

# BIG POWER

in



*Overland*  
**ROUTE**  
150

# POWER the West

After the steam era, UP and SP continued the tradition of massive, distinctive locomotives with turbines, double diesels, and diesel-hydraulics

BY A. J. WOLFF



Big power dominates on the Overland Route: Three EMD DDA40Xs and a DD35 lead an eastbound freight into Cheyenne, Wyo., in February 1976. It would take eight conventional locomotives to give the same power.

A. J. Wolff

# Gas turbine-electrics

**In the steam era,** Union Pacific was a proponent of large, powerful locomotives to move tonnage at high speed over significant grades. The most notable examples of this approach were 88 4-12-2 Union Pacific types (introduced in 1926), 105 4-6-6-4 Challengers (1936), and 25 4-8-8-4 Big Boys (1941). Although UP began to use diesels on passenger trains as early as 1934, it believed steam would be the preferred choice for freight for years to come. However, prior to 1940, it began exploring alternate forms of motive power.

UP flirted with the concept of turbine-electric locomotives in 1939, when it tested two General Electric-built steam turbines, Nos. 1 and 2, for two months. The units were never owned by UP and were returned to GE in June 1939.

In late 1948, Alco-GE built a 4,500 h.p. gas turbine-electric locomotive (GTEL), No. 101. The dual-cab, 84-foot, B+B-B+B unit burned the then-plentiful and relatively cheap Bunker C fuel that commonly powered oil-burning steam locomotives. The turbine was coupled to a D.C. generator through reduction gears, and the resultant electrical energy was transmitted to eight traction motors. After tests on eastern roads, the unit was painted in UP colors and renumbered to 50 in June 1949. It operated for 21 months to Los Angeles; Port-

land, Ore.; Seattle; Denver; and Kansas City in all types of service. However, the majority of runs took place over the Wyoming Division from Cheyenne to Ogden. Impressed with the prototype, UP went on to order three groups of gas-turbine-electrics from GE; the road's 55 units constituted North America's only major turbine fleet.

Later, UP experimented with a coal-burning steam-turbine-electric, which it tested from 1962 to '64. Built from a former PA cab unit, a Great Northern electric, and a fuel tender, it was scrapped in 1968.

MODEL	UNITS	BUILT	H.P.	TRUCKS	LENGTH	WEIGHT
GTEL 4500	UP Nos. 51-60	1/52 to 8/53	4,500	B+B-B+B	84 feet	276 tons
GTEL 4500	UP Nos. 61-75	3/54 to 10/54	4,500	B+B-B+B	84 feet	276 tons
GTEL 8500	UP Nos. 1-30	8/58 to 6/61	8,500	C-C (two)	179 feet*	592 tons*

\* Figures include tenders

## General Electric GTEL 4500 ("standard")

Union Pacific accepted its first production-model turbine, No. 51, in January 1952. It was initially assigned between Green River and Ogden, to power 5,000-ton freights up the 1.14 percent eastbound grade to the summit at Wahsatch, Utah, and 5,600-ton trains on the westbound 0.82 percent grade from Evanston, Wyo. (Once in service, turbine-powered eastbounds often required help from steam pushers.)

As delivered, the unit had a single cab with air intakes on the sides, a characteristic shared with the next five, Nos. 52-56. The balance of the

group, Nos. 57-60, had rooftop air intakes. The first six were similarly modified to address air circulation problems.

Nos. 51-60 came to be called "standard turbines" in recognition of their full-width body similar to a diesel cab unit. The main tank held 7,200 gallons of bunker C fuel oil. To operate the locomotives with the turbine shut down or to start the turbine, they were equipped with a 250 h.p. Cummins diesel engine.

Fuel tenders holding 22,000 gallons and fabricated from tenders off retired 4-12-2s were added in 1956, enabling the turbines to expand their

territory beyond Ogden-Green River. With a tender, they could run Council Bluffs-Ogden, almost 1,000 miles, without refueling.

No. 57 was converted to burn propane in May 1953. It tested between Las Vegas and Los Angeles, but fuel costs and safety concerns offset any advantages. It was converted back to fuel oil in early 1954.

A double turbine combination with Nos. 59 and 60 back to back, spliced by a common fuel tender, was tried in late 1958. The trial was discontinued due to air intake problems on the trailing unit.

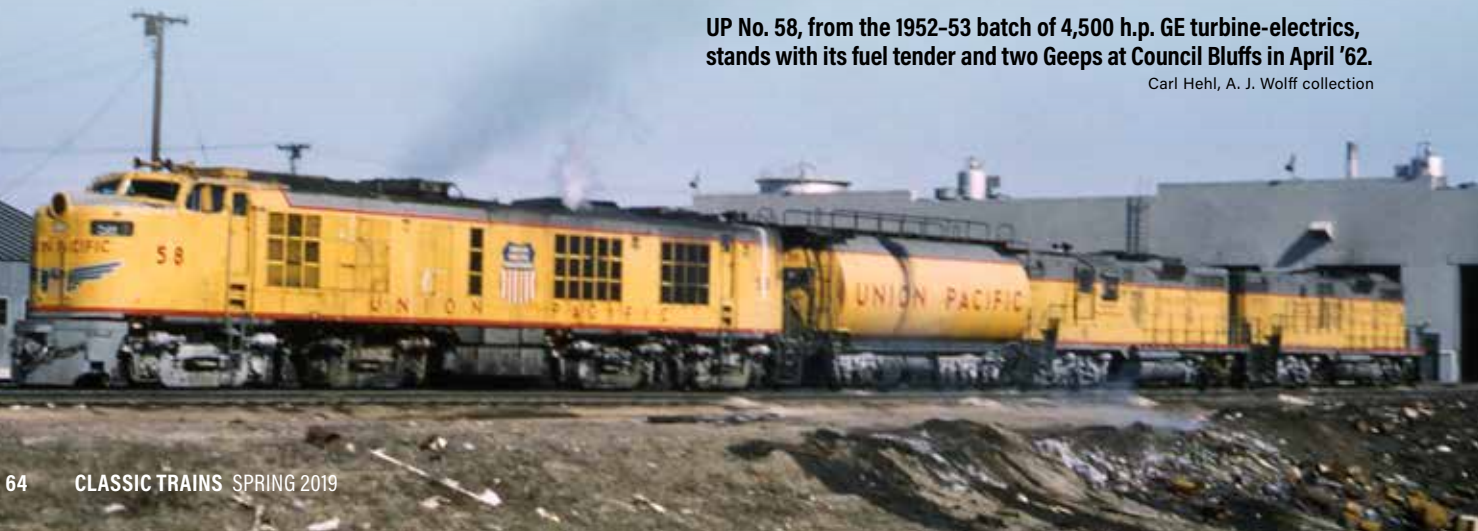
To increase the horsepower

at the pulling face, Nos. 55 and 58-60 were modified in 1958-59 to enable them to operate in multiple with diesels. The standard turbines made several trips to L.A. in 1962, but otherwise their normal operating territory was Council Bluffs to Ogden.

Because of increased maintenance costs, Nos. 51-57 were retired by the end of 1962. No. 60 was dropped from the roster in August 1963 and Nos. 58-59 followed in June 1964. Trucks and other usable parts went to GE for reuse in U25B and U50 diesels. The bodies were subsequently scrapped in Omaha and Cheyenne.

**UP No. 58, from the 1952-53 batch of 4,500 h.p. GE turbine-electrics, stands with its fuel tender and two Geeps at Council Bluffs in April '62.**

Carl Hehl, A. J. Wolff collection



Turbine No. 64, one of the 15 "veranda" units, and 4-8-4 No. 826 hustle a fruit block east out of Green River, Wyo., in September 1958.

Henry R. Griffiths Jr.



## General Electric GTEL 4500 ("veranda")

Seven months after the delivery of the final "standard" turbine, No. 60, the next group of 15 began to arrive. They incorporated a number of improvements over the previous version, the most noticeable change being the addition of walkways along the unit body to enable easier access to internal components. Since these walkways were sheltered below the roof line, they gave the appearance of residential verandas, as the class was eventually dubbed. In addition, the air intakes were moved to the roof in lieu of side intakes. Like Nos. 51–

60, the veranda-style units had a 250 h.p. Cummins diesel engine for yard movements and starting the turbine. To heat the 7,200 gallons of viscous bunker C fuel oil, Nos. 61–75 were equipped with Vapor Clarkson boilers as were the earlier "standard" GTEs.

As built, the veranda units lacked tenders. No. 61 was the first turbine to receive a tender (from 4-8-4 806), which occurred in October 1955. The balance of the veranda turbines, like the earlier standard group, were equipped with tenders fabricated from 4-12-2 tenders that enabled

operation across UP's Eastern District, all the way from Council Bluffs to Ogden. In 1958, No. 61 was modified for multiple-unit operation with diesel locomotives, which proved successful. Eventually, all but 6 of the 25 4,500 h.p. turbines were so equipped.

Like the standard turbines, the verandas' usual operating territory was between Council Bluffs and Ogden. For evaluation beyond the Overland Route, No. 61 with a pair of GP9s made two trips to Los Angeles in late 1958 while No. 67 made two trips to Kansas City from North Platte.

The first of the verandas was retired in August 1963. Nos. 67 and 68 were the last to be dropped from the roster, lasting until June 1964.

Twelve of the verandas surrendered their B+B truck and bolster assemblies to GE for use under new U50 double diesels [see page 68]. The remaining three had their truck assemblies sent to Alco to equip the forthcoming C855s [see page 69].

Locomotives 71 and 75 had the shortest service lives at nine years. None of the standard or veranda-style turbines survive in preservation.

## General Electric GTEL 8500

In the quest for more horsepower to enable even greater speeds across the system, UP in 1955 again approached General Electric for a new generation of turbines. Rated initially at 8,500 h.p., they would later be modified to a gross output of 10,000 h.p.

After a nearly three-year period of development, GE in August 1958 released the first of what would be a fleet of 30 locomotives. It consisted of a control cab semi-permanently coupled to a 63-foot B unit that housed an 8,500 h.p. turbine. A 24,000-gallon fuel tender, from retired class FEF-1 4-8-4s and 3800-series Challengers, was part of the design from the start. Unlike the 4,500 h.p. GTELs, the heavy fuel oil was heated by electric coils in the body of the tender. Under full load, the big turbines consumed 800 gallons

of fuel per hour.

The cab unit housed a six-cylinder, 850 h.p. Cooper Bessemer diesel that provided the means for yard movement with the main turbine shut down and was also used to start the turbine. In addition, it housed the air compressors and dynamic brake resistors. The B unit contained a single-shaft, 10-combustion-chamber gas turbine coupled to two 3,500 h.p. generators to provide 7,000 h.p. to the rail.

The delivery of the last turbines occurred in June 1961. They were assigned to run from Council Bluffs to Ogden, although the type made trips to Los Angeles in mid-1962. All but five could operate in multiple with diesels.

Like the smaller 4,500 h.p. turbines, their reign on the UP was relatively short. They were hampered by rising fuel



**Turbine No. 1 rests at Council Bluffs in September 1960. The giant locomotive, including tender, stretched 179 feet and weighed 592 tons.**

Carl Hehl, A. J. Wolff collection

costs and maintenance issues with fuel pumps, nozzles, and turbine blade corrosion. The big GTELs were sidelined when fuel and maintenance expenses exceeded those of diesels in comparable service. The first four were retired in August 1968, and just 13 remained on the roster by December 1969. Several were stored as early as mid-1966. No. 7 had the honor of mak-

ing the last turbine run on December 26, 1969, from Cheyenne to North Platte.

The railroad traded 20 to GE with their six-motor trucks to be utilized under new U50C diesels [page 71]. The balance went to various dealers and were scrapped. Two are preserved, No. 18 at Illinois Railway Museum at Union, Ill., and No. 26 at the Utah State Railroad Museum in Ogden.

**This undated public-relations photo showcases UP 8,500 h.p. turbine No. 13. The A unit housed auxiliaries; the turbine was in the B unit.**

Union Pacific



# Double-engine diesel-electrics

**In the early 1960s**, Union Pacific determined that 15,000 h.p. was the optimum needed to move freight trains at speeds required to remain competitive with other railroads and trucks, particularly on the main line between Council Bluffs, Ogden, and Los Angeles.

At the time, such a horsepower requirement could be attained with the combination of six 2,400–2,500 h.p. diesel-electrics or an 8,500 h.p. turbine in multiple with three diesels. In words of President E. H. Bailey, that was just “too many go-carts.”

After 1962, UP ceased the use of the

turbines west of Ogden because of noise and environmental issues in California. That led the railroad to seek proposals from the three diesel locomotive builders — EMD, GE, and Alco — to design and build a three-unit set that developed 15,000 h.p.

EMD was the first to respond. It built two B units, designated model DD35, each fitted with two 2,500 h.p., 16-cylinder, 567D3A engines. They rode on four-axle Flexicoil trucks with D67 traction motors. To reach the 15,000 h.p. that the UP wanted, the two B units were paired with two GP35s. However, that produced a set of

four units, not three as UP desired. A GP35-DD35-DD35-GP35 demonstrator set painted red and white toured the nation in 1963–64.

GE and Alco soon fielded their own double-engine, eight-axle, 5,000 h.p. diesel-electrics. Only EMD and GE received quantity orders for double diesels, and both fielded follow-on models after their 1963 offerings. UP eventually amassed a fleet of 155 twin-engine diesel-electrics; Overland Route partner Southern Pacific sampled a total of 6. No other North American roads bought such units.

MODEL	UNITS	BUILT	H.P.	TRUCKS	LENGTH	WEIGHT
EMD DD35	UP Nos. 72B–98B, SP Nos. 8400–8402	9/63 to 9/64	5,000	D-D	87 feet	260 tons
EMD DD35A	UP Nos. 70–84	4/65 to 6/65	5,000	D-D	88 feet	261 tons
GE U50	UP Nos. 31–53, SP Nos. 9550–9552	10/63 to 8/65	5,000	B+B-B+B	83 feet	279 tons
Alco C855	UP Nos. 60, 60B, 61	7/64	5,500	B+B-B+B	86 feet	275–276 tons
EMD DDA40X	UP Nos. 6900–6946	4/69 to 9/71	6,600	D-D	98 feet	273 tons
GE U50C	UP Nos. 5000–5039	10/69 to 11/71	5,000	C-C	79 feet	221 tons

## Electro-Motive DD35

Union Pacific acquired 25 new DD35s in 1964 and also took the 2 EMD demonstrators, Nos. 5653 and 5655. It also purchased 22 GP35s to build the desired 15,000 h.p. package.

Because of the proximity of the sandboxes to the electrical cabinets, problems developed as grit began to foul the electrical components and compounded reliability problems. Three of the DD35s, UP 91B, 93B, and 98B, had new cabinets fabricated at the rear of the carbody (98B had two, front and rear). A less expensive alternative to alleviate that problem involved the mounting of triangular-shaped

sandboxes outside of the handrails near the middle of the engine compartments on both sides, well away from the electrical cabinets. Photographic evidence suggests that at least 19 of the DD35s were so equipped around 1974–75. The project may have been halted before the fleet was competed as the units approached retirement.

With the arrival of large numbers of EMD SD40-2s and GE C30-7s, the units entered storage during 1975–78 and were retired and sold for scrap beginning in June 1979.

Of note, the DD35s were last B units ordered by UP.

Southern Pacific was im-

pressed enough with the EMD demo set that it ordered 172 GP35s, but only three DD35s. Initially, the DD35s were paired with GP35s on the Sunset Route out of Los Angeles.

By 1977 they were used on transfer moves between Taylor Yard in L.A. and West Colton.

SP found the DD35s too bulky and unwieldy, and retired them in December 1978.



**SP 8401 shows the DD35's square ends and four-axle trucks. All EMD DD models had a passageway between the engine compartments.**

CLASSIC TRAINS collection



**A GP35-DD35-DD35-GP35 consist, as intended by builder EMD. The third unit, No. 73B, is a former demonstrator.**

CLASSIC TRAINS collection



UP DD35A No. 83 leads a westbound train out of Cheyenne, Wyo., in October 1978 with three SD40-2s producing a total of 14,000 horsepower.

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## Electro-Motive DD35A

Seven months after the last DD35 was built, UP accepted delivery of the first DD35A: a cab-equipped version of the big B unit. To accommodate the addition of a cab and maintain the same frame length as the DD35s, the radiators for both engines were flared out and abutted one another.

With the arrival of the DD35As, UP now had the means to build a three-unit EMD set that developed the

desired 15,000 h.p. that management had envisioned at the beginning of the decade. Various combinations of DD35As and DD35s were fairly common during their 14 years of operation on the UP, but they were widely used in concert with other power including GEs, Alcos, and turbines.

Like the DD35s, the A units received outboard-mounted sandboxes relocated away from the electrical cabinets to alleviate dust and

grime problems. However, the DD35As were only outfitted with two of the triangular shaped boxes placed adjacent to, and outside of, the handrails near the middle of the rear engine compartment on both sides of the unit. That application began in 1975 and photographic evidence indicates that all but No. 80 were so equipped.

In another modification, Nos. 82 and 82B were equipped with roof-mounted

antennas in May 1968 to accommodate Remote Radio Control System operation. UP initiated a similar program for a portion of its SD45 fleet at the same time. The radio control gear was removed in 1973.

Again, like the DD35s, with the arrival of new units, the A units saw periods of storage beginning in 1977. Formal retirement and scrapping came during 1979–81. No DD35s or DD35As are preserved.

## General Electric U50

General Electric responded to UP's three-unit, 15,000 h.p. proposal by delivering three U50 locomotives, Nos. 31–33, in October 1963. Each was powered by two 16-cylinder, 2,500 h.p. 7FDL-16 engines, the same installed in the more conventional U25B. The U50's B-B+B-B running gear came from retired 4,500 h.p. gas turbines.

The engines were mounted in the carbody such that one radiator was at the rear of the unit, the other just behind the cab. A large cooling fan supported by a vertical shaft was visible below the radiators

mounted under the roof line; the appearance of those rotating fans gave rise to the moniker "whirlybirds" for the U50s. Large "squirrel cage" type equipment blowers were also visible within the screened compartments below the radiators. The generators were mounted back-to-back in the middle of the unit. The high-mounted cab had no nose door, so crews entered the cab on each side from the walkways.

Since these double-diesel units constituted a new, untested design, an agreement was reached that orders for additional U50s could be can-



U50 No. 31 towers over a U25B on a test run at Omaha in October 1963.

Lou Schmitz, A. J. Wolff collection

celed and replaced with U25Bs if UP was not satisfied. Initially pleased with the U50, UP placed an order for 20 addi-

tional units, delivered between July 1964 and August 1965.

A railroad proposal to upgrade the U50s to 5,600 h.p.

## Alco C855

**B**ecause of developmental issues, Alco was the last builder to respond to UP's proposal for a three-unit locomotive producing 15,000 h.p., with the delivery of an A-B-A combination of its new C855 model in July 1964. The "C" denoted Alco's Century series, which the builder had launched the year before; "8" stood for the number of powered axles; and "55" was the horsepower in hundreds.

Each unit sported a pair of 2,750 h.p., 16-cylinder 251C prime movers producing a total of 5,500 h.p. per locomotive. Thus, the three-unit set was rated at 16,500 h.p., which Alco proudly proclaimed to be the most powerful diesel locomotives ever built. As with GE's U50, the C855 rode on four trucks in a B+B-B+B arrangement from retired 4,500 h.p. GE turbines.

In an arrangement different from the U50s (but shared with EMD's DD units), the radiators were located in the middle of the carbody with one generator located at the rear of the unit and the other

with the substitution of 2,800 h.p. engines in 1969 was rejected by GE as the 5,000 h.p., six-axle U50C was already under development at the time.

When delivered, the U50s primarily operated between North Platte and Ogden. They later worked from North Platte to Kansas City. Reliability problems began to sideline the units beginning in 1973 with the retirement of No. 33. The rest were dropped from the roster by April 1977. All but three were traded to GE for U30Cs; Nos. 45, 51, and 53 were sold for scrap.

Southern Pacific sampled GE's entry into the double-



**Alco C855 No. 61 rests at the diesel pad at Council Bluffs, Iowa, in September 1966 with a mate. When run as intended in a three-unit set, they produced 16,500 h.p., more than any other double-diesel offering.**

Carl Hehl, A. J. Wolff collection

behind the cab.

There were electrical problems at the outset on their first trip west out of Council Bluffs, owing to Alco's rush to complete the units. This was just the beginning of the maintenance issues that plagued the big Centurys during their short tenure.

Normal operating territory was from Council Bluffs to Ogden. They were not seen west of North Platte after 1968 and ended their careers in eastern Nebraska and Kansas.



**The sole C855B unit, No. 60B, rests at Council Bluffs between runs in July 1967. Four sand boxes hang from the frame outside the handrails.**

Carl Hehl, A. J. Wolff collection



**SP U50 9952, one of three on the roster, rests with an SP DD35 at a Long Beach, Calif., scrapyard in 1978.**

Leon Callaway

diesel market by accepting delivery of three U50s in 1964. Like its three EMD DD35s, they were based out of Los

Angeles and initially ran on the Sunset Route. Later they were used in heavy transfer service. Maintenance issues

with their GE FDL engines and their minority status on the roster led to an early retirement in 1978.



## Electro-Motive DDA40X “Centennial”

In 1968, Union Pacific purchased 50 20-cylinder, 3,600 h.p. EMD SD45s for high-speed service. However, the units did not meet management’s expectations in that role. So, UP commissioned EMD to design and build a locomotive that would develop more horsepower than the DD35, U50, or C855 models. The result was the largest double-diesel locomotive ever produced, the DDA40X.

The first one built, No. 6900, was completed just in time to participate in ceremonies commemorating the 100th anniversary of the driving of the Golden Spike in Utah on May 10, 1969. To honor that event, the class was dubbed “Centennials.”

The locomotives were powered by two 16-cylinder, 3,300 h.p., 645E3A engines arranged in the same fashion as the DD35As — one alternator near the rear of the carbody and the other behind the cab. (Alternators replaced generators beginning in 1965–66.)

The radiators flared out at the middle of the unit with an open passageway between the engine compartments, again like the DD35As. The unit rode on two, four-axle Flexicoil trucks, and all axles were geared to D-77X traction motors. The cab was similar to that on EMD’s F45 and FP45 and had a small nose door.

The “X” in the model designation was to indicate a number of experimental features, notably new modular electronics that would appear in the upcoming Dash 2 series models. The new components made maintenance and trouble-shooting easier. The DDA40Xs also had a self-loading feature that enabled them to be tested independent of an external load box.

Delivery dates were staggered over a two-year period. The last unit, No. 6946, was delivered in September 1971.

By the mid-1970s, the Centennials had each accumulated more than a million miles of service. To improve their



Centennial 6905 rests at Cheyenne in near-perfect light in late 1970.

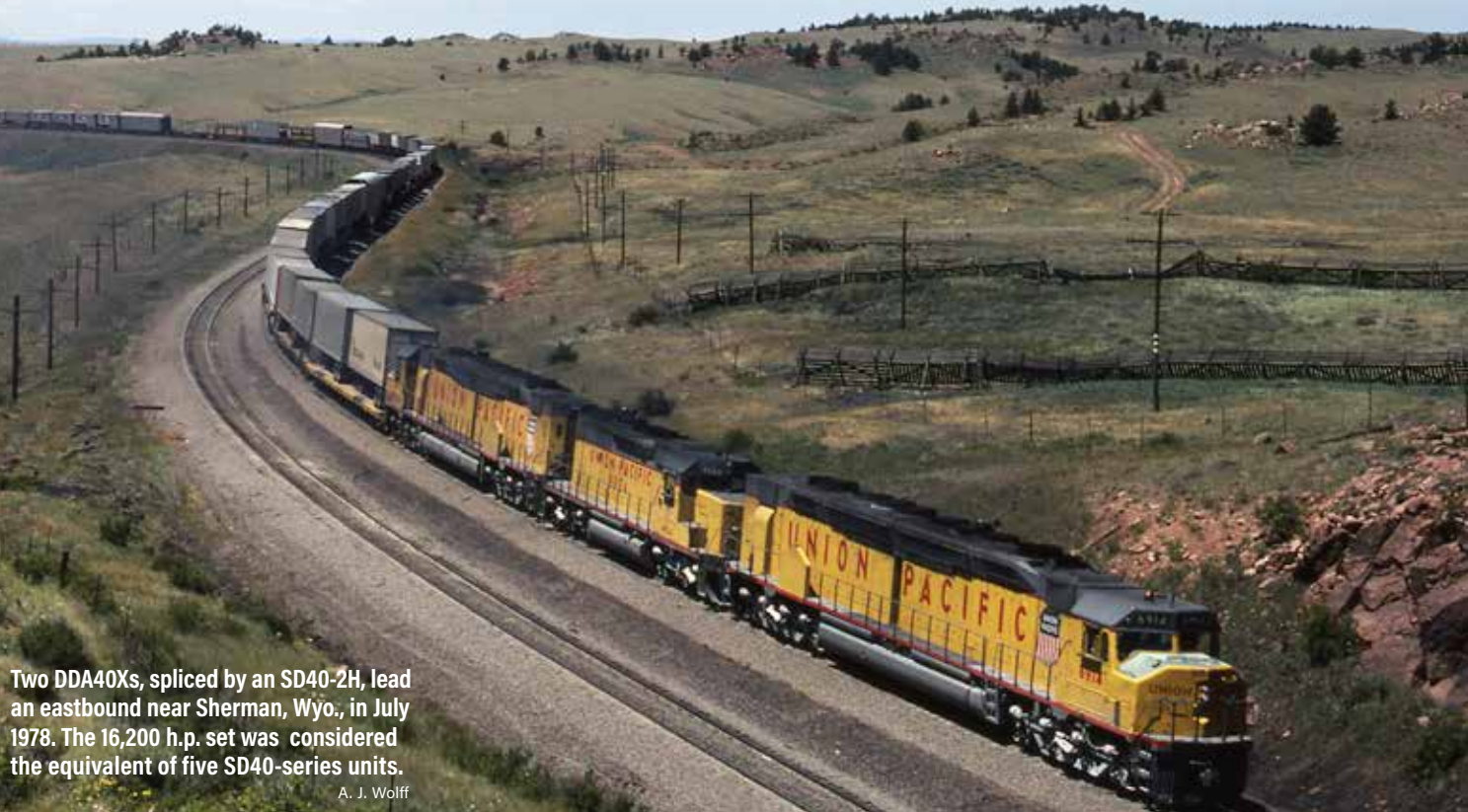
A. J. Wolff

reliability, UP initiated a “fail safe” program in 1976, which was completed the next year. The apex of DDA40X operation was during 1976–79 when they were paired with one or two 8000-series SD40-2H “Fast 40s” on priority freights across the system. With increasing maintenance costs and coupled with a nationwide economic recession, all were in storage by August 1980.

An upturn in business in late 1983 and a shortage of power saw 25 returned to service in February 1984; the others were unserviceable and

stripped for parts. All 25 were again stored by December 1984, but 14 saw limited service in early 1985. The last regular run of a DDA40X occurred May 5–6, 1985, on a Los Angeles to Chicago run, with No. 6936 and SD40-2 3680 as the lead power.

Of the 47 Centennials, two were wrecked and scrapped, Nos. 6903 and 6921, but an amazing 13 are preserved — nearly 28 percent of the fleet! No. 6936 is still on the UP roster in its heritage fleet, but has not operated for a number of years.



Two DDA40Xs, spliced by an SD40-2H, lead an eastbound near Sherman, Wyo., in July 1978. The 16,200 h.p. set was considered the equivalent of five SD40-series units.

A. J. Wolff



U50C No. 5028 rides on the Cheyenne turntable in March 1972. Its three-axle trucks came from retired 8,500 h.p. turbines. The U50Cs were the second most numerous, least successful double diesel-electrics.

A. J. Wolff

## General Electric U50C

Union Pacific management was still committed to the concept of double-diesel power in the late 1960s despite the arrival of new conventional C-C units from all three builders beginning in 1966.

The next step in the development and improvement of double-diesel power was first manifested with the design and construction of the EMD DDA40X “Centennials.” GE’s response to this evolution was the U50C, initially released in October 1969, five months after the first Centennial. Since Alco was no longer producing domestic locomotives after January 1969, it had no offering to supersede the poor-performing C855s.

The U50Cs were powered by two 12-cylinder, 2,500 h.p., 7FDL-12 engines, placed with radiators in the middle of the

carbody and alternators on opposite ends of the prime movers. The units rode on three-axle trucks from retired GTEL 8500 turbines, and the axles were geared to GE 752 traction motors. The U50Cs had the distinction of being the heaviest C-C units ever constructed: 221 tons. The first 12 units had no nose doors as delivered, but were modified by UP in 1972–73; the others had nose doors installed when built.

The U50C’s short tenure on the UP was marred by a series of mechanical and electrical problems. Aluminum wiring caught fire, and their tremendous weight caused stress fractures within the frame and on the recycled turbine trucks. One unit was sent to Morrison-Knudsen in Boise, Idaho, to replace the aluminum wiring with cop-

per. The upgrade eliminated the fire problem, but such work was deemed too expensive to convert the rest of the fleet. Also, some crews complained of a rough ride, and there were concerns that the short nose provided little protection in the event of grade-crossing accidents. Crews at Cheyenne derisively referred to them as “suicide units.”

During the recession of 1974–75, they were among the first power to be stored. In 1976, a few had their radios and cab roof warning lights removed and were used as trailing booster units. That downgrade did not save the U50Cs, however, and all were out of service by the end 1976. They were all formally retired through February 1978 and later sold for scrap. However, four were briefly used at two Ford Motor Co. factories as

stationary power plants in March 1978.

Although General Electric offered the U50C in its catalog, no other railroads expressed interest. With the retirement of UP motive-power boss D. S. Neuhart in 1970, Frank D. Accord was appointed as the Motive Power & Machinery department’s superintendent. He preferred to buy standard, off-the-shelf models — EMD SD40-2s and GE C30-7s — in part for maximum flexibility for pooling power with connecting railroads, as most roads were reluctant to accept large double diesels for that type of service.

Like the Alco C855s, the U50Cs were poor performers for the UP — none even reached a million miles of service. No. 5007 accumulated mileage of 680,437, the highest of the group.

# Diesel-hydraulics

**Germany was the early** leader in developing and building diesel locomotives that utilized direct-drive transmissions. Those early models in the 1930s incorporated torque converters and gears in lieu of electric motors geared to the axles, as was the norm in U.S. railroading. There was limited interest in such units in the U.S., although Plymouth and Whitcomb built small industrial direct-drive units from the late 1930s through the mid-1950s. Budd RDC cars represented the most successful and widespread application of hydraulic drives in the country.

In the late 1950s, both Denver & Rio Grande Western and Southern Pacific were interested in finding motive power that developed more power than the 2,400 h.p. models on the market, EMD's SD24s and Alco's RSD15s. Both roads approached Germany's Krauss-Maffei to design such a locomotive that utilized a hydraulic drive, and, as a result, each took delivery of three prototypes in 1961. Designated as ML-4000s, the units had full-width carbodies and high-mounted turret type cabs. Each locomotive had two 2,000 h.p., 16-cylinder,

1,585 rpm Maybach MD 870 engines coupled to Voith transmissions with drive lines geared directly to the axles. The three-axle trucks were of German design and unlike any made in the U.S.

Among the perceived advantages of hydraulic drive locomotives were full tractive effort when starting; no wheelslip under load with no subsequent overheating of the type experienced with traction motors; simplified controls; and easier maintenance. The Rio Grande initially believed that its three ML-4000s in multiple-unit operation, could do the work of eight conventional 1,750 h.p. units.

D&RGW modified the units to improve

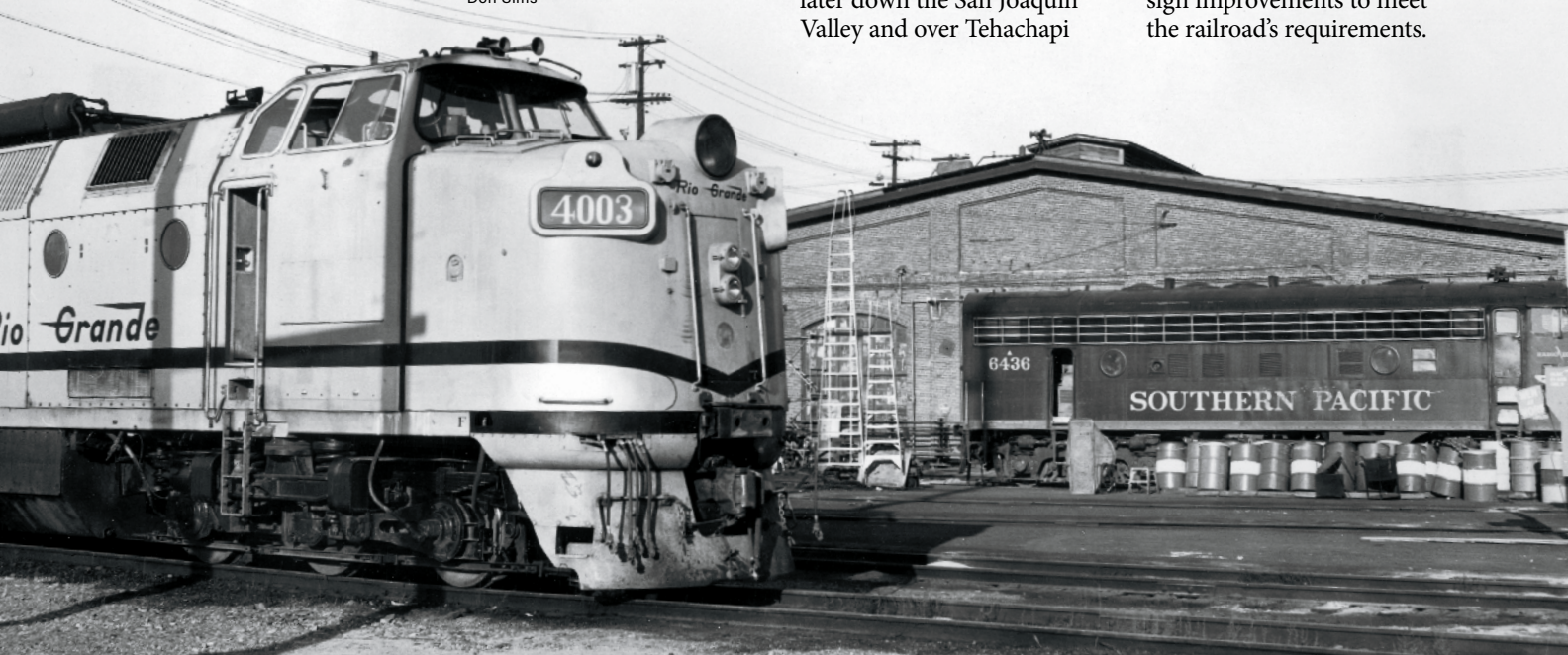
the intake of fresh air through the road's many tunnels, and it replaced the compressed-air multiple-unit controls with the electrically activated type that enabled them to operate with EMD models.

As it turned out, the Krauss-Maffei units required a high level of maintenance and were simply not rugged enough to meet the demands of heavy service over Rio Grande's mountainous territory. Since they were orphans on the roster, and the D&RGW found that they performed no better than the newly arriving GP30s, in February 1964 the road sold all three to the Southern Pacific, which gave the diesel-hydraulic concept a longer, harder look.

MODEL	UNITS	BUILT	H.P.	TRUCKS	LENGTH	WEIGHT
Krauss-Maffei ML-4000 (cowl body)	SP 9000-9002 SP 9021-9023, formerly D&RGW 4001-4003	1961	4,000	C-C	66 feet	165 tons
Krauss-Maffei ML-4000 (hood body)	SP 9003-9017	1963	4,000	C-C	68 feet	177 tons
Alco DH643	SP 9018-9020	9/64	4,300	C-C	76 feet	200 tons

**Former Rio Grande ML-4000 diesel-hydraulic 4003, built by Krauss-Maffei, rests at Roseville, Calif., on February 8, 1964, waiting to enter service for new owner Southern Pacific.**

Don Sims



## Krauss-Maffei ML-4000 (cowl)

**S**outhern Pacific based the six prototype Krauss-Maffei cowl body units out of Roseville, Calif., where they were first utilized over Donner Pass and later down the San Joaquin Valley and over Tehachapi

Pass. Not meeting expectations, all six were scrapped in September 1967. Even before their tenure was over, SP was still interested in diesel hydraulic locomotives with design improvements to meet the railroad's requirements.

## Krauss-Maffei ML-4000 (hood)

**S**outhern Pacific next wanted a diesel-hydraulic more closely aligned with current U.S. locomotive design practices. In particular, it desired a road-switcher type body with conventional trucks, multiple-unit capability, and a medium-speed prime mover of U.S. design. Another requirement was that the locomotive not require special servicing facilities.

To that end, Krauss-Maffei delivered 15 units in 1963, but they still came equipped with two high-speed 2,000 h.p. Maybach V-16 engines, contrary to SP's design preference. As before, the engines were coupled to Voith direct-drive hydraulic transmissions. The trucks were of standard Gen-

eral Steel Casting design, a type that also appeared on six-axle Alco diesel models. The cab sported side windows that slanted toward the roof and trapezoidal-shaped windshields, unique to U.S. railroading. Taller exhaust vents were also incorporated to minimize air intake issues.

Like their predecessors, the road-switcher hydraulics were assigned to Roseville, Calif., and utilized over similar territories, although four of the type were tested on iron-ore trains over Beaumont Hill in southern California in 1964. Over time, maintenance issues mounted, drive shafts were subject to failure, and the high-speed Maybach engines proved troublesome.



**Hood-type hydraulic 9014 lugs a train on the San Joaquin Valley line at Fresno, Calif., in September 1964 with livestock cars at the head end.**

Gordon Glattenberg

As a result, all were retired in November 1968. The former No. 9010 was converted to a camera car to film SP's right of way for use in a loco-

motive simulator for training purposes. It is undergoing restoration by the Pacific Locomotive Association at the Niles Canyon Railway.

## Alco DH643

**W**ith an eye on SP's desired specifications for a road-switcher that employed a hydraulic transmission, Alco designed and built three DH643 units in 1964. Each had two 2,150 h.p. 12-cylinder 251C engines coupled to German Voith hydraulic transmissions under a license agreement. The prime movers, of the type used in SP's Alco RS32s, faced opposite each other with the radiators in the middle of the carbody and the transmissions below. The drive shafts from the transmissions to the trucks were of a heavier design than those employed in the Krauss-Maffei locomotives. The DH643s rode on a tri-mount truck that had been standard on Alco six-motor units since 1950.

They initially performed well on the SP, and reportedly, they could haul twice the tonnage of a diesel-electric with the equivalent horsepower. Like the Krauss-Maffei units,



**Boxcars and reefers comprise much of the tonnage trailing DH643 9020 at Oil Junction on the northwest side of Bakersfield, Calif., in May 1965. The "bloody nose" is still bright and clean on the 8-month-old unit.**

Gordon Glattenberg

the DH643s were based out of Roseville and primarily used on San Joaquin Valley runs. They were frequently paired with at least one F7. Maintenance issues took their toll on the Alcos. In particular, there were instances when brass

flakes were noted in the truck gear boxes, necessitating costly repairs.

No additional DH643s were ordered, and no other road expressed any interest. Orphans on the SP roster, all were retired in 1972. ■

*A. J. WOLFF has been interested in the UP since he watched Big Boys on Sherman Hill as a boy. This is fourth CLASSIC TRAINS byline. He thanks former SP Mechanical Department employee Bill Wolverton for his assistance.*