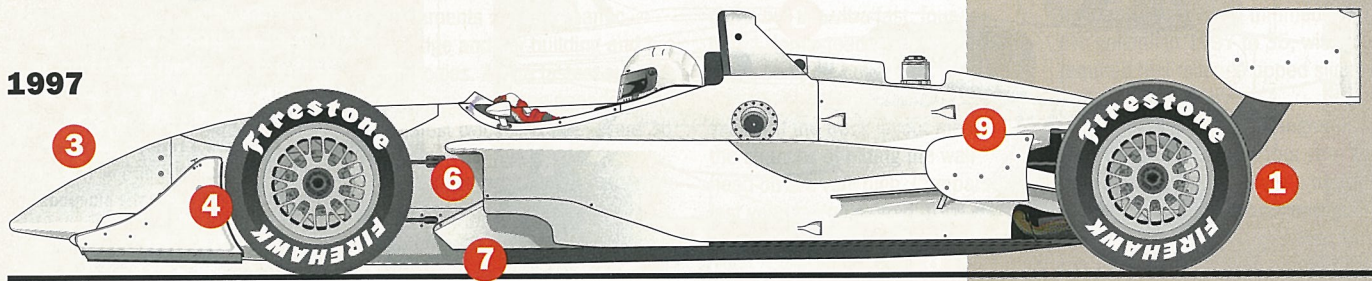


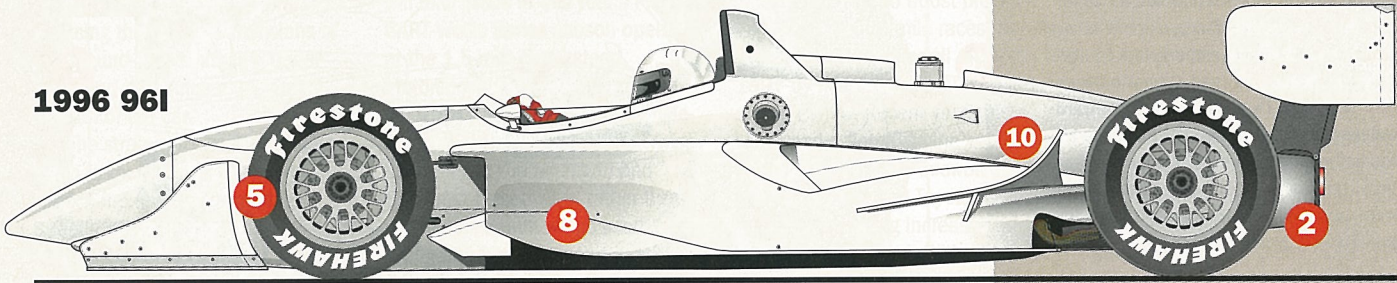
# Reynard 971

reynard 

1997



1996 961



**REYNARD 971** With the exception of a shorter tail (1)—the result of changing from a longitudinal gearbox (2) to a transverse unit—the 1997 Reynard has made fewer changes, visually, than most of the other '97 models. Because Reynard's customers use each of the four makes of engine, it has a more complex set of packaging criteria than do the other chassis builders.

■ Reynard chassis have won the last two PPG Cup championships and the company currently is CART's most successful and popular car-builder. Founded and operated by Adrian Reynard, the company is based in Bicester, Oxfordshire, about an hour's drive west of London. Reynard's chief designer is Australian Malcolm Oastler.

According to Oastler, the biggest change from last year's 961 to the new 971 is in its transmission. Oastler has gone for a 'transverse' gearbox this year with the gear clusters running transversely across the transmission, rather than the more traditional 'longitudinal' layout with the gear clusters facing fore and aft.

"I would say it's given us a considerable performance improvement," Oastler said. "The transverse box reduces the polar moment and the height of the center of gravity both longitudinally and vertically. There's not really much improvement aerodynamically from the transverse box." So quicker lap times should come from better handling than from aerodynamic tweaks.

In fact, Reynard has been the only Indy car builder in recent years *not* to utilize a transverse gearbox, which means Oastler has merely brought the 971 up to date. Oastler said it took a lot of work to cram all the components into the tiny space specified. "All gearboxes are a considerable undertaking," said Oastler, "particularly when you're trying to jam a bunch of gears into the same space where there weren't any before, and not make the car unacceptably long.

"If you make the gearbox too long, you end up with the fuel tank too far away from the back wheels; so when you fill it up with fuel, the weight distribution moves forward a significant amount and you get a change in handling. So, keeping it compact was one of the criteria. Another criterion was being able to change ratios quickly without having to pull the floor off and get involved in removing exhaust systems and all that unfortunate stuff."

Small aerodynamic changes have also reaped rewards. "There's a rear wing change for the new rules," noted Oastler, "which has removed a bit of downforce and drag, but there are no big changes to the aerodynamic concept. We've made some small improvements along the way from our work in the wind tunnel."

Reynard is the only constructor to produce cars powered by all four engines—Honda, Ford Cosworth, Mercedes-Benz and Toyota. Oastler said he and his design team have found ways to make all four engine installations roughly similar. "They're all very similar now," he grinned. "They weren't that way when we started; but now I'd say they were agreeably similar."

## Design Brief

There are a number of subtle aerodynamic changes in the 971. In moving the driver rearward, Reynard was able to shorten the nose (3).

Although the horizontal surfaces of the front wing are virtually unchanged from last year, the aft portion of the endplate (4) has been truncated, eliminating the unique kick-out (5) employed on the 961.

The radiator opening (6) has been moved rearward, as have the radiators; and Reynard continues to tweak the vortex generator (7) leading to the underwing. Also, the 961 had a subtle dimple effect in the lower half of the sidepod (8) just aft of the radiator opening. That dimple has been eliminated on the 971.

Another different aero approach on the 971 is the use of a winglet (9), complete with endplates, to divert the radiator exit air up, over and around the rear tire. This device came on line as an update, late in the 1996 season. The early 961 employed a kick-up fairing (10) to accomplish this.

### 1997 REYNARD LINEUP

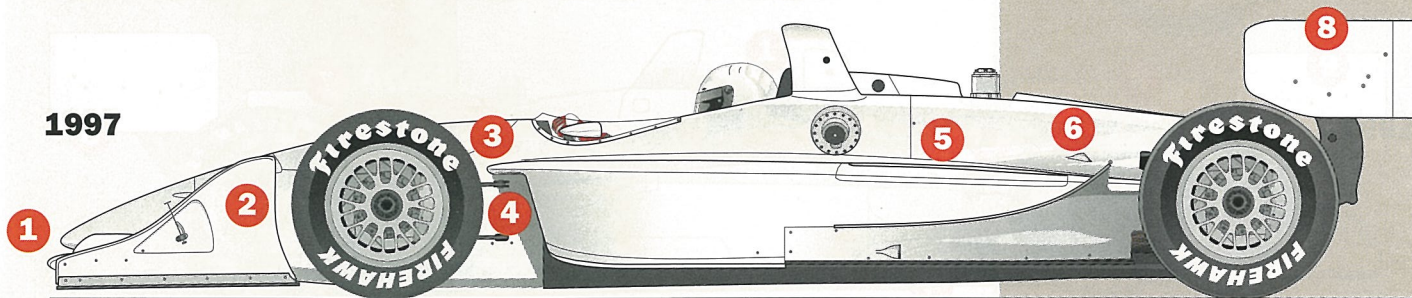
Target/Chip Ganassi Racing Teams  
Team Rahal  
Walker Racing  
Brahma Sports Team  
PacWest Racing Group  
Player's Ltd./Forsythe Racing  
Bettenhausen Motorsports  
Team KOOL Green  
Davis Racing  
Hogan Racing LLC  
Arciero-Wells Racing  
All American Racers



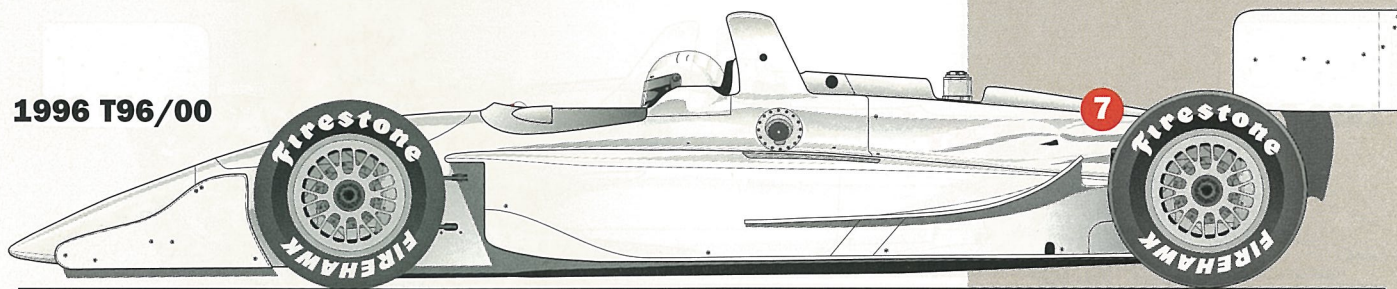
# Lola T97/00

LOLA

1997



1996 T96/00



**LOLA T97/00** With designer John Travis having moved over to Penske, the new design team at Lola—headed by Roger Tyler—has turned out a brand-new car for 1997. Much of the packaging has changed, particularly in the area of serviceability. The T97/00 is smaller and lighter than its predecessor, with a dramatically different aero package.

■ Lola cars have won 104 CART and USAC races since 1966. The English company, founded by Eric Broadley, also has won six PPG Cup titles. This year, Lola lost not only its keynote Newman/Haas team to the new Swift but also saw Pat Patrick and Jerry Forsythe go to Reynard. As a result, Lola's share of the market has dwindled to four teams.

Broadley continues as the overall conceptual design chief at Lola Cars, working with a large staff of younger engineers. As many as 20 worked on this year's T97/00, an effort headed by Ben Bowlby and aerodynamicist Chris Saunders.

Roger Tyler, the company's engineering director, described the '97 Lola as "a totally new car, not an evolution of anything we've done before. There's about 1200 hours of wind tunnel time in the project, supported by two aerodynamicists and six model makers. So it was a very big project.

"Fundamentally," Tyler continued, "we've changed the systems to a more straightforward configuration where the suspension points are on the outside of the monocoque. We've tried to do things like this that help the teams when they're making changes at the track. We're trying to make it easier for the teams by trying to simplify the car and reduce the number of pieces. I think we've reduced the number of bits by about 18 percent.

"From the chassis back we've made the design modular; so by dropping the underbody and undoing the engine mounts, you can pull the whole back of the car away from the tub. We've also brought the oil tank out of the fuel cell. These changes help in the speed of turnaround for an engine change or any major mechanical change."

The T97/00 has similar suspension geometry and front uprights to last year's car with "roll-damping" on the front end. Other features, said Tyler, include changing the weight distribution to get more out of the tires by moving the driver and the radiators farther back in the monocoque. It's a lighter car with room provided for ballast; so, according to Tyler, "The car has lots of development built into it in terms of grip.

"On the back end," Tyler concluded, "there's a change to the uprights and the drivetrain. We had some problems there last year, and we've increased the quality. We've basically got Formula 1-specification driveshafts."

With Reynard whittling steadily away at Lola's customer base and new competition for next year's customers from Swift, there's plenty of pressure on Broadley, Bowlby, Saunders, Tyler and the rest of Lola's design staff to make the T97/00 a winner.

## Design Brief

The smaller 35gal. fuel cell, mandated this year, has allowed the driver—and his pedal mechanisms—to be moved rearward, creating extra space toward the front of the car and allowing designers to shorten the noses on all the 1997 models. Lola chose this year of shorter noses to thrust its short oval/road course front wing radically forward in search of cleaner air. The resulting front wing actually extends forward of the nose (1) and sports the largest endplates (2) of any of the '97 cars.

The shape of the sidepods in plan view is virtually unchanged from the T96/00, and the leading edge of the sidepods (3) picks up farther forward than on the other '97 Indy cars.

The radiator inlet (4) on the T97/00 has been reshaped to better channel air to the radiators and the underwing, and the radiator exit (5) has been moved aft.

The engine cover (6) of the new car is much cleaner, having been cleared of many of the lumps and bumps (7) so prevalent on the '96 model.

Lola continues its practice of mounting the rear wing closer to the rear axle than do the other manufacturers. The rear wing endplates (8) have undergone a reshaping to better accommodate the new, two-element design for '97.

### 1997 LOLA LINEUP

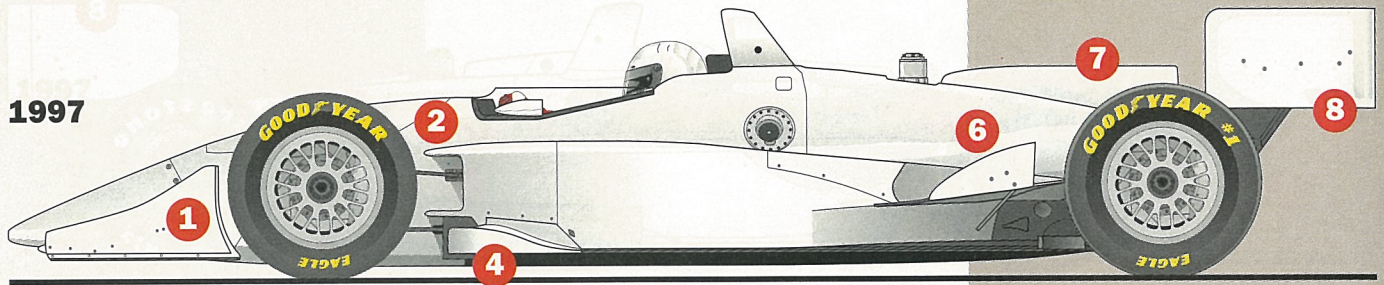
Tasman Motorsports Group  
Payton/Coyne Racing  
Della Penna Motorsports  
Project Indy



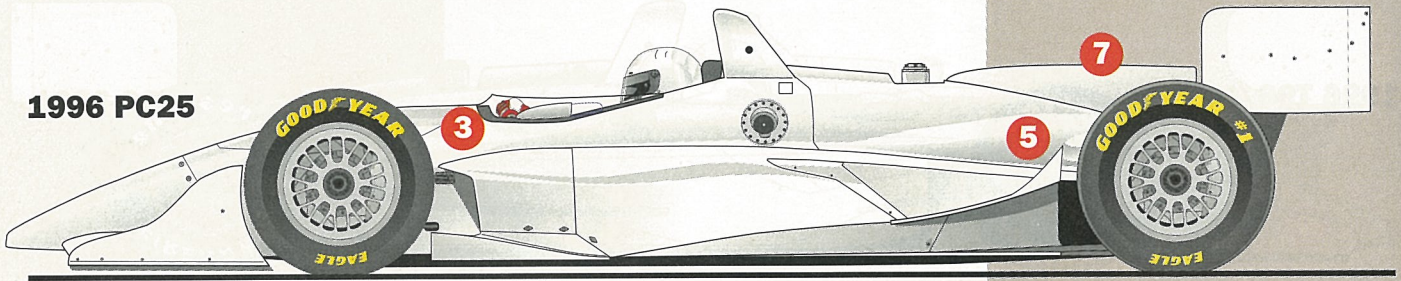
# Penske PC26

**PENSKE**

1997



1996 PC25



**PENSKE PC26** One of the areas that new chief designer John Travis has tackled with gusto is the front wing, which proved the Achilles heel of the PC25. Several observers noted front wing movement or flutter on the '96 Penskes, which led to intermittent erratic handling—a phenomenon that would be hard to pinpoint in a wind tunnel, because test models tend to be stiffer than real race cars.

■ Last year's Penske PC25 came close to winning two or three races, but failed in the end to win even one. It was the first time in 20 years that Team Penske had not won a single race. Not surprisingly, a big effort has gone into this year's PC26 with new Chief Designer John Travis assuming development of the car from retiring design chief Nigel Bennett. Travis joined Penske last summer after five years at Lola and since has taken a close look at his new employer's design and engineering methods.

"Last year's car had a narrow performance band, and that was due to the aerodynamics," commented Travis. "The PC26 behaves like a normal Indy car. It's more consistent. I think we've opened up the performance envelope, and the comments from the drivers in winter testing have backed up the simulations we've done."

"The big difference in the car," noted Travis, "is the front wing, which has been designed to reduce the sensitivity of the aerodynamics at the front of the car. Consistency and balance are what the driver wants."

Nigel Beresford, Paul Tracy's former race engineer, was promoted during the winter to head of engineering at Penske Cars. Beresford attends most of the races and is the key link between the race team in the USA and the English car-building shop.

"With Penske Shocks and our man, Jeff Ryan," said Beresford, "we have tons of resources which haven't been properly marshalled." Indeed, Marlboro Team Penske will have exclusive use of the reworked Penske Shocks this year.

Beresford says the PC26 has improved brakes. "We learned a lot from testing a Reynard last fall, and we've applied what we learned and more." Beresford adds that the PC26 "is much tidier mechanically, thanks to John (Travis)'s input."

Travis notes Penske is investing heavily in the Southampton University wind tunnel and its model-building shop, having just completed a study of the test area dynamics. "We will be investing in the study results to make the Southampton tunnel one of the best in F1 or Indy cars," said Travis. "We will also be investing in software that will enable us to analyze data in the tunnel and evaluate it instantly as it happens."

Nick Goozee is managing director of Penske Cars, the car-building operation in Poole, Dorset, on England's south coast. "We're very pleased that Roger has invested his trust in us," said Goozee. "We're fully aware of the importance of this year to Marlboro Team Penske, and I think we have all the elements to have a very good race car."

## Design Brief

When John Travis went about stabilizing the performance of the PC26 front wing, he had less to work with, structurally, because the Penske—along with the other '97 models—was sporting a shorter nose. Although the front wing is working much better, there is no external evidence of strengthening. The only visual difference is the reshaping of the endplates (1).

The radiator inlet has been raised a couple of inches on the PC26 (2), virtually eliminating the ramping effect that was noticeable along the upper forward surface of the sidepods (3) on the PC25.

The PC26 continues to sport the odd open channels (4) along the lower leading edge of the sidepods, more prevalent than ever on the PC26.

As with most of the '97 models, the PC26 has replaced the kick-up fairing (5)—as an air management device in front of the rear tire—with a winglet (6).

Nigel Bennett's shark fin (7) of a few years ago, remains a Penske signature. Besides being a nice sponsor billboard, there is some evidence that the fin produces a stabilizing effect in yaw. Teams have added these fins to every make of race car (see p. 73).

One other noticeable aerodynamic tweak is that the new two-element rear wing (8) has been moved aft several inches.

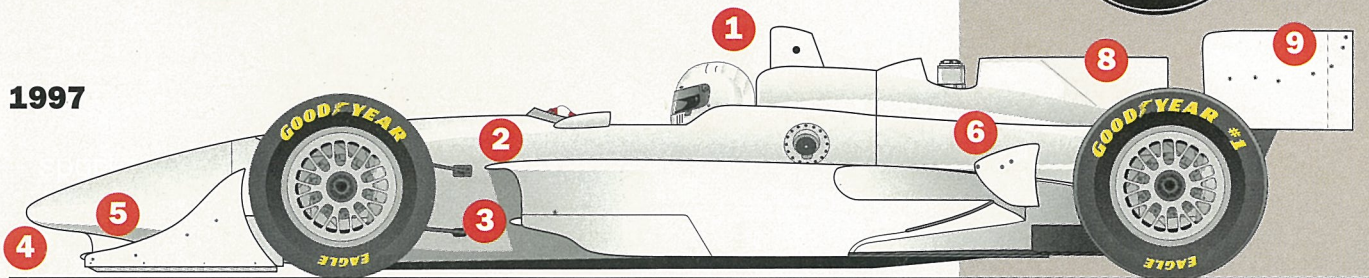
1997 PENSKE LINEUP  
Marlboro Team Penske



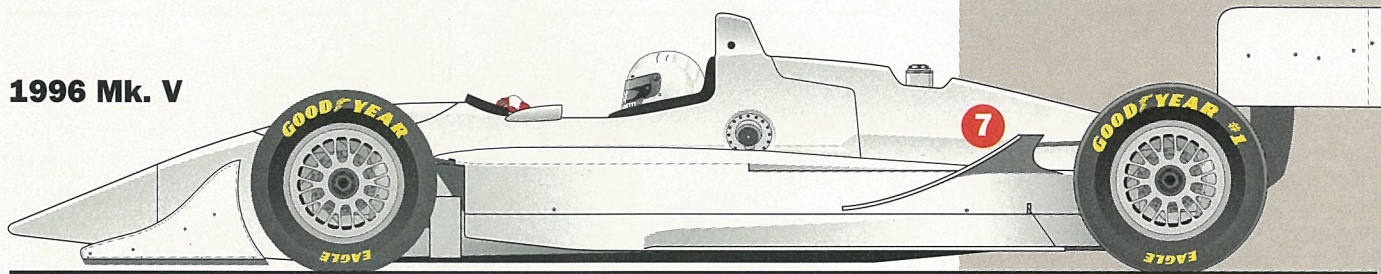
# Eagle 977



1997



1996 Mk. V



**EAGLE 977** If you had any doubt that the new Eagle was indeed a fresh approach, you need look no farther than the two side views above. The rounded front-to-rear profile of the Mk. V is history, giving way to the projectile look of the 977. A cursory examination of the comparative aero packages suggests that Dan Gurney is leaving no stone unturned in his search for the combination that will put the Eagle in the hunt.

■ The Eagle is designed and built at All American Racers (AAR). Founded by driving great Dan Gurney in 1965, AAR built the first Eagle Indy car the following year in the Santa Ana, Calif., shop they still occupy today. Between 1966-'81, Eagles won 23 USAC and CART races, including the '74 National Championship and the '75 Indy 500. More recently, AAR competed in IMSA's now-defunct GTP series with a pair of Toyota-powered Eagle prototypes, winning the 1992 and '93 championships and scoring 17 consecutive victories.

AAR returned to PPG Cup racing last year with the Eagle Mk. V-Toyota driven by Juan Fangio II and PJ Jones. This year's new Eagle 977 has been designed specifically for Toyota's new RV8B engine to be introduced later in the season. While the new package is prepared and tested, AAR will race the older engine in a '96 Reynard chassis.

"We will only race the Eagle if it is competitive," said Gurney before the start of the season. "We will thoroughly test the car and give it our best shot. We are concerned that our aerodynamic package may not be up to the job, in which case, we will go back to the wind tunnel and work on making it better."

How long will that take? "I believe we will race an Eagle before the end of the season," Gurney asserted, "and we will be working flat-out on producing a competitive car. We intend to race an Eagle this year," he stressed. "We don't intend to run it unless we think it's going to be very competitive."

"We don't have the final configuration nailed down yet," Gurney said. "We've made a lot of progress from last year's car; but we feel that in order to be really solidly in the hunt, we're going to have to be better than our first version of the new car."

"Understanding why one is better than the other—or establishing what are the strengths or the weaknesses of the Reynard, or any other competitive car we see out there, and hopefully incorporating the various strengths and maybe actually enhancing them a little bit—will be what the Eagle should amount to. At this point, prior to the start of the season, we have quite a few more questions than answers. I sure hope the new Toyota engine is much stronger and more competitive than last year."

"We're very happy that we have a Reynard to fall back on," Gurney concluded. "I think the Reynard people realize that we are trying hard with the Reynard, and they've been reasonably open with us. Considering the situation, we give Reynard high marks; and I think we've surprised them with how well we've gone in winter testing. It's a good combination."

## Design Brief

It would appear that Gurney has had more success than his competitors in '97 in moving the driver (1) rearward, winning that design competition by several inches. That has allowed moving the radiators and the leading edge of the sidepod (2) rearward dramatically. If weight distribution was a problem with the Mk. V, then AAR has gone a long way toward curing that.

The radiator inlet and tunnel entrance (3) areas have also undergone a redesign.

The shorter, more rounded nose of the 977 (4) has inched higher, further enhancing the anhedral effect (5) of the front wing.

Air management aft of the radiator outlets has received considerable attention, with the ubiquitous winglets (6) replacing the kick-ups (7) of last year.

And, would you believe, that vertical slab in the middle of the engine cover is a shark fin (8), upon which Denso has already staked a claim.

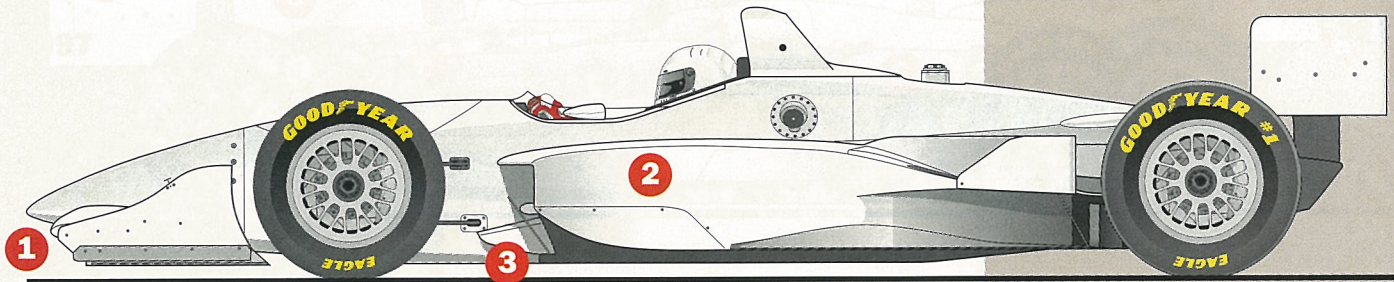
At the back, the new two-element rear wing (9) has been moved slightly inboard, making the Eagle the shortest overall of the '97 models.

1997 EAGLE LINEUP

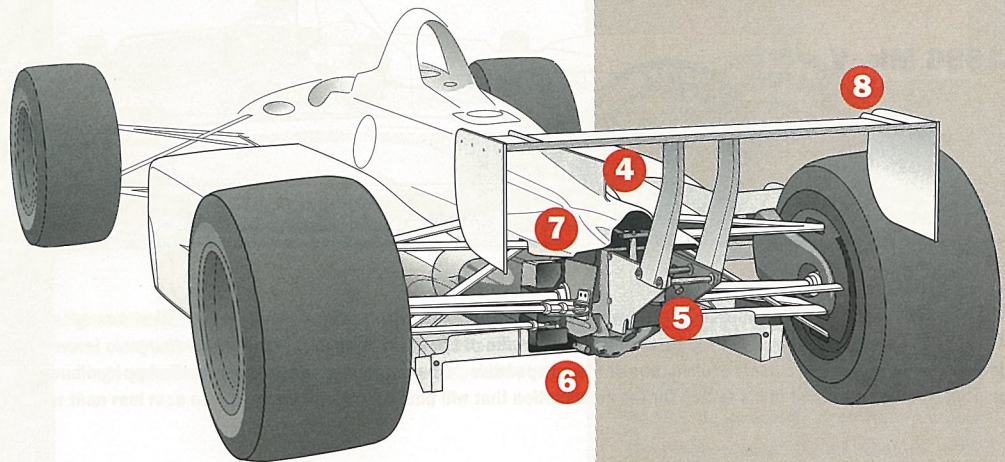
All American Racers



# Swift 007.i



**SWIFT 007.i** Designer David Bruns likens the design of an Indy car to a packaging exercise. "All of the mechanical systems not only must fit under the skin of the race car," said Bruns, "but they have to have room to operate through a full range of motion. That's where having input from race engineers is so helpful. It allows you to take into consideration a variety of setup configurations."



■ The Swift 007.i aims to become the first American-built car since 1983 to win a PPG Cup race. Elegant in both detail and overall concept, the Swift is judged by many observers to be the most beautiful of the 1997 race cars. With Michael Andretti and Christian Fittipaldi handling the driving for Newman/Haas Racing, expectations are high for Swift's first season.

Hiro Matsushita bought Swift Race Cars in 1990 and plans were developed by Executive VP and Chief Operating Officer Alex Cross and Chief Designer David Bruns to construct a state-of-the-art wind tunnel in anticipation of a future Indy car project. The new tunnel was used extensively last year by both the Williams and Stewart F1 teams, with Stewart-Ford continuing to lease tunnel time. Meanwhile, the Swift Indy car project received the green light last February, after Matsushita and Cross forged a partnership with Carl Haas for Newman/Haas to race the Swift in 1997 and for Haas to act as the company's sales agent for both PPG Cup and Toyota Atlantic cars.

Swift, founded by Cross and Bruns in 1983, has built a series of successful small race cars—Formula Ford 1600, FF2000, Sports 2000 and Toyota Atlantic—but it was Matsushita's vision and investment, plus the construction of the wind tunnel that enabled Swift to tackle the Indy car project. With his first chance to design a whole race car from scratch, Newman/Haas' aerodynamicist Mark Hanford began his wind tunnel studies for the 007.i last March, while Bruns and his team of engineers went to work designing the mechanical elements of the car.

"From the experience and data that Newman/Haas has gathered over the last 10 years," commented Bruns, "their engineers—particularly Peter Gibbons and Brian Lisle—have a very good fundamental understanding of what these cars need in order to run quickly; and what we tried to do was incorporate that experience into a piece of hardware that will allow that to happen."

In addition to designing the car, Swift had to buy and install the necessary machine tools and autoclaves and hire enough skilled people to build the cars. Much of the spooling-up duties fell to Jim Chapman, vp of manufacturing. A total of 65 employees, including 15 design engineers, are now dedicated to the project, working in Swift's 60,000sq.ft. engineering facility in San Clemente, Calif.

Bruns has gone against conventional wisdom by designing a more traditional longitudinal gearbox rather than a transversely geared transmission as employed by every other 1997 PPG Cup car. Bruns won't discuss his reasons for taking the opposite tack; and it is with this spirit of adventure that the Swift has been born.

## Design Brief

Note that the profile view of the 007.i shows road course/short oval trim, while the three-quarter rear view is of the speedway configuration.

The Swift is a striking example of the current raised nose/anedral front wing design trend (1).

The top of the sidepod (2) is slightly more rounded in profile than the other '97 designs. The underwing tunnel entrance features a vortex generator (3).

The team may choose to add a shark fin (4), shown here in the rear view and on Andretti's car (BOTTOM, p. 73).

The most unique visual feature of the Swift is the raised gearbox (5), which allows unobstructed air flow from the full 35in width of the underwing tunnel exit (6). Also, the engine exhaust system (7) has been tucked up around the gearbox, cleaning up the undertray area between the rear wheel and the gearbox/exhaust housing.

One other aero feature of the Swift is the fence (8), inboard of each of the rear wing endplates.

1997 SWIFT LINEUP  
Newman/Haas Racing