Appendix 1: Race Results

Can-Am 1967–1972

1967 M6A (Engines by Gary Knutson)
- Elkhart Lake (Sep 3): Hulme 1st; McLaren retired
- Bridgehampton (Sep 17): Hulme 1st; McLaren 2nd
- Mosport (Sep 23): Hulme 1st; McLaren 2nd
- Laguna Seca (Oct 15): McLaren 1st; Hulme retired
- Riverside (Oct 29): McLaren 1st (Hall’s Chaparral 2nd); Hulme retired
- Las Vegas (Nov 12): McLaren retired; Hulme retired

McLaren 1st, Hulme 2nd in Championship

1968 M8A (Engines by Gary Knutson)
- Elkhart Lake (Sep 1): Hulme 1st; McLaren 2nd
- Bridgehampton (Sep 15): Hulme retired; McLaren retired
- Edmonton (Sep 29): Hulme 1st; McLaren 2nd
- Laguna Seca (Oct 13): Hulme 2nd; McLaren 5th
- Riverside (Oct 27th): McLaren 1st; Hulme 5th
- Las Vegas (Nov 10): Hulme 1st; McLaren 6th

Hulme 1st, McLaren 2nd in Championship

1969 M8B (Engines Built at Colnbrook under George Bolthoff)
- Mosport (Jun 1): McLaren 1st; Hulme 2nd
- St Jovite (Jun 15): Hulme 1st; McLaren 2nd

1970 M8D (Engines Built at McLaren Engines under Bolthoff)
- Mosport (Jun 14): Gurney 1st; Hulme 3rd
- St Jovite (Jun 28): Gurney 1st; Hulme retired
- Watkins Glen (Jul 12): Hulme 1st; Gurney 9th
- Edmonton (Jul 26): Hulme 1st; Gethin 2nd
- Mid-Ohio (Aug 23): Hulme 1st; Gethin 9th
- Elkhart Lake (Aug 30): Gethin 1st; Hulme disqualified
- Road Atlanta (Sep 13): Gethin 7th; Hulme retired
- Donnybrooke (Sep 27): Hulme 1st; Gethin 2nd
- Laguna Seca (Oct 18): Hulme 1st; Gethin retired (see Reynolds ad)
- Riverside (Nov 1): Hulme 1st; Gethin retired

Hulme 1st, Gethin 3rd, Gurney 9th in Championship
1971 M8F (Engines Built at McLaren Engines under Knutson)

- **Mosport** (Jun 13): Hulme 1st; Revson 2nd
- **St Jovite** (Jun 27): Hulme 2nd (Stewart 1st); Revson 3rd
- **Road Atlanta** (Jul 11): Revson 1st; Hulme 2nd
- **Watkins Glen** (Jul 25): Revson 1st; Hulme 2nd
- **Mid-Ohio** (Aug 22): Revson 7th; Hulme retired
- **Elkhart Lake** (Aug 29): Revson 1st; Hulme retired
- **Edmonton** (Sep 26): Hulme 1st; Revson 12th
- **Laguna Seca** (Oct 17): Revson 1st; Hulme 3rd
- **Riverside** (Oct 31): Hulme 1st; Revson 2nd

Revson 1st, Hulme 2nd in Championship

1972 M20 (Engines Built at McLaren Engines under Knutson)

- **Mosport** (Jun 11): Hulme 1st; Revson 3rd
- **Road Atlanta** (Jul 9): Hulme retired; Revson retired
- **Watkins Glen** (Jul 23): Hulme 1st; Revson 2nd
- **Mid-Ohio** (Aug 6): Hulme 4th; Revson retired (engine)
- **Elkhart Lake** (Aug 27): Hulme retired; Revson retired
- **Donnybrooke** (Sep 17): Hulme retired; Revson retired
- **Edmonton** (Oct 1): Hulme 2nd; Revson 6th
- **Laguna Seca** (Oct 15): Hulme retired; Revson retired
- **Riverside** (Oct 29) Revson 2nd; Hulme retired

Hulme 2nd, Revson 6th in Championship

### Indianapolis 500 Results

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Appendix II

A. McLaren-Chevrolet Big-Block Development History

By David Kimble (Reprinted with the author’s permission)

This excerpt is from Kimble’s article in the February 2016 issue of Hot Rod Magazine. He interviewed Gary Knutson, as well as Chevrolet engineers for this story. Kimble was an engineer at Bartz’s shop when Knutson was working on the aluminum big block for the 1968 season. Teddy Mayer asked Kimble to do a cutaway of the M8A just before the Riverside Can-Am race, so he took photos of the car at the shop.

Gary Knutson built McLaren’s big-block Can-Am development engines at Al Bartz’s shop on Stagg Street in Van Nuys, California. He stayed with the blocks’ 4.250-in. cylinder bores and used for production 3.76-in.-stroke crank forgings machined by the Moldex Crankshaft Co. in Dearborn Heights, Michigan. The stock inverted-tooth timing chains were replaced by a Cloyes roller chain spinning 0.600-lift camshafts supplied by Vince Piggins’ group. Production of solid lifters, ForgedTrue pistons, and Carrillo rods completed the short blocks.

The engines’ dry-sump lubrication systems used external Weaver Bros. pumps driven off the front of the crankshaft by toothed belts. McLaren’s shallow magnesium oil pans were cast by the same foundry as Chevy R&D’s Chaparral dry-sump pans and sat on the chassis ground-clearance line.

The 1968 aluminum L88 cylinder heads had 2.19-in. intake and 1.84-in.-diameter exhaust valves, but the ports were enlarged and recontoured with Crane aluminum, roller-tipped,

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McLaren Team Cars in orange highlights. Team Car and Penske Offenhauser and Turbo Cosworth Engines by McLaren Engines, Inc.
needle-bearing rocker arms with studs on top. The magnesium intake manifolds had a 2.9-in. bore vertical throttle body for each cylinder. A fuel injector sprayed into each of the curved and tuned-length stainless steel velocity stacks. Fuel was routed through the injectors and returned to the tank from the metering unit. Plumbing the fuel systems this way was thought to keep the intake manifolds cooler.

The intakes were improved versions of the aluminum manifolds available from Crower. Gary Knutson had MacKay Bros. make the intakes (along with his Lucas metering units, Vertex magnetos, and tach drives) from magnesium, and they were free to sell them to other engine builders. On the exhaust side, equal-length 2-1/8-in. primary pipes fed into 4-in. collectors, and this combination was good for about 650 hp at 7,600 rpm. McLaren press releases at the time rated them at 620 hp, perhaps to not completely show their hand.

Chevrolet Product Promotions made sure these and other developments were available to everyone running Chevy engines in the Can-Am, and Bill Howell handled Vince Piggins’ group’s liaison with the teams. Howell had done the dyno development of the Mystery Motor and the Mk IV big blocks before being invited to join Piggins’s group in 1967, so he knew these engines well and could offer guidance on running them.

The only Chevy-powered competitor that was not part of the program was Chaparral, with its engines coming straight from Chevy R&D, developed behind closed doors, and they were independently working on a Lucas-based fuel injection of their own. This was being done by Jim Kinsler, who had started his own fuel-injection company in 1965. Kinsler was recruited by Chevy R&D in 1967, leading to the 58-mm Weber carburetors on the Chaparral 2G’s aluminum 427s being replaced by Kinsler’s fuel-injection system in 1968.

Fellow Kiwi Denny Hulme joined McLaren in 1967 as Bruce’s teammate, and their pair of pastel orange M8As were the sensation of the paddock when they made their appearance for the first race of the 1968 season at Road America. These cars were still underdeveloped but that didn’t slow them down in qualifying, with Bruce on the pole and Hulme second quickest, followed by Jim Hall in his aging Chaparral 2G. The race started on a wet track and finished under dry conditions, with McLaren second and Hulme first—although he finished on seven cylinders with zero oil pressure. Things only got worse at Bridgehampton, with Bruce’s engine suffering main bearing failure and Hulme’s throwing a rod, while Mark Donohue won, driving Roger Penske’s McLaren M6B with an aluminum 427 Chevy built by Traco Engineering.

This was the low point for McLaren’s fast-but-fragile big Chevys, but they were reliable for the rest of the season, finishing first and second at Edmonton, with Hulme winning the race. However, Hulme finished second and McLaren fifth with healthy engines at Laguna Seca. The race was run in a deluge and John Cannon outfoxed the field by anticipating the weather and winning with Firestone intermediate rain tires on his Bartz small-block-Chevy-powered McLaren M1B.

Bruce McLaren’s only win of the season was round 5 at Riverside, and Hulme won the season finale at Las Vegas, where Jim Hall survived a horrific crash—but the 2G did not—with Bruce finishing sixth. Denny Hulme was the 1968 Can-Am champion, with Bruce McLaren second in the final point standings. But the McLarens hadn’t dominated the series the way they had in 1967 and would again from 1969 until 1972.

In 1969, Can-Am engine builders didn’t find the open-chamber heads to be much of an improvement, but they appreciated the stronger ZL-1 blocks and liked the 4.375-in.-bore version that Vince Piggins’ group made available. With a 427-in.³ engine’s 3.760-in.-stroke crankshaft, these big-bore blocks brought displacement up to 465 in.³ With the 1970 4.00-in.-stroke 454 crank, displacement increased to 494 in.³
It was at this point Reynolds Aluminum came out with a new block that had the potential for even bigger bores. To promote Reynolds’ A-390 high-silicone alloy being used to cast Chevy’s 2300 Vega engine blocks, Reynolds supplied Product Promotions with Can-Am blocks with 4.4375-in. aluminum bores that the pistons could run in without iron liners.

The Reynolds blocks were often bored to 4.500 in. for 509 in.³, with a 4.625-in. bore possible. TRW made special pistons for these engines coated with iron by electrolysis and fit with chrome-plated rings to prevent galling from the aluminum-to-aluminum contact.

### B. George Bolthoff, Can-Am Engine Builder

By Doug Nye (Reprinted with the author’s permission)

Nye gives background on Bolthoff and details his Chevrolet big-block engine build process at the McLaren factory in Colnbrook, England, during the 1969 season. Not covered here is the change that year to a high-revving short-stroke 430-in.³ version of the engine that was well-received by the drivers.

Ace engine builders are few and far between, but one such unsung hero is the man behind this year’s McLaren domination of the Can-Am series—George Bolthoff. His interest in performance cars and in extracting the utmost from otherwise stock power units began in high school back in California in the early 1950s. There he built his version of the traditional “flathead Ford roadster” hotrod and took it out once a month to the dry lakes to pit his preparation and driving skill against others of the genre.

Service in the U.S. Army intervened from 1954 to 1956, and on his “release” he went to work as a rocket engineer for North American Aircraft. Engine tuning and car preparation were still a consuming interest, but George soon found that drag race meetings in the center of town offered more interest than salt-lake record runs once a month 200 miles out in the desert.

Rocketry continued as bread-and-butter employment, and from 1959 to 1963 the amateur drag-racer worked on the beginnings of the Apollo lunar landing project at Lockheed. So successful was he becoming at blasting along quarter-mile strips that his winnings began to top his basic salary, and so he left Lockheed to concentrate on professional drag racing. George had built his own slingshot chassis and prepared 800-plus-hp Chevrolet and Chrysler gas-class engines to propel it. His rocket experience seems to have come in useful for the name ‘George Bolthoff’ began to appear in national gasser record lists as he set a record of 7.97-second elapsed time for a 197-mph terminal speed in the quarter mile.

He was making his drag racing pay particularly well by preparing and maintaining his own car and engines, driving his own transporter-cum-caravan to meetings all over the nation and generally holding expenses down to a minimum. But when George married, some certain security became vital and so he retired from driving and went to work for Jim Travers at Traco Engineering, preparing and building race engines. There he spent three years doing all the engine assembly work for Roger Penske’s Trans-Am Camaro and USRRC Group 7 championship contenders, as well as for Traco’s other, less august, customers.

At the beginning of this year he heard that Gary Knutson was returning to Chaparral after a very successful spell with McLaren, and February 1969 saw the Bolthoff family moving lock, stock, and barrel to England, and George taking overall responsibility for the team’s Can-Am motive power.
McLaren Racing’s Colnbrook base lies under the west-bound flight path from Heathrow Airport and there a small engine assembly shop is staffed by Bolthoff and his Kiwi assistant John Nicholson. Basis for the Can-Am mills is the Chevrolet ZL-1 427 in.³ (7-liter) high-performance option. This is an all-aluminum unit offered as the ultimate in Corvette goodies and selling over the counter for around $3,000 in the States. For the Can-Am program, eight of these were purchased, and the modifications made are surprisingly minor in view of the successes they have achieved.

Starting with the block, the castings are generally cleaned up and “de-burred” to remove casting flashes and any other possible cracking sources. The stock heads have their exhaust ports smoothed a little, and the intakes are carefully matched to the specially made McLaren manifolding. The intake ports are straightened and polished, but evidently the basic design leaves little room for drastic improvement. Finally, the combustion chambers, which are ‘semi-hemi’ in form, are matched to the bores and to each other for volume, and with an optimum 12:1 compression ratio.

Reciprocating parts are surprisingly stock items in the main, starting with Chevrolet’s standard ZL-1 crankshaft. This runs in high-performance Chev main bearings, but the bearing caps are secured by specially made high-grade bolts. Another optional item used is a high-performance crankshaft damper carefully scribed with timing marks to make final tuning easier. The conrods are stock items again, being de-burred and shot-peened to strengthen them. All these stock items are Magnaflux-tested before final preparation to detect flaws and only perfect components are built into the finished units.

The aluminum pistons are specially made by Mahle in Germany, reproducing the basic Chevy design to McLaren order. Some alterations have been made to the stock shape, but George wasn’t too specific on these. Three rings are carried, two 1/16-in. compression rings and a single 3/16-in. for oil control. Stock pistons have been used in the engine, which Bruce raced at Watkins Glen, but cracks were found in one of them before the race started. The team took a calculated risk in running the unit, but it seems their calculations were wrong for the piston did break up, putting Bruce out. George is still keen to run the Chevrolet pistons again, however.

The single central camshaft, running in the vee between the cylinder banks, is another high-performance stock item, as are the pushrods, but stock rockers are replaced by beautifully made Iskenderian components. These proprietary Californian hot-rod parts are cast in aluminum and pivot on needle-roller bearings, and as with all other hotrod items used are supplied by Reath Auto of Long Beach, California. High-grade valve springs made by Engle Cams are another expensive imported goody, but the enormous valves themselves are stock Chevy high-performance parts.

McLaren’s own induction system is used, this stemming from an original injection setup produced in California two years ago by Crower Cams, another of the specialist hot-rod equipment manufacturers. This comprises a bulky but extremely light magnesium manifold with tall big-bore intake trumpets and Lucas electronic metering unit and upstream injection nozzles. Other specially cast mag parts are the dry sump and the rocker covers, which have ‘McLaren-Chevrolet’ lettering cast in. A Weaver Bros. large capacity hot-rod oil pump is fitted and the M8Bs have an oil tank of about 4 gallons (U.S.) capacity carrying 2 gallons of Gulf oil.

Only other mods to the engine concern the tapping of two large diameter bolt holes to attach a chassis A-bracket, through which the unit is semi-stressed when mounted in the M8B chassis. Ignition is by Vertex magneto and Bosch plugs.

When the standard ZL-1 engines arrive at Colnbrook they produce around 475 bhp, a Chevrolet figure, which George
reckons is probably underrated. When they leave his shop, output is up to around 600–650 bhp, but he can’t be sure of the exact figures because McLarens do not have their own dynamometer. Early in the development cycle, units were run up on Cosworth’s brake in Northampton, and Lucas Engineering’s in Huntingdon, but, like Rolls-Royce, output is obviously “sufficient.”

A logistical problem exists in building and preparing engines on one side of the Atlantic to support a racing program on the other, and for the three M8Bs at any Can-Am round there are five engines present—three in the cars and two spares. The other three mills are then either at Colnbrook being stripped and rebuilt or somewhere in transit between home base and the works team. George reckons to take three days to build a completely new engine, three hours to strip a raced one, and anything from 12 to 16 hours to rebuild it. In each strip all reciprocating parts are Magnafluxed and the rods, bolts, and rings replaced as a matter of course. The stock bearings are replaced as standard practice after two races, and even then looks fit enough for several more.

After a lot of trouble finding a company competent and well-equipped enough to do large-capacity V8 balance over here, George came up with Hilthorne Engineering, of Hanwell, and they do quite a bit of other contract work on the units, such as head-leveling and so on.

McLaren’s own small machine shop at Colnbrook does quite a bit of work on the engines, and George and John are sometimes joined in their clinically clean workshop by John Dornay from the F1 team. They found he had experience in cylinder head work and when there’s a porting job to be done he has co-opted to do it.

But perhaps the most surprising feature of McLaren’s engines is the fact that they are so stock in specification; it makes one wonder what kind of road car the optional ZL-1-powered Corvette must be like! Apparently, it goes like stink and gulps gas at about 6 mpg, and when Bolthoff-prepared it goes even better and still with 4–4.5 mpg “economy,” which for a racing 7-liter engine can’t be bad.

George hastens too points out that “It’s not what we do, it’s the way we do it that gets results,” and it is patently obvious that painstaking care goes into preparing these engines fit for a champion. The only question remaining is, who will it be this year—Bruce or Denny?

Appendix III

Development of the McLaren-Cosworth Turbocharged Indy V8

By Steve Roby

With notes by principal engine builder Bill McKeon

Steve Roby was crew chief of McLaren’s Indy team from 1976 to 1979. He then followed driver Johnny Rutherford to Jim Hall’s Chaparral team. A graduate engineer, Roby’s interest in racing began in Australia during his youth when, through a friend, he became a race team “gopher.” That introduced him to the Australian racing fraternity.

He won an engineering scholarship with British Leyland, which led to an internship with the automaker’s Competitions Department’s service team in Australia for the London-Sidney Marathon. After graduation he went into racing full time, joining the Surtees racing team in England.

“I worked for Surtees for two years and then Brabham for two years, and then I went to Graham Hill’s Embassy Hill team—because Graham always had an Australian guy running his car. Why? Because Aussies are all good mechanics!” Roby told the author.
In 1975, Roby decided to get out of racing, partly because of Embassy Hill driver Rolf Stommelen’s disastrous crash at the Spanish Grand Prix that year, when five spectators died. “I was just burned out of it. I mean it’s hard work; we keep saying it’s the good old days, but it wasn’t that good. You see lots of bodies. So, I decided, ‘all right, I’m done.’ And Watkins Glen was going to be my last race.”

In those days, the F1 teams were organized by the tire engineer—that way, they didn’t have to run everywhere. “Our team and Penske’s and one other were always grouped that way [with the Goodyear engineer],” he explained. “[Mark] Donohue used to tell me all these stories about America. I told him this was my last year, and then I was going to drive around America.” When Roger Penske heard Roby’s plan, he offered the use of a car if he would stay after Watkins Glen while the team conducted testing.

“Penske gave me this car to deliver to Reading [Pennsylvania] and pick up another to deliver to Long Beach the Monday after the Riverside race. After that, I went home, did a whole Tasman Series with my buddy I.G. [Ian Gordon] and then I was going to get a real job.” But then McLaren Engines’ Tyler Alexander called with a new project.

Prior to the decision to develop a Cosworth DFV-based turbo engine for Indycar use, McLaren Engines had built and serviced the turbocharged Offenhauser engines used by the team with great success. The Offys of this period initially ran with unlimited boost. In 1973 Johnny Rutherford qualified on pole at Indy with a speed of 199.071 mph; he later noted the run was made “at 120 inches of Hg boost with the boost needle bending against its stop.”

After the accidents and fires in the 1973 race, USAC reduced the allotted fuel capacity from 75 gallons to 40 gallons and the cars had to run the race with a maximum of 280 gallons of fuel. A pop-off valve was mandated and boost levels reduced to 80 in. Hg. These restrictions made the Offy less competitive as it was heavy, tall, and configured to run high boost.

Nicholson McLaren Engines in Hounslow, U.K., had been rebuilding DFV engines for both the McLaren works F1 team and for Graham Hill Racing, so a wealth of DFV knowledge was available for the Indy engine project, which became known as the DFX. Cosworth boss Keith Duckworth was not interested in turbocharged engines at the time, so development of the turbocharged, methanol-fueled DFV became our project at McLaren Engines in Livonia.

In early 1976, we received two ex-F1 engines (block numbers DFV122 and DFV172) from Nicholson McLaren Engines. The goal was to develop a 2.65-liter Indycar version capable of producing 800–900 hp using 80 in. Hg of turbo boost. The V8’s projected duty cycle of perhaps 90%–100% extended wide-open-throttle (WOT) per lap for 500 miles.

Typically, we qualified using 80 in. Hg of boost but had to race at 76 in. Hg to meet the USAC fuel-mileage requirement, which was legislated at 1.8 mpg.

To keep things in perspective, one should understand that the DFV in F1 format was naturally aspirated, 3.0 liter, and gasoline fueled. It produced 460–480 hp at 10,500 rpm. The duty cycle of the F1 engine was typically more slanted to bursts of power—no more than perhaps 25 seconds extended WOT per lap for 200 miles, although at the fast slipstreaming races like Monza and Hockenheim in that era, the duty cycle for WOT would have been more like 80%–90%.

The 2.6-liter turbocharged Offenhauser engines then used by McLaren employed a Hilborn fuel injection system that featured two downstream-facing injectors per cylinder. This set-up formed the basis of the new turbo V8’s fuel delivery system, later moving to upstream-targeted injectors.
The Cosworth V8s initially used crankshafts supplied by Moldex, located in nearby Dearborn Heights, Michigan. Other key components included connecting rods from Carrillo in California; pistons from ForgedTrue, and then TRW; specially made piston rings from Sealed Power in Detroit, bearings from Clevite, and camshafts from both Cosworth and Herb Porter.

The standard DFV F1 cam was designated DA1; the Cosworth sports car cam was designated DA2. The DA2 had a profile with shorter duration and less lift but the same basic shape as the DA1 up to 9,600 rpm. We ran the valves from the sports car engine as they had thicker shafts. At Milwaukee, a short (approximately one mile) oval track, which required low-rpm power off the corner, we tried BD3 cams (from the Cosworth BDA engine) and they worked very well.

Unfortunately, however, the BD3 cams produced a different sound for all to hear so our competition knew what we were up to. We won that race and, as I recall, we stayed with BD3 cams for short tracks.

Analysis showed that the Cosworth cam profiles were so good that they did not float the springs within the rev range. We also tested a lot of Herb Porter cam profiles.

Valve springs were a constant problem for us. Typically every night the first task after running was to perform a leak-down test on each cylinder to check for valve-to-seat leakage. Invariably while doing this on the cooling engine we would hear a ‘ping’ and know that a valve spring had just broken—signaling time for the engine drill!

The cogged belt on the front of the V8, which ran the oil and water pumps low down on the engine, and the half speed drive in the vee between the cylinder banks, which powered the magneto and distributor, started to shed teeth and fail after years of consistent reliability in F1. These belts, made in Germany, were sourced by McLaren from Cosworth.

At first Cosworth did not want to know about this problem until they ran out of belts, or when Roger Penske (on whose engines these belts often failed) complained too loudly. Then Keith Duckworth became involved. He found out that the belts were manufactured with excessive tolerance but shipped to Cosworth anyway.

As if by magic, one day a package arrived from Cosworth with a set of pulleys and a batch of clear belts, and a note to “try these belts.” Problem solved—although we never did find out exactly what happened. I suspect that the belts that failed were made from a polymer, which was not oil proof.

When we were running at 80 in. of boost, the rod side of the main bearing would wear excessively. To rectify this issue, Clevite made us eccentric bearings with more material on the rod side and less material on the cap side. It always seemed to be a battle to get enough Mallory metal into the crankshaft throws to offset the piston mass, so the DFX shook a bit—but not as much as an Offy.

In an attempt to achieve more cooling for the tops of the combustion chambers, the engines were fitted with copper water pipes (like those sold in hardware stores for household plumbing) around each chamber, external to the heads. This piping was a visible loop, from cylinder to cylinder. The insufficient heat rejection that prompted this strategic cooling solution was causing the exhaust valve seats to tip in the head castings. Because of the seat tipping, the exhaust valve would fail to seal and the seat/valve would be torched through by the exhaust flow.

Whenever the engine was a bit lean, such as during part throttle/high boost conditions encountered when the car was turning into a corner at a long track, this failure mode would rear its ugly head. It was especially prevalent in California where the air was hot and dry. We less-than-fondly called it “The Laguna Leanout.”
In 1979 Wiley McCoy found that the Cosworth cylinder heads were much softer aluminum alloy than that used in the BMW heads (Brinell hardness 120-130 BHN) on the turbocharged BMW IMSA engines. We built a massive head heat-treat fixture in which thick steel plates sandwiched the heads while they were being heat treated—but the entire structure would warp, rendering the heads useless.

All cylinder head work were done by McLaren in house—and actually all-in-the-building, as McLaren Engines was located in the north end of the building and Duor Die Machine had the south end. The combustion chamber finishing was done by Duor Die on one of their pantograph machines.

Bill McKeon’s notes have the following hardness test results done on 16 heads dated 4/7/79.

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Perhaps this soft head problem contributed to our exhaust valve seat tipping.

Early in the DFX program while trying to solve the exhaust seat problem, Tyler Alexander, Gary Knutson, and Don Beadle decided to move the pitch of the exhaust ports further apart to resemble the pitch of the inlet ports. Their aim was to provide more metal around the port to better support the valve seats. As was typical, Cosworth wanted nothing to do with our turbo project, so Nicholson McLaren engines in the U.K. had 36 heads cast, heat treated to a greater hardness, and partly machined by Cosworth with the exhaust valve ports, valve stem guides on one side of the head, and the exhaust side cam bucket bores on the other side of the head un-machined.

I will never forget the emotional trauma this project wrought on Graeme Bartels, our machinist. Nicknamed “Rabbit,” he had a restless creative mind and always had sideline projects going, including his own Super Vee, a home-brewed 2-liter BMW-powered midget racer, and another formula car.

Rabbit learned how to operate the dyno simply as an intellectual exercise. He ran a Bridgeport mill with X, Y, and Z LED positional readouts but was otherwise totally manual. By comparison, at the time Cosworth was using self-made, tape-controlled CNC machine centers for machining cylinder heads. The head machining process began with a mountain of head castings, stacked 36 per pallet, 12 layers high. The pallet was placed on the floor right beside the Bridgeport, so Rabbit could not escape it.

He tackled the job with his usual creativity. For the eight exhaust valve ports in each DFX head, Rabbit would machine the basic valve seats on a lathe, then machine each seat recess and valve stem guide bore into the head, shrink the seats into the head, then finish-machine each seat and valve stem bore. He made a fixture to flip the head and machine the guide bore for the cam follower buckets on the top side of the head, eight per head.

Our development of piston liners was extensive. Initially the turbo V8s produced a lot of blow-by, not surprising given the increase in cylinder pressure, and as a result the liners were cracking. We tried Cosworth steel liners but they wore out quickly. These were replaced by Cosworth cast-iron liners, which themselves were replaced by (Curt) Nicholson Machine 43br40 nitrided steel liners. Later the steel liners were flash chromed to prevent flaking on the backside (water side).

On the return trip from Ontario Motor Speedway (OMS) for a car test, we were hauling a palleted box (about 3 ft. × 3 ft. × 4 ft. high) of raw liners back to Livonia from Nicholson’s Machine’s
shop in Irvine, California. The poor Ford Econoline van was struggling up hills with four people and this huge box of steel liners and we dared not think of the consequences if it got away from us on the steep grades of the three-day drive. At least we were smart enough to remove the second row of seats this time to put this heavy cargo midships in the van. It was not a pleasant trip.

On another west coast trip early in the DFX project we got stuck in a snow and ice storm while entering Indiana. This time we had an Offy engine in the back of the van. The van was so tail-happy that it slid down an icy banked corner going about 10 mph. We stopped, moved the engine to the middle of the van to get the handling somewhat more neutral, and set out for California with the van more stable albeit probably not so safe in an accident.

It was on this trip, following our semi-trailer that I asked Wombat, who was doing about 15 mph if he knew where his trailer wheels were, as the rear of the trailer had slid down a lane on a banked, icy curve.

In an attempt to get Edsel Ford interested in our project the basic McLaren engines had “Ford” labeled cam covers. On the F1 DFVs, the Ford label appeared twice on each cam cover—a reminder that Ford had funded the DFV’s design and construction. At the same time, the Vel’s Parnelli team (owned by Parnelli Jones), who were also doing a turbo DFV project, used “Cosworth” labeled cam covers. Then McLaren’s Bill Smith took it one step further. He had the “Ford” milled off and replaced it with “FORD MCLAREN” in large cast letters glued onto the cam covers. Don Beadle reported that Edsel Ford came into the shop and demanded to know what McLaren Engines were doing with “his F1 engines.”

We used Boris Kondaroff’s Mallory magnetos. We gave Boris an office in the chassis shop so we could keep track of him and get rebuilds when we needed them—and to try keep him out of the Schnapps till later in the day. Boris also developed a unique CD ignition system, which we raced often. Unfortunately, we only ever had that single unit.

Boris took delight in showing newbies the corona effect by running the magneto on his test rig, with the lights off in his office, so we could see the corona leakage off the coil and plug wires and how the verglas tubing over the plug wires prevented the leakage. He also showed us that the Mallory decal, which was made of mylar, prevented the leakage exceptionally well so we ran the Mallory decal under the coil wire.

As an aside, one of the best features of an Indy car of that era was that the car ran a magneto and thus had no need for a battery. An ugly memory for those of us who worked in F1 or F5000 was to always have a battery, or two, on charge in the bathrooms of our motel rooms every night. So, having a magneto and no battery was a great feature of the Indy car racing for us.

Radio static “noise” was a huge problem on the DFX. It was never easy with the Offy but the V8 had twice as many spark firings per second, so it was a lot worse. We tried all manner of fixes on both the chassis and the engines—grounding one end of the shielding around the coax cable was one fix. We tried going to a base station with a repeater on the truck so that we simply overpowered the electronic noise was the most successful fix.

Prior to this setup we used to have problems when we ran at OMS, due to a local gravel truck business who obviously were not conforming to FCC rules. Rutherford would be out on track performing his duties when he would be told to go to some address and deliver a load of #2 gravel. These guys were very loud in our headsets!

From the start of the DFX program in 1976 to late 1978 we struggled to keep the exhaust pipes from cracking. The pipes were made from SS321 tubing, in various diameters. The exhaust system started as a single piece weldment with four-primaries-into-a-collector with bellows only in the “Y” piece. The next step was to have bellows on each primary pipe, plus bellows from the collector to the “Y” piece. In each of these steps the port flange
(which was bolted to the cylinder head) was cut from flat plate to which both the primary pipe and several wraps were welded.

By the end of the project we had slip joints on each primary, which then went to the collector. The collectors were then vee-band-clamped to the “Y” piece with a bellows in each leg of the “Y” piece.

The last step in exhaust pipe design, circa winter of 1978, employed an investment casting made for the port flanges. For this version we tucked the pipes in close to the block to lessen the amplitude of the vibration. These pipes had slip joints with no surrounding bellows in each of the primaries. The purchased bellows actually had slip joints inside the bellows, so we really just did away with the bellows.

Looking back, I think that the exhaust pipe failures came to a halt when the engine shop started using Laystall cranks. Moldex, our local crankshaft supplier, had some kind of short-term manufacturing dilemma and could not deliver crankshafts, so we went to Laystall in the U.K. They were Cosworth’s crank supplier before Cosworth developed its own manufacturing line. Laystall manufactured the shorter-throw 2.5-liter (Tasman Series) crankshafts for Cosworth. The Laystall crankshafts reduced the engine vibration amplitude, which also may have been aided by our changing the piston mass and adjusting the amount of Mallory metal in the crank throws.

At some point when each side exhaust was a single weldment, we suspected that the vibration and continual heat cycles were hardening the material. In an attempt to counter this, we built a massive steel fixture so the entire weldment could be heat treated and annealed. Unfortunately, it made absolutely no difference. The pipes would stress relieve themselves; if they fitted up to the collector just fine when you mounted the pipes on the engine, by the time the car had run a few times the pipe weldment could be off by half a pipe diameter. We had many struggles with levers and so forth to get the pipes to mate up on the engine in the car.

In the 1978 Indy 500 we were doing okay until the exhausts on the left bank broke. It took us 20 laps to change them. A large amount of that time was spent trying to lever a set of pipes to get the secondary pipe to mate up with the “Y” piece upon which the turbo sat. With Rutherford driving we still finished 13th, which was like a non-finish for us, and for that experience we had a lot of burned arms, hands, and fingers. That year also marked the first Indy 500 win by a DFX-powered car (Al Unser, Sr., driving a Chaparral), starting a 10-year winning streak for the Cosworth turbo V8 at Indy.

For both the team and for our customers Phil and I built many sets of exhaust pipes. Fabricating exhaust pipes during the winter off-season was not so bad as it was part art, part science, and part skill. We had coat hangers bent to simulate the centerline of each pipe and bags upon bags of special pipe bends done for us in the Detroit area. We simply dug into the bag for the appropriate bend, eyeballed the cut (which always had to be perpendicular to the centerline, so the mating parts fit nicely), then cut the tubing. Welding the wraps onto the pipe and flange was a noisy process which, combined with the buzz from the welding, gave one a headache.

On the inlet side of the DFX we had a variety of aluminum plenum chambers, of different volumes and runner lengths. Some plenums had the entry radius of ram tubes initiate on the plenum floor, and some had the entry of the ram tubes elevated from the plenum floor. When running 80-in. of boost it was quite difficult to keep the plenum from pulling away from the injector and lifting off the engine, despite the inclusive angle of the ram tubes and double clamping. We typically tie-wrapped the plenum to the engine and had a variety of more robust fixes, which constrained the plenum such that it could tolerate the thermal expansion in the engine but not pop off the ram tubes.

On the M16 Offy, which ran initially at 120 in. Hg of boost, the inlet plenum was held on the engine with four large Avimo
connectors. We initially thought that by just applying lessons learned from the Offy—including four Avimo connectors on the four corner ram tubes (numbers 1, 4, 5, 8), silicone hoses fitted with hose clamps, and threaded tee bolts on the other runners—that the combined fixes would constrain the plenum chamber. But it was never that simple.

For the short tracks and for road racing I “borrowed” a battery-operated oil pressure switch from the dyno spares and made it into an adjustable boost light. At short tracks like Milwaukee and Phoenix, Rutherford (J.R.) could not both read the boost gauge and precisely turn into the corner at the end of the short straights—which is where we wanted the boost to max out. We constructed a range of small inlet plenums and crept them down in size until J.R. could see the red light pop on at the end of the straights.

At 80 in. boost, and a 1.39 A/R turbocharger turbine housing (known as the “snail” because of its shape) the car would accelerate very aggressively down the short straights with rear tire grip being the constraint. At the reduced 60 in. of boost and then 48 in., getting max boost became more important, so we resorted to the boost light to help us get maximum boost and thus torque. It must be said that J.R. was very good at these short tracks so a little improvement in engine or chassis performance typically resulted in wins for us.

For this project Gordon Coppuck designed the McLaren M24, which was an evolution of both the Indy M16 and the F1 M23. The M24 used the foam-filled, crash-absorbing radiator ducts similar to the design of the smaller M23 as conceived by John Barnard. In simple terms the M24 had M16-like suspension grafted onto a larger, M23-like, tub with a turbocharged DFV engine replacing the venerable turbocharged four-cylinder Offy. The original cars had the floor of the side pods flat, but we had to lift the right-hand side pod floor an inch, just so we could get our quick-lift jack under the car in a pit stop.

Bill McKeon’s Notes on Cosworth Indy Engine Development

Bill McKeon grew up in Howell Michigan, about 30 miles from McLaren Engines. As a young man in the 1960s, he worked for Jack Conely, an engine building legend in the Midwest racing scene. Bill attended the University of Detroit before serving as a U.S. Army sergeant in charge of a Transportation Command motor pool at Cam Ranh Bay, Vietnam, circa 1966-67. On his return to the U.S. he was with Conely for a while before joining the factory AMC-Hurst racing team as an engine builder/track tuner in 1969.

He went on to serve as division manager at General Kinetics, a camshaft manufacturer in Detroit. Later, he was at Diamond Racing Pistons before joining McLaren—hired by Fritz Kayl in the early 1970s. Kayl had been at Diamond before becoming McLaren’s general manager after Colin Beanland left. McKeon worked on Chevy small block NASCAR development, along with GM’s Bill Howell. After this, he built the first Cosworth turbo V8 test engine, completed on January 22, 1976.

He continued to build and develop turbo V8 for Team McLaren and later for other Cosworth DFX users, including Mayer Motor Racing. He built McLaren’s BMW GTP turbo four-cylinder engines in 1985 and 1986. (Jack Conely’s son John also was an engine builder there, working on Buick Turbo engines and assisting Bill McKeon on the BMW project.) After leaving McLaren, he was briefly an auto dealership fleet manager before joining Price Engineering in 1993, where he built the Ford [Aston Martin] V-12 development engines.

The development engines, DFV 122 and DFV 172, had both previously served as Formula 1 engines, hence the DFV nomenclature.
DFX 122 1st Development Engine: January 22, 1976

Following a 0.6-hour dyno run and one power check dyno run.
1. Engine seems to have excessive blow by keeping the dyno float pegged at 10 CFM
2. The tops of pistons and the combustion chamber look very dry
3. All pistons showed signs of heavy rocking
4. The top land (of the piston rings) show cylinder wall contact
5. The inlet valves touched the pistons at the valve pocket edges
6. The piston pin bores look fair
7. The gas-filled sealing rings look cooked
8. The Cooper rings look fine (ed the cooper rings seal the heads to the liners in place of head gaskets)
9. The oil level would not stabilize
10. Installed two-12 (Aeroquip) breather lines into the dyno sump but the oil level was still unstable

Mk II build and run:
1. The pistons were reversed to move offset away from the thrust face (ForgedTrue pistons)
2. The valve pockets in the tops of the pistons were enlarged
3. The top lands were taper-turned
4. The engine was reassembled with all-new Cooper rings
5. Sump was modified to Mk 111 version
6. Engine was again run on the dyno. After a 0.2-hour warm up and six power checks the engine was put in M24-001 and run at OMS. (Note: Mileage not recorded.)

DFX122 Engine Teardown after OMS test
1. #3 piston was burned
2. #3 liner was cracked
3. Piston rock was much less than after the first dyno run
4. Bearings look passable
5. Cooper ring sealing was excellent
6. Valves still touched the pistons
7. Mk 111 oil system appears OK
8. Left side of engine appears drier than right
9. Pin bores picked up in several places
10. Used 9600 rpm map

DFX 172 (Third Development Engine)

This was the first build on this engine. The engine was not run on the dyno in Livonia or even started prior to it running in the car at OMS.

1. Engine had no pin-end float on assembly on some cylinders. This is a normal condition as end float appears after engine has run on the dyno.
2. This unit saw +9000 rpm during initial track run-in.
3. Several pins had seized in rod bushes lightly, then pin galled in piston (this is a normal chain of events).
4. One pin seized in its rod, then galled the piston badly, then the rod bush turned in the rod. Bush then came loose from the pin and moved over into the pin boss (heavy pin boss wear). Piston has cocked on the rod. Rod bearing out on that rod—could be from rod misalignment under load along with low side clearance.
5. Top ring on one piston had scuffed in groove and groove was badly worn.
6. One cylinder head is leaking water—cause not yet known. This chamber was touched by piston after bearing failure.
7. No liners cracked (visual inspection only—Zyglo later).
8. All piston skirts look good.
9. All rod bearings show heavy contact—possibly due to high revs with low cylinder load.
10. Center main (ed. bearing) shows heavy loading.

Operations performed on engine DFX 172:
1. New pistons
2. Tighter bore clearance
3. Larger valve pockets
4. Cosworth steel liners
5. Remove dampener and can flywheels

DFX122 4th Development Engine
Observations taken after 6.4-hour on dyno:
1. Four-into-one exhaust system evaluated
2. Large and small logs evaluated
3. Cycle durability
4. Burnt piston #2
5. Scuffed # 2 liner
6. Crank picked up on #6 journal (side)
7. RH head exhaust seats sunken
8. LH head cracked
9. LH exhaust timing slipped to 100°

Operations performed on engine:
1. Replace liner
2. New pistons TRW
3. Moldex crank—Tufrided
4. New rods for 1-in. pin
5. Cylinder heads repaired

DFX 122 5th Development Engine
Observations taken after 2.8 hours on dyno:
1. All during test the engine never really ran properly—had persistent misfire.
2. All pistons had magnetic rust deposits on top.
3. LH cylinder head cracked worse than before.
4. All valve seats sunken.
5. Steel liners worn out.
6. Above problems attributed to bad fuel—excessive water.

Operations performed on engine:
1. New thick iron liners installed (Cosworth).
2. Cylinder heads from DFX 172.
3. New magneto and housing

DFX 122 6th Development Engine
Observations taken after 3.5 hours on dyno, followed by Indy test totaling 25 miles. Engine ran poorly on all tests.
All during test the engine never really ran properly, had persistent misfire
1. Ruined center main bearing
2. Rods bossed in pistons
3. LH head cracked
4. RH head guides bad
Operations performed on engine:
1. Increase mains clearance
2. Replace cylinder heads
3. Machine piston pin bosses

**DFX 172 7th Development Engine**

Observations taken after 4.4 hours on dyno, followed by MIS test totaling 260 miles:
1. Four-into-one race car prototype exhaust system
2. Single/twin log evaluation
3. Power consistently good
4. Power fell off at end of test due to broken collector pipe
5. Engine ran on dyno after MIS. Good power but failed center main on second power run at 9600 rpm
6. Measure RH side water flow with twin Vega radiators
7. First Kay exhaust system

Operations performed on engine:
1. Engine align-honed
2. Nicholson 4340 nitrided steel liners
3. Heavy counterweight crankshaft
4. Lower compression ratio
5. Shorter rod eyes
6. Newer cylinder heads
7. New main studs

**DFX 172 8th Development Engine**

1. Evaluate lower compression
2. Exhauts 1¾ with 2-in. collector to turbo pipes
3. Nicholson 4340 liners
4. Second design Hilborn injector
5. Run twin inlet turbo snail
6. Ran Milwaukee test, 162 miles

Observations after Milwaukee test 162 miles and 2.5 hours on dyno:
1. All bearings looked fine
2. First compound spindle broke at block end
3. #2 and #6 rods touched—galled slightly
4. #3 rod bushing cracked
5. #6 rod bushing spun
6. Pin bores are all terrible looking

Operations performed on engine:
1. Raise compression ratio to normal 8.1:1
2. Use full Clevite lower main bearing
3. Narrow rod’s big end for more side clearance
4. Drill 4 rods for test pin oiling
5. Drill 4 pistons for test pin oiling

**DFX 122 8th Development Engine**

1. Evaluate prototype mag pumps
2. Measure water flow in RH side

Observations after MIS test 104 miles and two full power runs on dyno:
1. #6 plug fouling
2. #8 plug hotter than normal
3. Second ring scuffed on #4 cylinder

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4. Pistons and rods with drilled holes appeared better
5. Water flow appears to be down
6. Possibly too much spark
7. Oil temperature 240° to 250°F
8. Lost 10 psi oil pressure due to increased main clearance
9. Engine still looks very dry

Operations performed on engine:
1. Burnish pin bores
2. All rods and pistons to get drilled for oiling
3. Flash chrome liners to prevent flaking
4. New ring package
5. New bushing material
6. Shim PR valve
7. Large impeller in water pumps
8. Extra oil cooler
9. Crankshaft rods and pins
10. Pistons—prepare new set with oil holes, reduce second and third land diameters, measure and record pin clearances
11. Hardness check skirts
12. Lap valves and cleanup #6 chamber (possible new valve in #6)
13. Ring groove diameter
14. Replace #6 liner

DFX cams—Porter HP-52

1. Porter inlet clearances
   
   .050 Open @ 17° BTC
   .050 Close @ 58° ABC
   Lift @ TAC 0.118
   115

2. Porter Exhaust Clearances

<table>
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<th>.050 Open @ 49° BBC</th>
<th>.050 Close @ 14° ATC</th>
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<td>.050 Close @ 14° ATC</td>
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<td>.050 Open @ 49° BBC</td>
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<tr>
<td>.050 Close @ 24° ATC</td>
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Valve Spring Data

HP-52 Camshafts
0.405 gross lift; 0.395 net lift

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<th>Installed Height</th>
<th>Open Pressure</th>
<th>Open Height</th>
<th>Distance from CB</th>
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DA-2 Camshafts
0.381 gross lift; 0.370 net lift

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<td>1.340</td>
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<td>0.970</td>
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We also ran Cosworth BD3 camshaft at short tracks
Appendix IV

A Fabulous Milestone: McLaren’s 40th Anniversary

Roger Bailey studies photos among memorabilia brought by Barry Smyth, the Gulf Oil representative who worked with Team McLaren during the Can-Am and Indycar eras.

Tyler Alexander attended from England, where he was still associated with the McLaren F1 team.
In 2009 McLaren marked the company’s 40th year since its founding by Bruce McLaren, Bill Smith, and Teddy Mayer in 1969. Smith returned for the event, along with Tyler Alexander. Mayer’s son Tim attended, representing him. Linamar president Linda Hasenfratz, along with her family, welcomed everyone.

Livonia and State of Michigan dignitaries were there, including Mayor Dennis Wright and former Mayor Jack Kirksey along with members of the Livonia Chamber of Commerce and City Council, and members of the Michigan Economic Development Corp. Detroit Red Wings star and racing enthusiast Larry Murphy was also there.

Many of the early employees, engine builders, race team members, and drivers also reunited in Livonia to celebrate with their compatriots and with the current staff, some of whom were there during the company’s racing heyday. These current staff included Wiley McCoy, the recently retired CEO and now chairman of the company’s Technical Committee. Another engine builder, Jim Daw, had been there nearly as long.

Several historic cars were on special display that day, including the 1965 prototype McLaren M1-B, an M16 Indy car, 1971 M8 and 1972 M2 Can-Am cars. Johnny Rutherford, winner of the Indy 500 in 1974 and 1976 in M16s for the McLaren team, attended. Thanks to Indy winner Bobby Rahal, who manages the BMW Historic car collection, there were two McLaren-raced BMW cars: one of the 1977–1979 320 Turbos and a 1986 BMW GTP car on display. David Hobbs, a multiple winner in the 1977–1979 320 Turbo campaigns and a BMW GTP driver in 1986, was there, too.
FIGURE A.1  A bunch of BMWs, with a David-Hobbs 320 Turbocar in the foreground. David himself is being interviewed in the right background. McLaren headquarters can be seen in the background.

FIGURE A.2  Leaning on an M8F wing during the 40th reunion, from left: Teddy Mayer’s son Tim, Bill McKeon, Steve Roby, Bill Smith, Tyler Alexander, Alec Greaves, Syd Carr, Barry Smyth, and David Hobbs.
Tom Klausler, David Hobbs’s sometime 320 Turbo teammate, joined the festivities. He has been a valued engine builder-developer at McLaren on 8 Mile Road since 1977. That’s 42 years as of this printing.

Roger Bailey, one of the early McLaren Engines team members, also enthusiastically participated. As is chronicled in these pages, Bailey built Offy Indy engines and Chevrolet Can-Am engines in 1971–1973, ran the BMW 320 team from 1977 through 1979, and then brought in enough Cosworth DFX service business to keep the racing business current after BMMR and BMW stopped their race programs.
GNX engineering project manager Lou Infante brought a prototype Buick GNX. He originally donated use of his Buick Grand National for GNX package development in return for the car being completed as a GNX. Its dash-mounted sequence number reads “000.” A production version was also shown, courtesy of the local Ken Lingenfelter collection.

Mary Petitpren drove her 2008 Viper up from Atlanta, and former McLaren engine builder/developer Bill McKeon brought his Corvette Z06. These cars’ engines represented McLaren/Linamar engineering programs: the entire Viper engine and the Corvette LS7 cylinder heads, respectively. They both also used the McLaren/Linamar-developed Opti-Power system, a technique for CNC-machining the ports and combustion chambers for high performance.

**FIGURE A.5** Two of the McLaren Buick GNXs and the McLaren-built “UPS” truck that featured a hand-built space frame with all-independent suspension.

**FIGURE A.6** McCoy addresses the 40th reunion guests.
An automotive writer since 2003, Roger S. Meiners served in editorial roles at Mopar Magazine for ten years, as well as writing stories and taking pictures for the auto enthusiast press.

He has been an automotive industry businessman and lawyer for over forty years. He joined Motorola’s Automotive Products Division in 1973, serving in marketing and product management in the Chicago area, and account management in Detroit, where he worked automotive OEM accounts, including Ford, Chrysler, AMC, and Volkswagen. Later, he practiced law in Detroit, during which time McLaren Engines became a client, and he eventually moved to that company in 1986 as director of operations and marketing. In the early 1990s, he began working independently as a legal advisor and consultant to McLaren and to others in the industry.

He is a lifelong auto enthusiast, beginning amateur road racing in 1982 in the Skip Barber Formula Ford series. He thereafter raced primarily in vintage cars such as a Ferrari 250 SWB, Lotus 23B, Brabham BT26A F1 car, Alfa GTA, and a Porsche 550A Spyder, none of which he still owns (unfortunately). He also did some few races in IMSA (Honda CRX) and SCCA (Lola S2000). Most recently (2016) Meiners “also ran” in a Lemons event, driving a BMW 328 built by Wiley McCoy and a team of veteran McLaren Engineering racers and friends. He refuses to say he is “retired” from racing.
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McLAREN: The Engine Company
A History of McLaren Engines, Inc. and its Successors
Roger S. Meiners

McLaren: The Engine Company is the previously untold story of McLaren Engines, an American company founded in 1969 by Bruce McLaren and his partners to build engines for McLaren’s legendary Can-Am and Indy Cars. From this base in suburban Detroit came the mighty 8-liter big-block Chevrolet V8s that powered the iconic orange racecars to the final two of their five consecutive Can-Am championships. McLaren’s busy dyno rooms also spawned the thousand-horsepower turbo Offenhausers that put McLaren cars in Victory Lane at Indianapolis two times between 1972 and 1976.

For decades this non-descript shop on 8 Mile Road was the hotbed of horsepower for factories and top independents alike. McLaren Engines developed the turbocharged version of the Cosworth DFV Formula 1 engine that powered Indy cars for both Team McLaren and Penske Racing. It rendered BMW’s turbo engine for IMSA racing that later became BMW’s Formula 1 weapon. The long list of race engines developed here powered Buick Indy and IMSA cars, BMW GTP cars, Cadillac LeMans prototypes, Porsche Trans-Am 944s and David Hobbs’ F5000 single seaters. There were McLaren-built big-block turbo V8s for offshore boat racing and even a Cosworth-Vega engine for American dirt tracks!

I always told my wife Betty that if I ever found a team that loved racing as much as I did, I’d be a winner. How true that was!

Johnny Rutherford

Author Roger Meiners combines his life-long passion for motor racing and technology with his historian’s sensibilities to make the engines, cars, and key personalities come alive. Ride along with Meiners as he uncovers little-known details of the company’s transition from a race shop to an engineering company, developing exclusive performance cars such as the sensational 1987 Buick GNX, the 1989 Pontiac Grand Prix Turbo, the FR500 Ford Mustang concept, and other projects that the public never saw.

Today the company, known as McLaren Engineering, is a subsidiary of Canada-based Linamar Corporation, and is known for its state-of-the-art R&D and manufacturing capability.