars came in 1937 when the streamlined *Super Chief* debuted with Electro-Motive E1 diesels and Budd-built lightweights. By the end of 1941, the road had 20 E1, E3, and E6 passenger diesel units (13 cabs, 7 boosters), plus an Alco DL109-110 cab-booster pair. Wartime restrictions precluded the acquisition of additional passenger diesels for the duration.

Diesel switchers and passenger units were in service on other railroads, but the Santa Fe was unique in its early embrace of road-freight diesels. In early December

1941, the railroad had five 5,400 h.p. four-unit Electro-Motive FTs, Nos. 100–104, in service. These 100 Class units were being used to test and establish routes, locomotive configuration, and tonnage ratings. An ordered and steady progress to dieselization seemed to be well in hand. Then came The Day of Infamy, followed by Germany's December 11 declaration of war, and the picture changed dramatically.

MORE TOOLS FOR THE FIGHT

The Santa Fe responded with orders for additional rolling stock, although War Production Board restrictions curtailed the numbers available. Motive-power requirements were met through allocations approved by the WPB with an order for 20 (soon upped to 30) new 2900 Class 4-8-4s. Eleven new FTs filling out earlier orders were received, while an additional 42 new FTs were on contract. Santa Fe received 8 diesel switchers with another 46 on order. While 1942 saw the receipt of 31 lightweight passenger cars and the ordering of 27 additional ones, no new diesel passenger locomotives were allowed by the WPB.

The year 1943 witnessed the arrival of the first new steam to be delivered on the Santa Fe since the 3776 Class 4-8-4s of 1941. The 30-strong 2900 Class, classified



FT No. 101, built in March 1941, wheels a freight extra west at Willow Springs, Ill., in November 1946. Concentrated initially in the arid, steam-unfriendly territory between Winslow, Ariz., and Barstow, Calif., Santa Fe's 320-unit FT fleet was dispersed across the system after the war.

C. H. Kerrigan

by the War Production Board as freight locomotives, was initially to be built to the design of the 3776s. Material restrictions and guidelines imposed by the WPB prevented the use of certain light-weight components, and the 2900s were heavier despite being identical in most dimensions to the 3776 Class.

The WPB also authorized construction of 25 2-10-4 locomotives based on the existing 5001 Class. Design modifications made the new 5011 Class — delivered in 1944 as the Santa Fe's final new steam order — slightly superior to the 5001s.

Had World War II not intervened, followed by the War Production Board's prohibition of the acquisition of substantial new diesel production, particularly for passenger service, the age of steam would quite possibly have come to an end on the Santa Fe without the acquisition of the magnificent 2900s and the equally wonderful 5011s. The 5001 and 5011 Classes worked almost without interruption on the Pecos Division as far east as Wellington, Kans., throughout the war until final retirement in 1957. The 2900s did not find a "home" as such and were used as needed until spending their relatively short lives working freight between Belen, N.Mex., and Wellington. Both classes, particularly the 2900s, made occasional appearances on passenger trains.



Alco HH1000 switcher 2321, last-built of Santa Fe's 2310 Class of 1939, works at Dodge City, Kans., in 1941. The road bought 34 of the successor model, the 1,000 h.p. S2, during 1942-45.

W. K. Aughenbaugh

Wartime restrictions prevented the Santa Fe from acquiring as many FTs as it would have liked. But, in view of its strategic location and long hauls through country devoid of water for steam locomotives, the road did get a substantial quantity of the freight diesels. From the handful on the roster at the end of 1941, the fleet grew to a total of 320 units (155 cabs, 165 boosters) by the time the last ones arrived in August 1945. Nearly 30 percent of all FT production went to the

Santa Fe. Many roads ordered their FTs built with drawbars between the A and B units, but Santa Fe specified couplers for maximum flexibility. During the war, many as-delivered A-B-B-A sets were re-arranged to A-B-B-B.

Santa Fe's FTs were customized with all current modifications to dynamic brakes, gearing, and other operating concerns uncovered during testing of the early units in 1941. As 1942 began, the Santa Fe was working its five 4-unit FTs

between Argentine, Kans., and Waynoka, Okla., with an occasional run as far west as Belen. Prior to the March 1942 arrival of FT No. 105, the Santa Fe had planned on concentrating its FTs on the Albuquerque, Arizona, and Los Angeles divisions, with their primary service point selected in 1942 to be at a new diesel shop at Winslow, Ariz. This location corresponded with a proposed plan to reduce water usage across the desert regions of Arizona and California, and added the benefit of testing the new dynamic braking systems on the long 1.42 percent ruling grade in Arizona and on the shorter 2.2 percent grades over California's Cajon and Tehachapi passes.

The Winslow site was already an established change and service point for 3800 Class 2-10-2s working west to San Bernardino and Bakersfield, and 3160 and 4000 Class 2-8-2s working east. The new diesel shop would provide a central location for FT maintenance and repair, a location for establishing shop practices and training of shop forces, and make available close in-service observation of the new and unfamiliar internal-combustion motive power. This plan was much more formal and organized, as opposed to the heretofore almost prima donna treatment given the passenger diesels that were still headquartered in Chicago.

This plan was implemented, and work began on the construction of the facility at Winslow. The Winslow plan was soon seen requiring change and expansion as war requirements quickly showed there was need for not only an additional 38 FTs but many more. Despite difficulties surrounding the selection of Winslow as the new location, temporary and expedient work progressed rapidly.

Despite labor shortages, personal difficulties, and space limitations, the new facility was developed to the point that throughout most of the war all maintenance of what would soon be a bona fide and ever-growing fleet of FTs was carried out at Winslow. This shop was a busy and all-important interim facility, and there is little doubt that the Santa Fe could not have prosecuted the heavy wartime freight movements required without the concentrated ability to maintain the ever-increasing numbers of FTs.

RELIEF FROM OLD RULES

As traffic surged in early 1942, existing labor-related operating rules and related practices began to show an immediate and adverse effect on the Santa Fe's ability to move tonnage. For years, due to train-

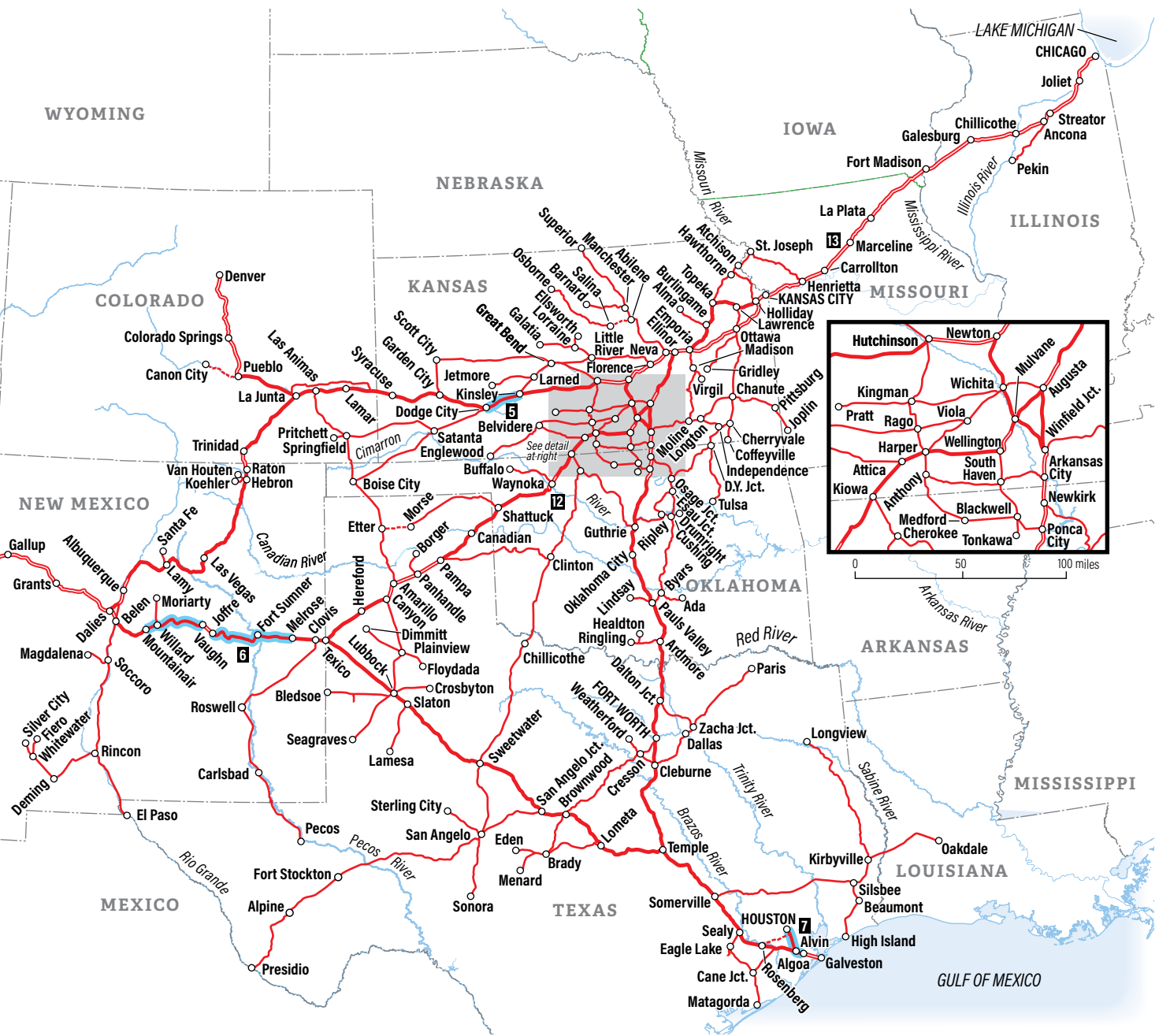
The Santa Fe in World War II



length restrictions imposed in the early 1900s by labor agreements and by California and Arizona state laws, a maximum 70-car length limitation had been in place on all trains operated between San Bernardino, Calif., and Albuquerque/Belen, N.Mex. This limitation also affected the development of motive power, resulting in the early demise of the 3000 Class 2-10-10-2 Mallets after their introduction in 1911 and, later, the banishment of the 5001 Class 2-10-4s from Coast Lines use in 1939. Both classes were more than capable of moving trains

in excess of the 70-car limit.

Another handicap was the "Double-header Rule," a work agreement reached in 1903 between the railroads and the conductor's and brakemen's unions whereby a train could be doubleheaded only if the resulting combined power did not exceed the tonnage rating of the more powerful of the two locomotives. The Santa Fe's highest tonnage rating for a single locomotive in Arizona in 1942 for 3800 Class 2-10-2s was 2,900 tons; however trains normally powered by single 3160 and 4000 Class 2-8-2s were rated at



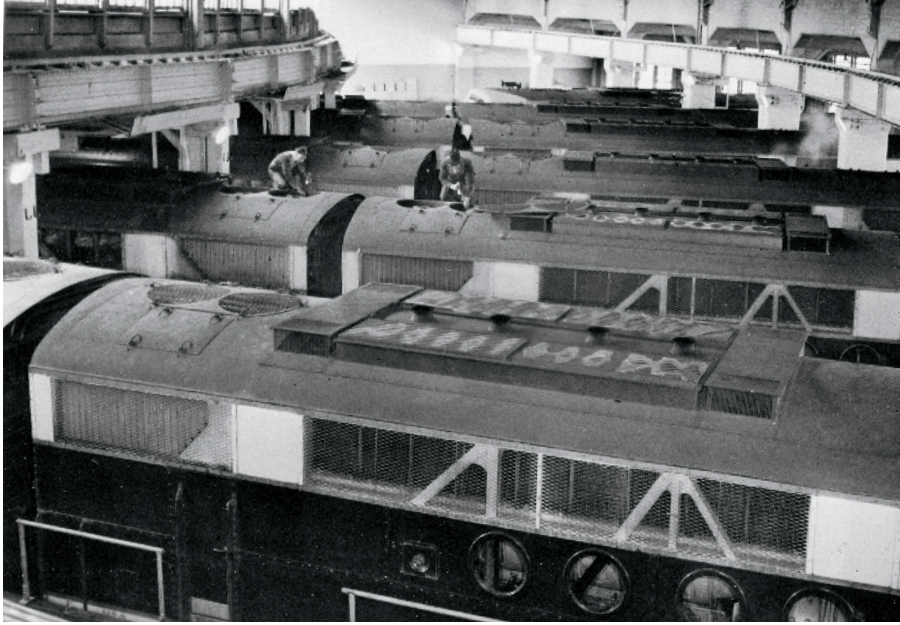
2,200 tons. In addition, work rules in Arizona limited trains with two brakemen to a maximum length of 39 cars. Additional cars required an additional brakeman. Arizona's state law limiting maximum train length within its borders to 70 cars if freight or 14 cars if passenger had been implemented in 1913. California had implemented a law limiting trains descending Cajon Pass to a maximum of 50 loaded cars.

In many ways, conformance to these restrictions had affected the whole Santa Fe system. Freight trains, other than re-

gional "drag" freight movements, were blocked to conform to the 70-car limit. Ruling grades east of Winslow, Ariz., to Dalies, N.Mex., and on to the Southern District at Belen were at 0.6 percent, allowing the use of 2-8-2s with ratings of 2,200 tons single on the Albuquerque Division. The 2-8-2s were also capable of handling freight service between Belen and Winslow and east of Clovis, N. Mex.

Santa Fe had designed the 3800 Class 2-10-2s with tonnage ratings of 2,900 tons to allow single locomotive operation on the Coast Lines and doubleheaded on

the Arizona Division over 1.43-percent grades east of Needles, Calif., and over the Pecos Division's 1.25-percent climb between Belen and Mountainair, N.Mex. When World War II erupted and car movements increased through Arizona from 400 to 500 per day to more than 1,500 per day, the nearly 700 miles of main line in Arizona and California with sidings designed to accommodate trains of no longer than 70 cars became an instant and potentially devastating bottleneck, with the nearest adjacent major yards at San Bernardino and Barstow,



The Santa Fe converted several stalls in the roundhouse at Winslow, Ariz. (top), for FT servicing. The steam facility was ill-suited to diesel work, and the lessons learned from it resulted in a completely different design for the new diesel house at Barstow, Calif. (above).

Two photos, Santa Fe

Calif., and Belen and Albuquerque.

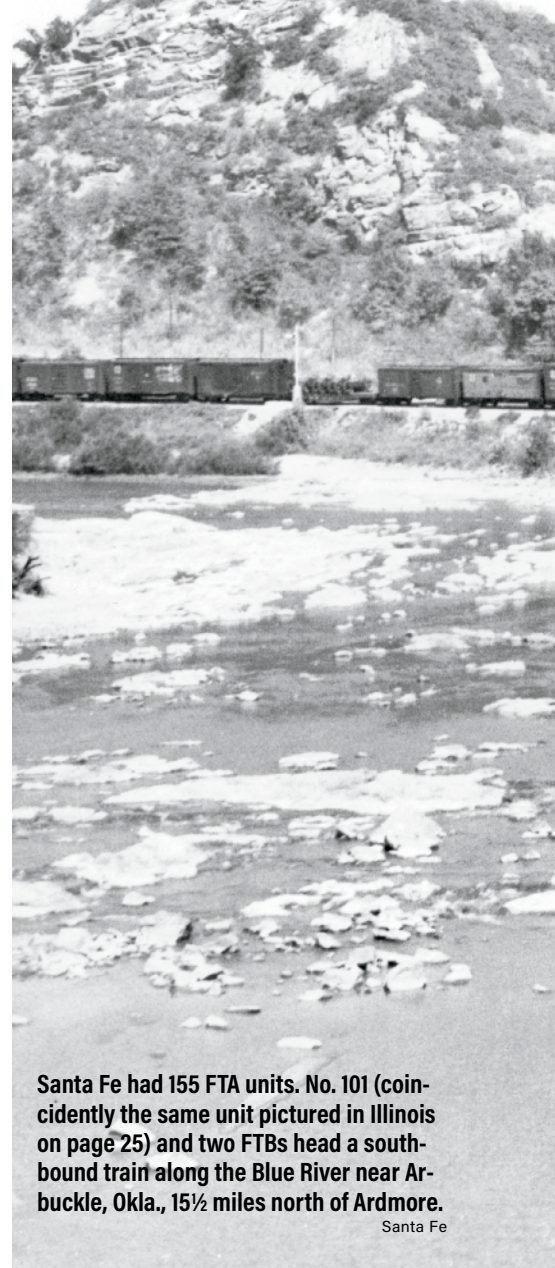
In 1941, the 5,400 h.p. FTs had been tested in Arizona with trains of up to 3,500 tons, exceeding 90 cars. There was no doubt that FTs could easily handle the needed heavier and longer trains. Similar tests in 1938 with 5001 Class 2-10-4 No. 5006 had yielded comparable results and dictated the reassignment of the 5001s to the Pecos Division west of Belen, where their hauling capacity was not restricted by law and labor rules.

In September 1942 the ICC, invoking its war emergency powers, rescinded all state-imposed labor and operating restrictions that were not demonstrably safety-related. Thus the Arizona and California laws and the Doubleheader Rule no longer constrained operations.

However, despite this relief, the increased power of the FT by itself could

not alleviate the problem. The Santa Fe was double-track through much of Arizona, but absent classification and make-up terminals convenient to Arizona, for many years transcontinental trains had been blocked to conform with the 70-car limitation at eastern (Belen) and western (San Bernardino) classification yards. The blocking served to accommodate the weight and length restrictions over the nearly 700-mile stretch of constrained territory. In addition, sidings and yards that had been designed to accommodate the 70-car rule were woefully short and cramped.

Cajon Pass in California, with sidings and trackage between San Bernardino and Summit laid out to accommodate that state's 50-car limitation, was another bottleneck. Longer freight consists and passenger trains, which were exceeding

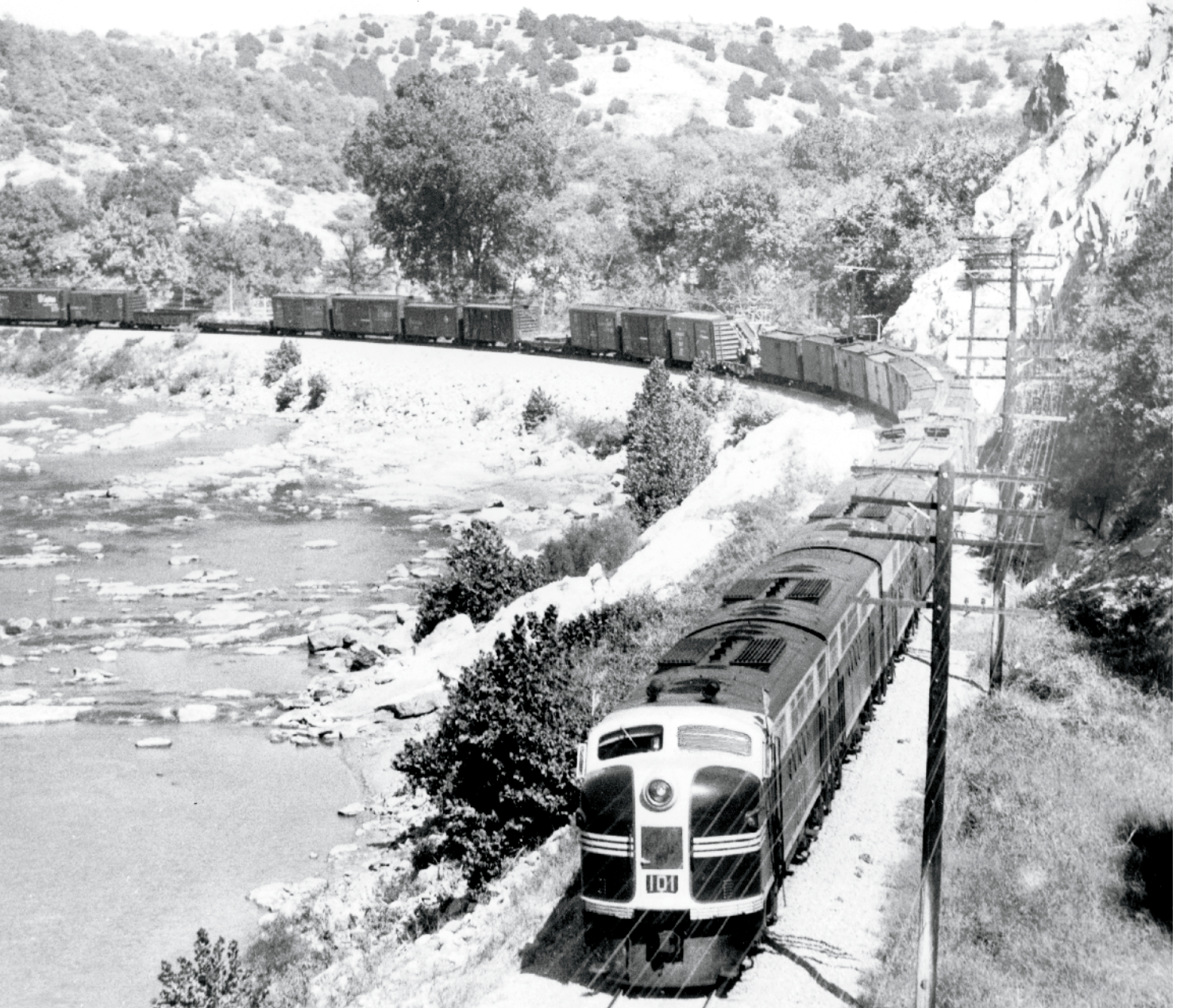


Santa Fe had 155 FTA units. No. 101 (coincidentally the same unit pictured in Illinois on page 25) and two FTBs head a south-bound train along the Blue River near Arbuckle, Okla., 15½ miles north of Ardmore.

Santa Fe

14 cars, and troop trains, often including a mix of passenger and freight cars, were subject to long delays. The situation became intolerable.

With the California and Arizona train-size limitations lifted, Santa Fe was presented with the simultaneous challenges of expanding track, bridge, and siding capacity, to accommodate trains of up to 3,500 tons and 110 cars. Purchasing added motive power capable of moving the tonnage expeditiously, and finding qualified personnel to operate and maintain all facets of the rapidly expanding system, added to the burden. The railroad addressed all this in a \$20 million plan that was approved in November 1942, and had, with two exceptions, resolved these dilemmas by the end of the war. The major exceptions were the replacement of the old gantlet-track bridge



across Canyon Diablo in Arizona, and the completion of the new diesel shop at Barstow.

REMAKING THE RAILROAD

Between the beginnings of track expansion in late 1942 and the near completion of the effort in late 1944, many miles of right of way were rebuilt. Santa Fe increased 12 passing tracks westbound from San Bernardino to Barstow over Cajon Pass to 90-car capacity; eastbound, 12 sidings were increased to 100-car capacity. From Barstow to Winslow, 37 sidings westbound were increased to 100-car capacity, as were 39 sidings eastbound. Between Winslow and Belen, 17 passing tracks were increased to 110-car capacity westbound, and 20 passing tracks were increased to 110-car capacity eastbound. These enhancements also made it possi-

ble for Santa Fe to consider additional Centralized Traffic Control installation.

Increased car capacity on passing tracks was of little help without increased yard capacity. By the end of 1945, where space allowed, every major yard between Clovis, N.Mex., and Los Angeles had been significantly expanded. To name a few, car capacity at Clovis increased from 1,420 to 2,140; Belen from 1,755 to 2,689; Winslow from 1,021 to 2,460, Barstow from 1,735 to 2,590; San Bernardino from 3,220 to 3,400, and Hobart Yard in Los Angeles from 1,885 to 2,775.

CTC was expanded, some realignment of curves and grade reduction was accomplished, and the installation of heavy rail, up to 131 pounds per yard, continued, and practically every bridge was strengthened.

Although concentrated on the West-

ern Lines, the \$20 million program also resulted in virtually a new Coast Lines right of way as well as significantly updated Eastern Lines. Without this massive investment, the new FTs, 2900s, and 5011s could neither have moved the tonnage demanded nor kept the schedules required. Initially, without this effort, there was no added car capacity room, not for the FTs in Arizona and California and not for the 2900s and the 5011s east of there.

Along with a huge yard expansion at Barstow, a new diesel shop, purpose-built from the ground up, was under construction there. Barstow would eventually become a prime shopping point for all Santa Fe diesels in transcontinental service. The new diesel shop benefited greatly from the experience and knowledge gained at Winslow. Initially planned to



The 1890-vintage gantlet-track bridge over the Colorado River at Topock, Ariz. (above), was a bottleneck for all Santa Fe traffic moving in and out of California. The double-track replacement that opened in 1944 (right, in a 1953 photo) was on a new alignment that dispensed with a number of sharp curves.

Two photos, Santa Fe

accommodate a full three-unit Alco PA or four-unit EMD locomotive in six indoor bays, with two additional auxiliary truck and traction-motor-service bays, it was not in operation until 1946.

The old bridge at Topock, Ariz., where the main line crossed the Colorado River at the Arizona-California state line, had long been a bottleneck. Built in 1890 as a single-track span, it had been strengthened with a central pier and converted to a gantlet track configuration. Construction of a replacement, begun in 1942, was scheduled for completion in early 1945. The attendant line relocation was also beneficial, resulting in curvature and grade reductions on the western approach. The new fills and grading were especially helpful, with three new curves of 1 degree or less, resulting in elimination of seven curves of 2 to 4 degrees, plus one 10-degree curve.

Far to the east, the road undertook massive curve reductions on Curtiss Hill in Oklahoma, completed in 1946. Although the ruling grade remained 1 percent, the large cutting operation allowed the extension of passing tracks and aided the movement of longer trains.

Another achievement in 1945, resulting from procedures begun with a filing with the ICC in 1944, was the acquisition



of right of way into Long Beach, Calif. An additional and long-needed improvement was the completion of a 3.3-mile track relocation and grade reduction near Marcelline, Mo., including new cuts and fills and lessening of curvature over Cardy Hill.

One of the last bottlenecks on Santa Fe's transcontinental main line was the old bridge over Canyon Diablo in Arizona. Not only was its gantlet track an operational impediment, the span's weight-bearing capacity was so meager that doubleheaded 3800s could not be operated across it. The spindly trestle was scheduled to be replaced in the 1942 plan, but perhaps because of steel shortages, the new Canyon Diablo bridge was not operational until 1946.

Santa Fe was one of the first railroads to embrace diesel power for passenger

trains, and *the* first to commit to diesels for freight. In the early 1940s it had a stable of highly capable steam locomotives, including potent designs that could be quickly built under wartime conditions. The railroad's ability to deploy these tools effectively, and to improve its physical plant to handle huge increases in traffic, were vital factors in America's victory in World War II. ■

LARRY E. BRASHER, son of a Santa Fe Mechanical Department employee, authored three books about the road. This is his third article in a CLASSIC TRAINS publication, following pieces on the first streamlined Super Chief [STREAMLINER PIONEERS, 2004] and Santa Fe Chief Mechanical Engineer Charles T. Ripley [Fall 2007]. Larry Brasher died in 2015.

Another choke point, the trestle over spectacular Canyon Diablo west of Winslow, Ariz., was planned for replacement in 1942, but completion of the new steel-arch bridge was delayed until 1946. Work progresses on the new span as Mikado 4004 passes with westbound freight.

Santa Fe

