

By L. C. CRANE

**M**otor racing is a sport of domination. There have been periods of individual or group domination since its inception. When technical breakthroughs occur, they are generally made by the people who are not enjoying the fruits of victory.

In the very early years, the competition was between nations, but as more machines became involved, individual names began to take precedence. Panhard, Mors, Fiat, and Mercedes were early leaders, each in its own time. Bugatti ruled the 20s, Alfa the 30s until Mercedes returned; Ferrari held a thread of power from the Alfa days until well into the 50s, but the English seemed to be missing, except for certain types of cars in certain events. John Cooper must be given credit for breaking continental dominance with innovation. He was the harbinger of a new era, but it was one of his countrymen who

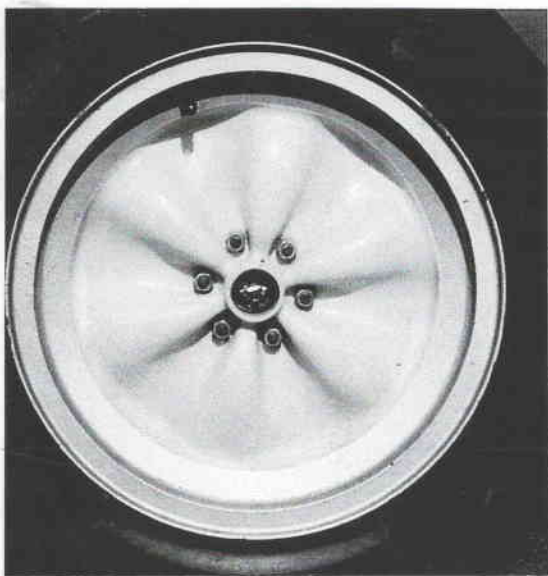
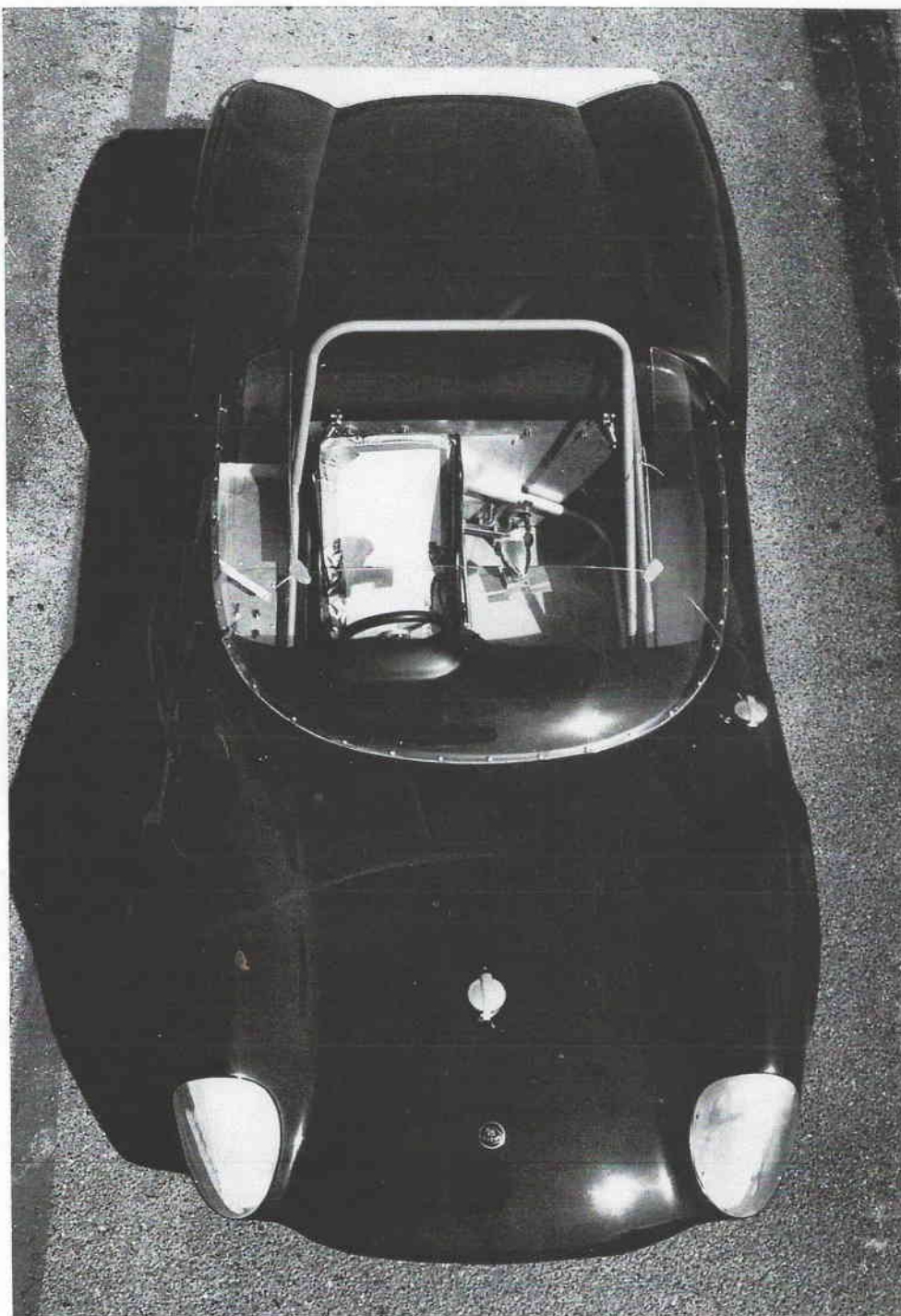
pointed the way with new technology. Colin Chapman was competitive, imaginative, and well-trained for his period of dominance.

Like most of the automotive giants before him, he began as an enthusiast. While he was still attending University College at London University in 1945, he got into the used car business to raise

of bit of sterling. Buying, repairing, and selling cars might have been an unorthodox beginning for a future designer, but it apparently did no harm. The business went well, then it went bust.

With his legendary determination to be involved with cars, he took his remaining stock, an ancient fabric-bodied Austin 7, and proceeded to build his first

# LOTUS 19



special for English hill trials. In the process of registering his lightweight creation, the name Lotus was established.

Lotus Mark 2 was a further development of the trials car and was also the first Lotus used in circuit racing. It led to the development of Marks 3 and 4, which became increasingly more competitive. With their split-beam independent front suspension and highly-tuned engines, they ceased to function as trials cars. Beginning with the Mark 6, Lotus was in the manufacturing business as well.

A series of front-engined sports cars with aerodynamics by Frank Costin, brother of Michael who was a key figure at Lotus cars, carried Chapman to leadership in British club racing. Colin continued to compete himself through the mid-50s and was able to beat such future stars as Stirling Moss and Jim Clark in identical Lotus cars.

Gradually, Lotus infiltrated the

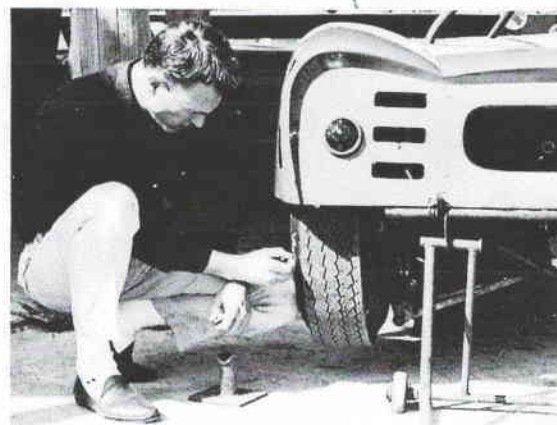
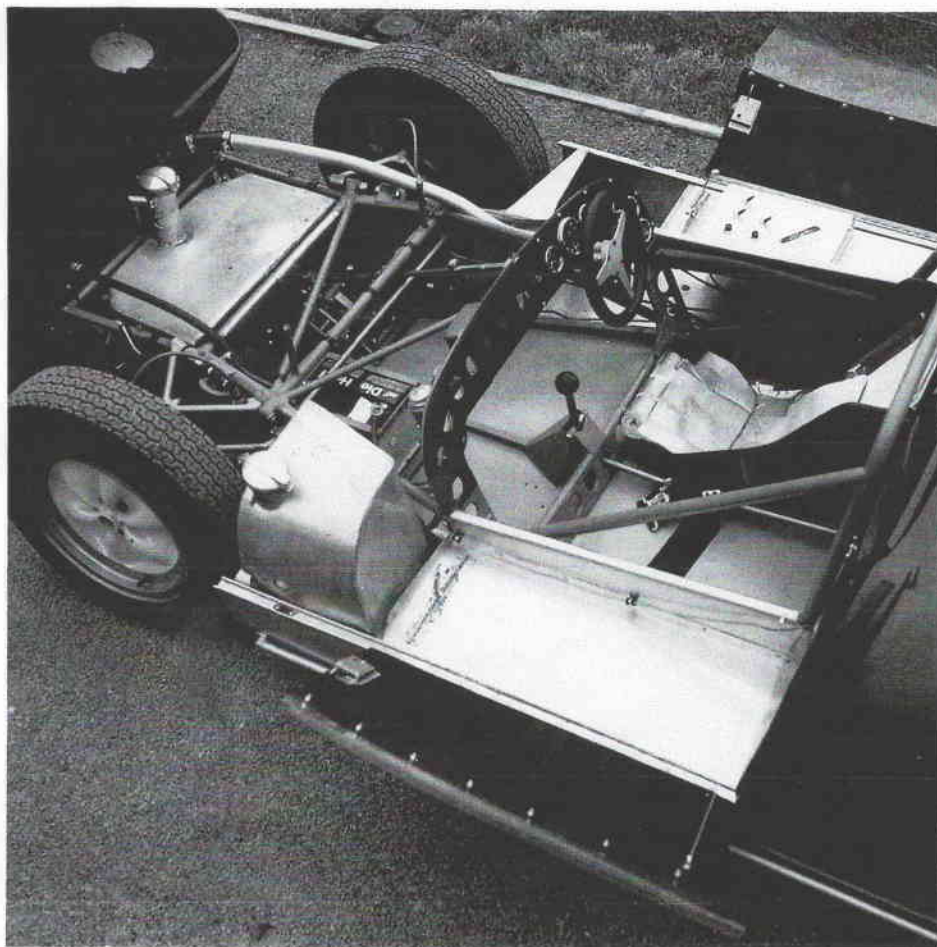
smaller classes in both Europe and America. As success bred success, Chapman, the astute manufacturer, began to actively cultivate the lucrative US market through west coast distributor Jay Chamberlain. America eventually became the biggest market for the marque.

Lotus customers on both continents felt the impact when John Cooper introduced his Formula 2 car with its engine in the middle and followed that with a sports car based upon the same design. In spite of their success, Cooper confronted an incredulous world. Since the days of Auto Union in the late 30s, it had been the general contention that when the engine was behind the driver, he lost his sensitivity to the car's balance and that was compounded by uncontrollable oversteer. These ideas did not deter the competitors, who watched the results and were interested only in performance. The designer of the Lotus cars

felt his prestige being usurped.

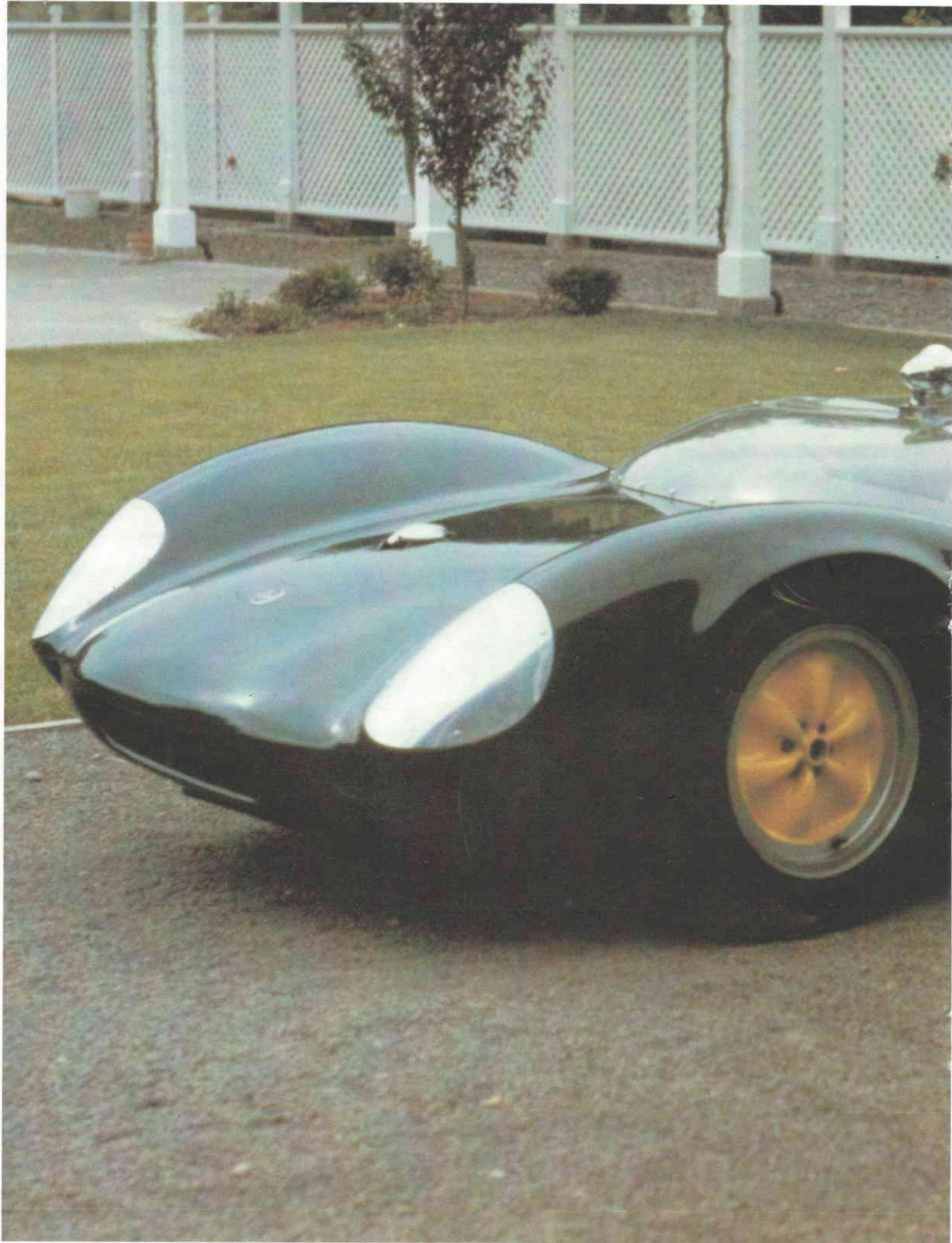
Inspired by Cooper's initial success and disappointment in his 16 single-seater, Chapman decided to try the new concept. The 16 had graphically demonstrated the need for simplicity in maintenance and preparation, so that joined reduced horsepower loss by minimum weight and wind drag as the criteria for the new car. By putting the engine behind the driver, the frontal area could be reduced by lowering him into the structure to a semi-reclining position. Chapman's experimentation with simplified suspension systems was another benefit to the new design. The improved road holding was an effective bonus.

The 18 went into production early in 1960 as Formulas 1, 2 and Junior with minor technical differences. The modest works on Tottenham Lane, Hornsey, in North London was already overburdened by the production of 7s, 15s, 16s, 17s, and the popular GT car, the Elite.

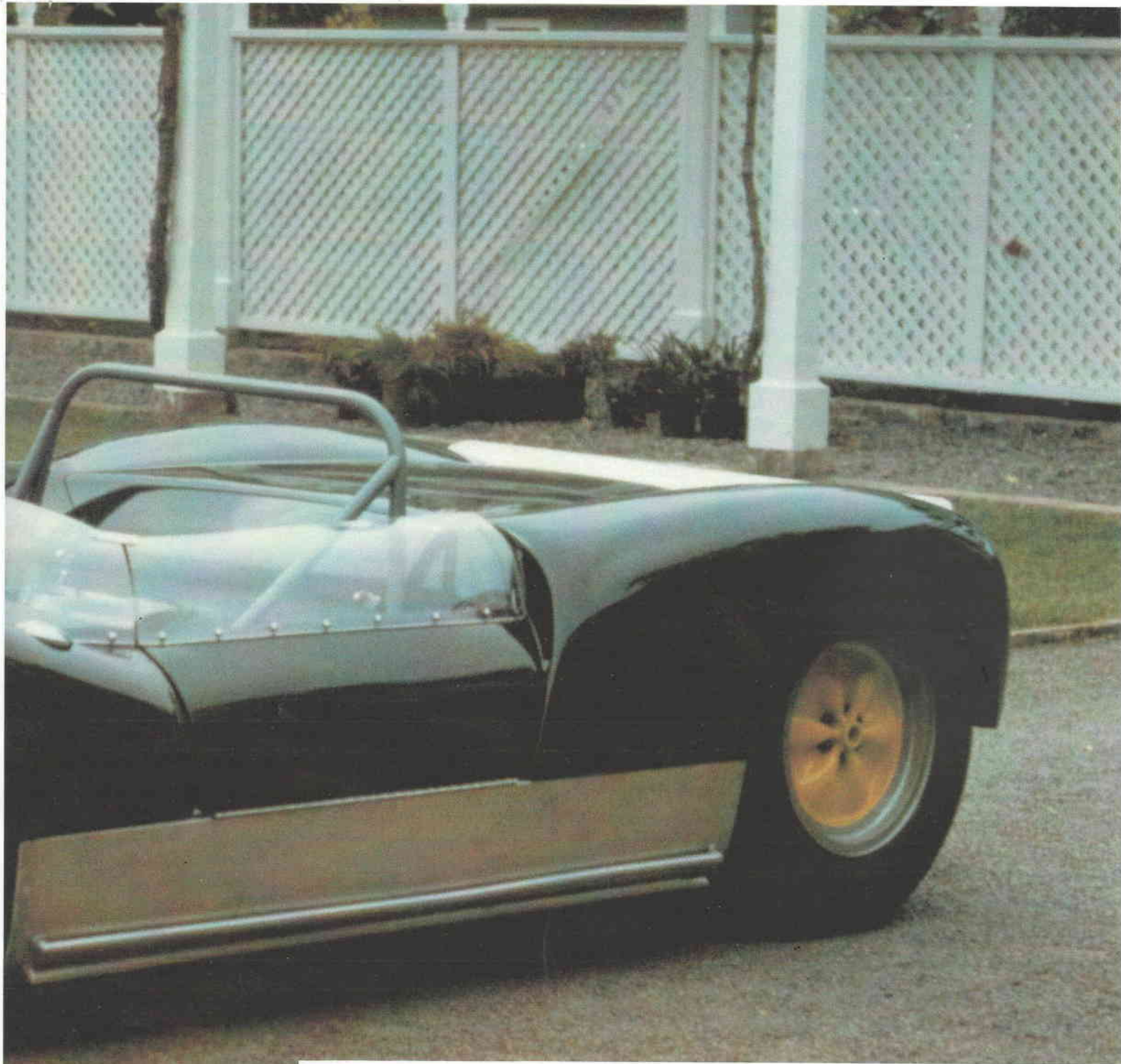


From left: Details of 959 as it now appears. (S.J. Earle) Above: Tire width myths exposed. Gurney's original Goodyear Bluestreaks (widest available) are nearly an inch narrower than Dunlops R-6 now available.









Lotus Nineteen number 959 of Tom Skouras.  
Photographs by Steven J. Earle.



There was neither manpower nor space available for another project. In the midst of all this, the entire operation was being moved to a new, larger facility in Cheshunt, but Chapman was intrigued by John Cooper's new Monaco and it was too tempting not to at least try an 18-based sports car.

The prototype was constructed in strictest secrecy in a small garage a short walk from the factory. Williams and Pritchard, who had done all the Lotus bodies since production began, translated Frank Costin's drawings into a smooth aluminum skin.

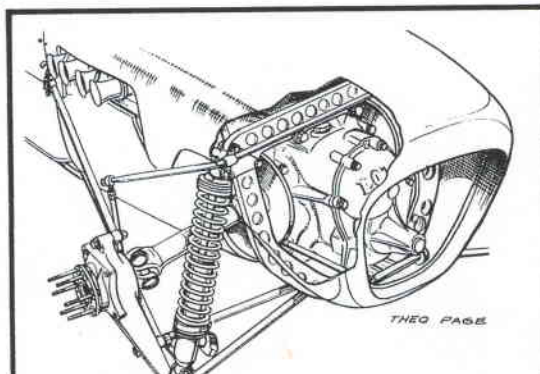
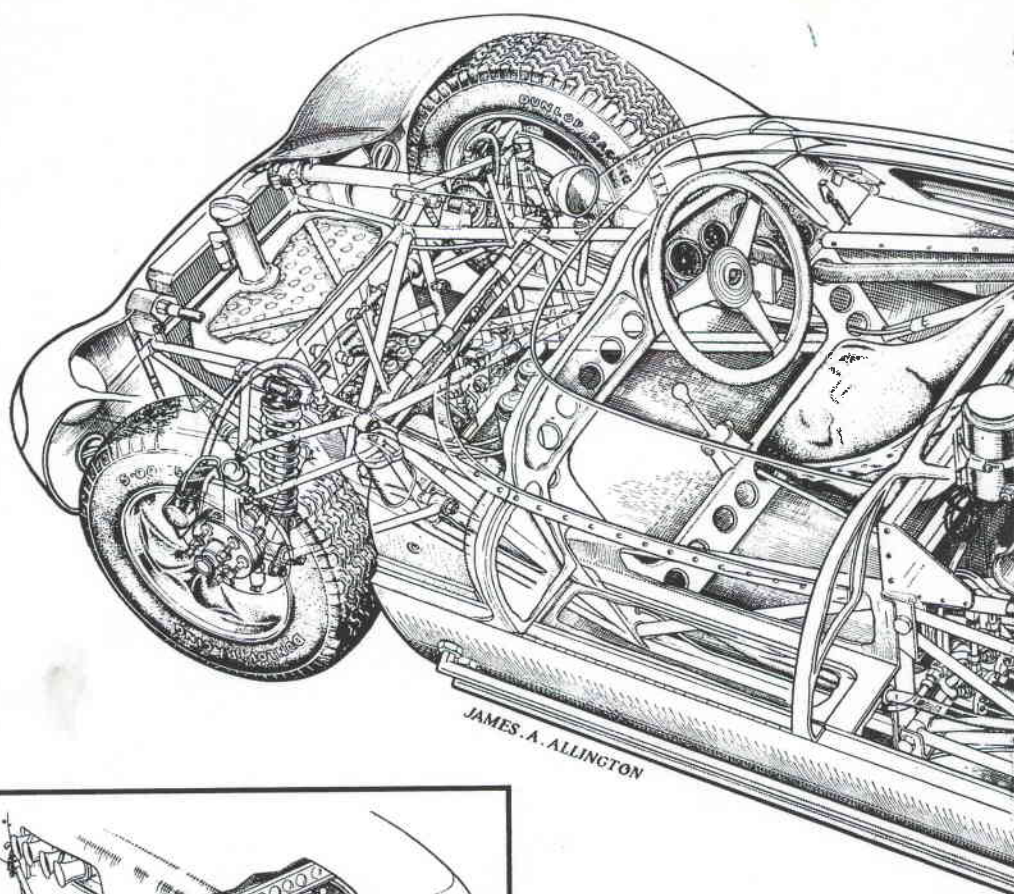
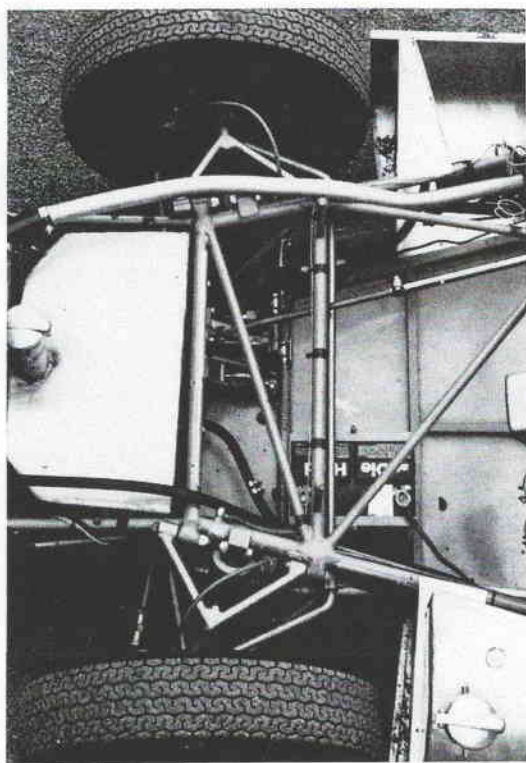
When the 18 entered the world of Formula 1, it represented the cumulative result of Chapman's continuing studies in maximum stress and minimum weight. It was made up of three structural sections; the front suspension box, the driver's compartment, and the engine bay which also carried the rear suspension. The 19 was the same car in

all dimensions except the driver's compartment.

The front suspension bay was the primary load bearer in the forward part of the frame. It was a rectangular box running laterally between the front wheels and was triangulated on five sides. It was constructed of 1-inch diameter 16-gauge mild steel tubing except for the top tube on each side, which was increased to 1½-inch 14-gauge tubing because the upper mounting bracket for the coil/shock unit was centered on its span, putting it in a bending strain. A lighter tubular structure extended forward of the front suspension box to support the coolant and oil radiators, a 6-gallon oil tank, and body mounting brackets. The front suspension was of unequal length A-arms, the upper set of which had threaded ball joints where they attached to the Triumph uprights for camber adjustments. The anti-roll bar crossed behind and below the upper

A-arms and was attached by spherical bearings below the ball joints. The steering rack and pinion was mounted midway down the front of the box at the apex of two triangles. The pedals and their hydraulic master cylinders were mounted on the bottom tubes inside the box. The battery was opposite the pedals. From the front corners of the box, the frame rails diverged rearward to attach to a cowl hoop fabricated of two tubular hoops attached by a perforated steel panel which acted in lieu of lateral triangulation in the cockpit. The top of the hoop carried the instruments, electrics, and hydraulic reservoirs. The bottom of the hoop supported the front edge of the seat and the simple shifter pivot. The entire center frame section was triangulated on the bottom by a stressed aluminum sheet.

From the cowl to the firewall, the frame rails ran parallel. From the firewall rearward, they converged to make



Lotus 18 rear suspension to show elements more clearly.



contact with another tube and sheet steel hoop which acted as the load bearer for the gearbox and rear suspension. The gearbox was suspended from the removable top section of the hoop and the reversed lower A-arms of the rear suspension mounted near the bottom where they were attached with a threaded spherical joint for camber adjustment. A Y-shaped removable structure passed from the upper left corner of the firewall to the upper corners of the rear hoop to triangulate and stiffen the engine bay. A trapezoidal structure reached rearward from the hoop to support the rear body panel.

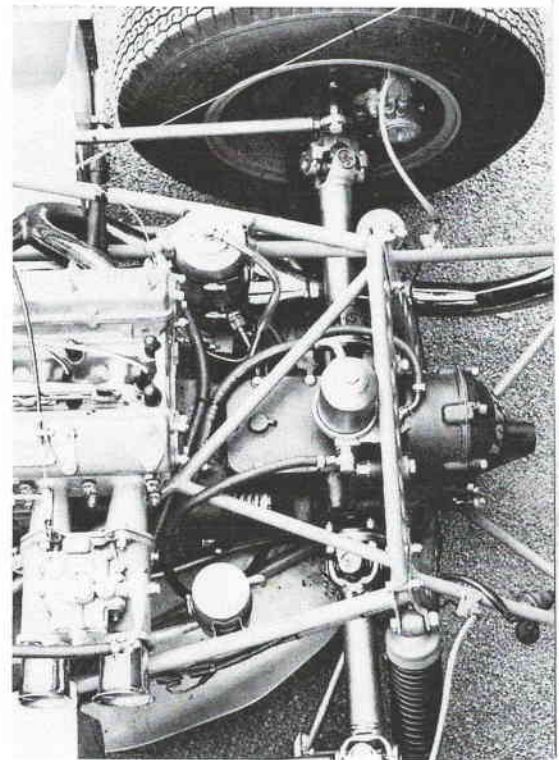
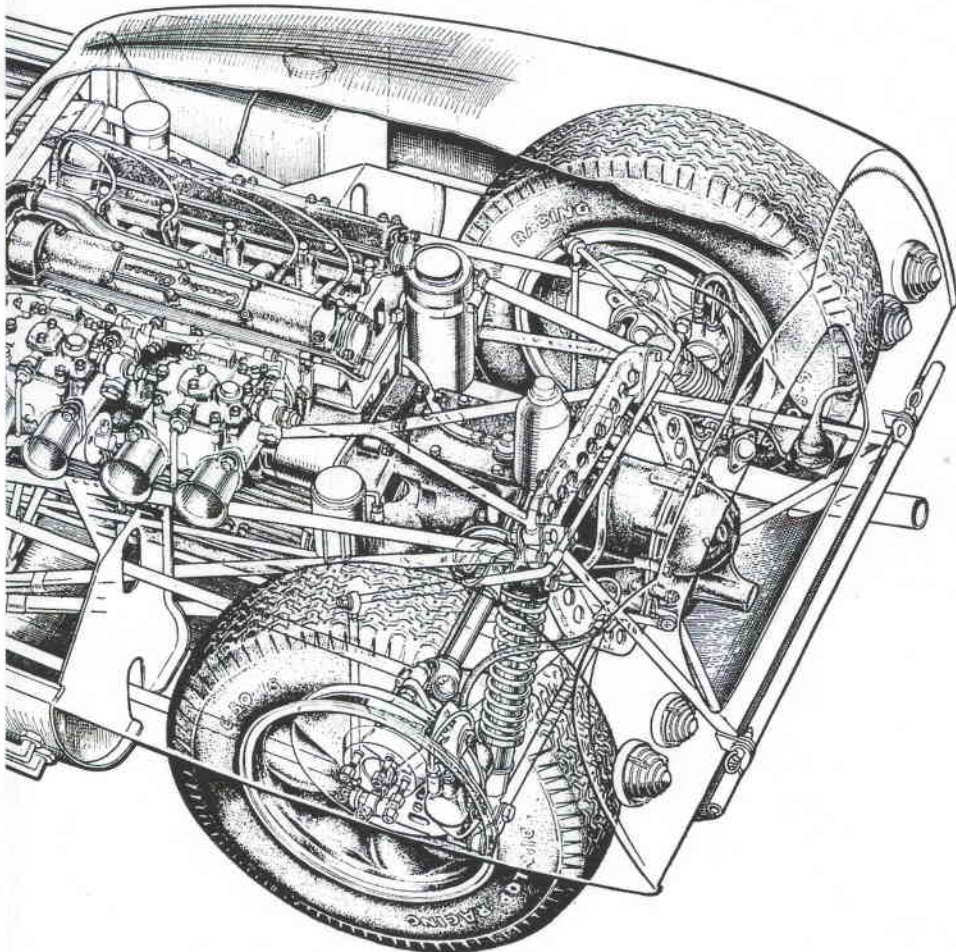
The unsplined halfshafts acted as the upper rear suspension lateral link, and the fore and aft loads were carried from the top and bottom of the cast hub carrier to the firewall by two tubular, trailing arms. The rear coil/shock units and reversed lower A-arms shared mounting points at the bottom of the hub car-

rier, which was little more than an inch from the road surface. This allowed a very low roll center, but dangerously little clearance in the event of a deflating tire. The rear anti-roll bar attached to the chassis at the upper mounting point of the coil/shock units and extended forward. A long vertical link with spherical joints on either end attached the bar to the lower A-arm.

The brakes were as on the 18 Formula 1 car—10½-inch discs in front and 9½-inch discs mounted inboard on the rear. However, the 19 included a provision on the rear upright for the discs to be mounted outboard when high ambient temperatures would cause excessive heat to build up. An interesting point is that while Moss chose to run American races with the rear brakes mounted at the wheel hubs, Gurney retained the inboard location to take advantage of the lower unsprung weight and ducted air to them from scoops on the lower body

panels ahead of the rear wheels. By 1963, the scoops had been moved to the top of the rear body panel. Coolant and oil were fed from the engine to their respective radiators by aluminum pipes running outside the lower body pane. This arrangement was less for the additional cooling than to isolate the heat from the driver's working space. Unfortunately, on many American race tracks, drivers were discouraged from cutting the course by half-buried tires at the apex of turns. This also discouraged drivers from leaving the cooling tubes outside the body work on the Lotus 19s. After only a few events, both Moss and Gurney moved them back inside where they were less susceptible to being crushed or forcefully removed.

Most of the fuel was carried in a tank between the driver and the right rear wheel. An additional tank, carried over the driver's knees on the 18, had been moved to a place behind the left front





wheel and the place it vacated was filled by the spare tire.

The engine was the Coventry FPF, 2496 cc, DOHC four which is described in great detail by Mr. Lynch in his story beginning on page 36 of this issue.

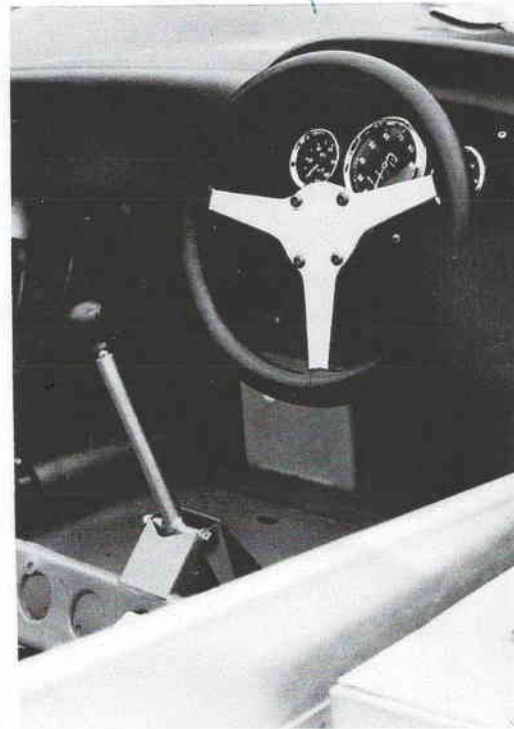
The most provocative technical detail of this revolutionary machine was its gearbox. It had been designed in 1956 by Harry Mundy, Richard Ansdale, and Chapman. The controversy had nothing to do with its ability to allow complete ratio replacements in only 10 minutes, or the fact that it was only 10 inches long, or that it was the lightest gearbox in automobile racing. The problem arose from its method of gear changes. It was a constant-mess gearbox, like a motorcycle's, and required progressive changes. To get from fifth to second, for instance, you had to engage both fourth and third on the way. If luck was not with you, four neutrals were available. An interlock with the clutch prevented

gear lever movement until the pedal was depressed. The gears were manufactured by Z.F. in Germany. Very careful attention had been paid to their lubrication. Two pumps were enclosed in the dry sump unit, one for scavenging and the other for pressure. The efficiency of the oiling system was proven by a number of differential failures when the transaxle unit was first used in competition. In each case, it appeared the failure was due to lack of lubrication on the ring gear. Exhaustive tests finally showed that at very high revs, the scavenge pump would completely deplete the oil supply of the differential area and would maintain two pints of oil in suspension in the gearbox. By speeding up the delivery of the scavenge and pressure pumps and redirecting the flow, the problem was solved. By the time the 19 came along in 1960, the box was well-proven in Formulas 1 and 2 as well as sports car applications. After the prototype had

established the body contours in aluminum, molds were pulled and all future 19s had fiberglass nose and tail sections.

When the prototype was finished, Stirling Moss was enticed to leave St. Thomas Hospital in London to do a test. Only 36 days had passed since his terrible crash at Spa Francorchamps in Belgium. With two broken legs and a broken back partially knitted back together and his spirits soaring, Moss arrived at Silverstone. He had enjoyed some success in Rob Walker's 18, so was not unfamiliar with the chassis' potential. In a very short time, he was circulating 1.5 seconds under the sports car lap record. It was fantastic. Moss was so excited, he asked Chapman to send him with the 19 to the Swedish GP for sports cars, which was only two weeks away.

On August 7, 1960, the unpainted prototype recorded its first victory at Karlskoga, Sweden. Two days later, Jo Bonnier borrowed the car and estab-



Clockwise from lower left: The prototype as it appeared, unpainted, in Karlskoga, Sweden. Moss in the U.D.T. colors at Riverside 1961. Gurney at Riverside.

shed a new Swedish record for the flying kilometer. The word quickly spread and Dan Gurney was soon at the door of Lotus with a check from his sponsor, the Arciero brothers, for a 19. The second car was hastily assembled while Gurney anxiously paced the shop and the adjoining street. The Riverside pro race was in October. Molds were taken off the aluminum prototype for production of all future bodies in fiberglass. A new chassis was assembled and an FPF Coventry Climax 2.5-liter engine was secured. Finally, the number two car was finished and shipped with the prototype, now owned by U.D.T. Laystall, who had ordered three. They arrived in Riverside just in time to qualify for the Times Grand Prix for Sports Cars.

Prior to the 19's arrival, the 1960 professional sports car series in the US had been dominated by the Birdcage Maseratis of Bob Drake and Bill Krause. It was a hint at a modern car with its ultra-light

space frame. Only the heavy old Ferraris, made for Italian roads, and the new "California Specials" of questionable parentage were its competition. When the 19s arrived at Riverside in October of 1960, they brought with them a new era.

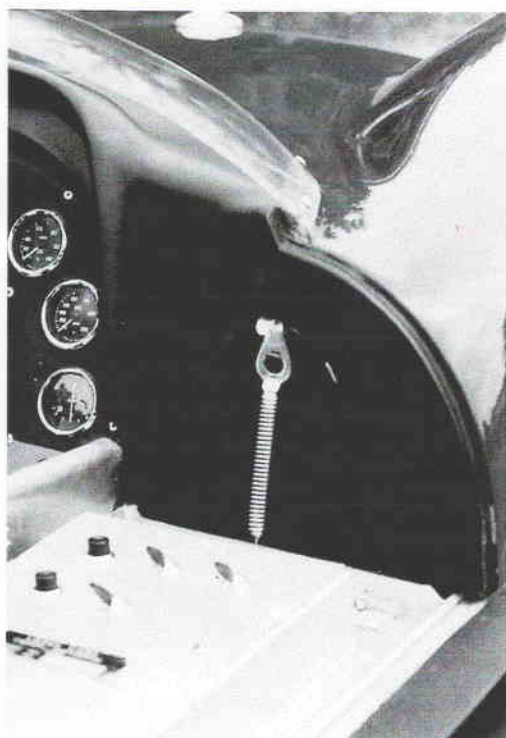
Just to confirm the point, both Moss and Gurney broke the existing lap record in practice. Gurney turned a 2:00.93, which was four seconds under,

Skouras testing the restoration at Sears Point with Stephen Griswold on his left.



with only three laps. The first was a standing start, the second was timed, and the third was a cool-off. He described the record lap as "no particular driving feat; it was just the car." Moss turned 2:03.62, being less experienced at Riverside, and Bill Krause qualified his Birdcage at 2:03.90, a particular driving feat. An interesting sidelight is the 1:54.4 that Moss turned in Rob Walker's 18 when he qualified for the US Grand Prix at Riverside a month later. Using the same basic chassis, same driver, and same track, the single-seater was over seven seconds quicker.

During the Times Grand Prix for Sports Cars, Moss's car went out on the tenth lap with that recalcitrant gearbox and Gurney's drive ended in 17 laps with a chipped cylinder liner. One reporter suggested he had missed a shift during his qualifying runs and might have exceeded the Climax's critical rev limit. The Birdcage refused to relinquish its

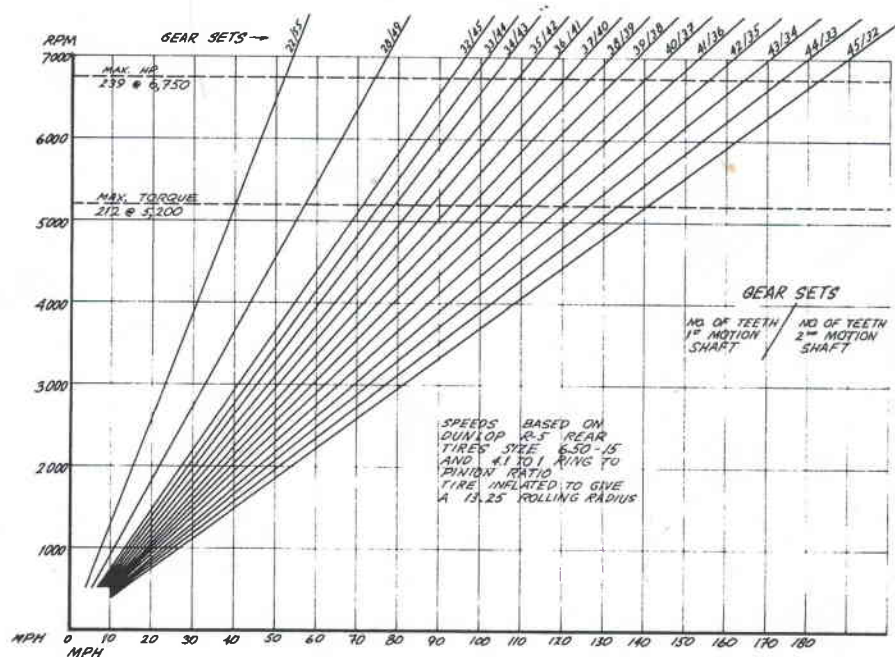


## TECHNICAL DESCRIPTION

ENGINE:	Coventry Climax FPF
CARBURETORS:	Weber 58 DC03
CLUTCH:	Twin disc/ sintered copper
WHEELBASE:	90 inches
FRONT TRACK:	51 inches
REAR TRACK:	50.5 inches
STARTING LINE	1250 pounds
WEIGHT:	(full tanks)
OVERALL LENGTH:	143 inches
OVERALL WIDTH:	65 inches
HEIGHT:	30 inches
FUEL CAPACITY:	22 gallons

TIRE SIZE:	Front: 5.00 x 15 Rear: 6.50 x 15
BRAKE DISC	Front: 10.6 inches
DIAMETER:	Rear: 9.6 inches
OIL CAPACITY:	6 gallons
WEIGHT DISTRIBUTION (with driver):	46% front 54% rear
GEARBOX:	Lotus
RATIOS AVAILABLE:	First: 22/55 fixed Second: 26/51, 28/49, 30/47 Third, Fourth, Fifth: 31/46, 32/45, 33/44, 34/43, 36/41, 37/40, 38/39

## GEAR CHART





position with only one fight, so the winner's check said Bill Krause.

Both 19s were quickly repaired for the Laguna Seca race the following Sunday. Gurney's car was out again when all the flywheel bolts sheered. In spite of work by crew chief Bill Fowler with help from Max Balchowsky and Jack Ross, it could not be repaired in time to qualify. Moss went on to win both heats and the event after strong challenges by the Birdcage and a Scarab.

Bill Fowler had time to disassemble and properly prepare the Arciero/Gurney car before the December event in Nassau. With the ride height raised by aluminum rings under the springs and Gurney driving a conservative, well-planned race in deference to the rough old airfield surface, they got the win.

With all the publicity from the 19's successes, there were plenty of buyers jockeying for the limited production planned. Chapman proceeded to deliver all 12 as advertised and filled four additional orders as well. Of the 16 cars (numbered 950 through 965), 11 were delivered with Coventry Climax FPF 2.5-liter, four-cylinder engines. Two of the remaining five eventually had FPFs

installed, while Rod Carveth immediately shoe-horned a new aluminum Buick V-8 in number 962. Many of the 19s that remained active into the mid-60s had the Climaxes replaced by V-8s, but the third car constructed, the second delivered to U.D.T. Laystall, was sold to Team Rosebud in Victoria, Texas, and it became the home of their Ferrari 250 TR engine. The only two cars shipped to Europe went to Charles Vögele (956) and Harry Zweifel (961), both of Switzerland, for use in the European Mountain Championship. Our records show four cars delivered to Great Britain. The three U.D.T. cars were 950, 952, and 953. Number 964 went to Howden Coundley with a 2.7-liter Climax in it.

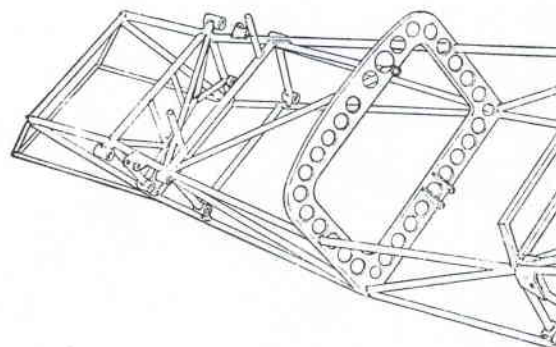
The subject of these photographs is the Peter Ryan car, number 959. Ryan was a Philadelphian by birth, but had taken a Canadian citizenship when he joined his mother at the Mt. Tremblant Ski Resort, which she owned. The car is consequently listed as a Canadian car. He took delivery early in the summer of 1961 and entered an event at Lime Rock, Connecticut, on July 1, where he finished second behind Penske's Birdcage. In August, he made another foray into



From the top: Stirling Moss in 950; Dan Gurney in 951; Innes Ireland in 952; Masten Gregory in 953

## Lotus 19 Production

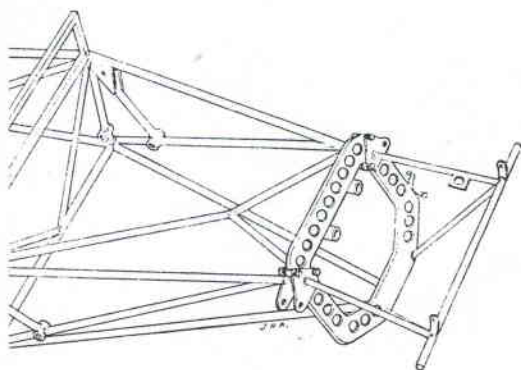
CHASSIS NUMBER	ENGINE DELIVERED	FIRST OWNER, KNOWN HISTORY
950	2.5 Climax	U.D.T. Laystall/Stirling Moss (G.B.) 1960—Terry Buffum (San Francisco) 1980
951	2.5 Climax	Arciero Brothers/Dan Gurney (California) 1960—Arciero Brothers 1980
952	2.0 Climax	U.D.T. Laystall (G.B.) 1961—Rosebud Racing Team (Victoria, Texas) 1962
953	2.5 Climax	U.D.T. Laystall (G.B.) 1961
954	2.5 Climax	J. Frank Harrison (Chattanooga, Tennessee) 1961—Became Harrison-Ford Special
956	2.5 Climax	Charles Vögele (Switzerland) 1961—Changed to 2.0 Climax for hill climbs; fifth in championship 1962
957	None	Corsten 1961
958	2.5 Climax	Roy Schecter 1961
959	2.5 Climax	Peter Ryan (Toronto, Canada) 1961—Tom Skouras/Lou Selley (St. Hellena, California) 1980
960	1.5 Climax	Robert Publicker (Fort Lauderdale, Florida) 1961
961	2.0 Climax	Dr. Harry Zweifel (Switzerland) 1961—Fifth in Hill Climb Championship 1961; seventh with Maserati engine 1962; fourteenth with Ferrari engine 1963
962	None	Rod Carveth (San Francisco) 1961—Installed Buick V-8 in 1961; Bev Spencer (San Francisco), Stan Peterson (Los Angeles), Frank Crane, Lee Geiter, Don Orosco (Fresno, California) 1979; Stephen Griswold (Berkeley) 1980; Chris Drake (G.B.) 1980
963	None	Henry Olds 1961
964	2.7 Climax	John Coundley (G.B.) 1961
965	2.0 Climax	John Mecum (Houston, Texas) 1961—Changed to Buick V-8; Bill Wonder (New York) 1980
966/19B	V-8 Ford	Dan Gurney (Costa Mesa, California) 1963—Wayne Lyndon (Sacramento, California) 1980







Lloyd Ruby in 954; Jack Nethercutt in 955; Dave Causey; Jerry Grant



the SCCA's stronghold only to DNF with gearbox ills, while running a close second to Penske again. At the age of 21, Ryan won the Canadian GP (for sports cars) on September 30 against a field made up mostly of Canadian club racers. That win, together with the points won previously in the 1961 Canadian season, won him the Canadian club's "Driver to Europe" award. He subsequently sold the Lotus to the R.M. Hollingshead Company in January of 1962 and crossed the Atlantic to drive a Lotus Formula Junior. Francis Bradley was the driver for the Hollingshead Company. He won the Canadian Championship in 1962 with two wins and several good places. For 1963, the car carried the name "The Whiz Special" and Dennis Coad was the new driver. He won Hollingshead their

second Canadian Championship and 959 its third.

By 1964, the King Cobras and Chaparrals were firmly in control of the professional racing scene. The Hollingshead Company sold their 19 and it slipped quietly into the obscurity of Canadian club racing. In 1965, it appeared at a six-hour enduro at Watkins Glen and suffered a minor breakage which eliminated it from the event. John Boxtrom of Toronto bought it on the spot and took it home. When Tom Skouras found it, it was virtually as raced in 1965. The Griswold Company has now completed a first-rate restoration and the car is about to enter its second race career. Its period of domination may be long past, but its period of great entertainment has just begun. 🏁

### Lotus 19 Victories

DATE	PLACE	DRIVER/SPONSOR	POSITION	AVERAGE SPEED (mph)
August 7, 1960	Karlskoga	Stirling Moss	1st	
October 23, 1960	First Pacific Grand Prix Laguna Seca	Stirling Moss/U.D.T.	1st Heat 1	
			1st Heat 2	
			1st Nassau Trophy	89.5
December 1960	Nassau Speed Week	Dan Gurney/Arciero	1st	
April 15, 1961	Oulton Park	Henry Taylor/U.D.T.	1st	
April 22, 1961	Aintree "200"	Stirling Moss/U.D.T.	1st	
April 29, 1961	Silverstone International Trophy	Stirling Moss/U.D.T.	1st	
June 24, 1961	Mosport Players "200"*	Stirling Moss/U.D.T.	1st Heat 1	
September 30, 1961	Mosport Canadian Grand Prix*	Peter Ryan	1st Heat 2	
			1st	86.36
			*Lap record: 1:40.0 (Moss)	
October 22, 1961	Second Pacific Grand Prix Laguna Seca	Stirling Moss/U.D.T.	1st Heat 1	90.3
			1st Heat 2	91.9
			1st Nassau Trophy	90.79
December, 1961	Nassau Speed Week	Dan Gurney/Arciero	1st	
February 11, 1962	Daytona Continental 3-Hour	Dan Gurney/Arciero	1st	104.1
June 9, 1962	Mosport Players "200"	Masten Gregory/U.D.T.	1st Heat 2 Plus Overall	
June 10, 1962	Laguna Seca	Pete Lovely/Rosebud	1st Heat 1	
			1st	84.6
			1st	82.91
July 29, 1962	Kent Seafair Cup	Jack Nethercutt	1st	
September 22, 1962	Mosport Canadian Grand Prix*	Masten Gregory/U.D.T.	1st	86.5
			*Lap record: 1:31.5 (Gurney)	
September 30, 1962	Kent Northwest Grand Prix	Dan Gurney/Arciero	1st Heat 1	89.0
			1st Heat 2	89.3
			1st Heat 1	89.0
October 21, 1962	Third Pacific Grand Prix*	Lloyd Ruby/Harrison	1st Heat 2	91.0
			*Roger Penske Cooper Special was third overall winner	
December, 1962	Nassau Speed Week	Innes Ireland/Rosebud	1st Nassau Trophy	
			1st Heat 2	
			1st Heat 1	92.0
June 1, 1963	Mosport Playes "200"	Chuck Daigh/Arciero*	1st	
July 28, 1963	Hoosier Grand Prix	Lloyd Ruby/Harrison	1st	
			1st	
			1st	
September 28, 1963	Mosport Canadian Grand Prix	Pedro Rodriguez	1st	
			3rd	
			1st Heat 1	86.2
September 29, 1963	Kent Northwest Grand Prix	Lloyd Ruby/Harrison Ford	1st Heat 2	86.3
October 20, 1963	Pacific Grand Prix Laguna Seca	Jim Clark/Arciero	DNF	
			Lap at 1:12.5	