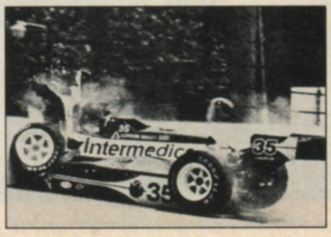
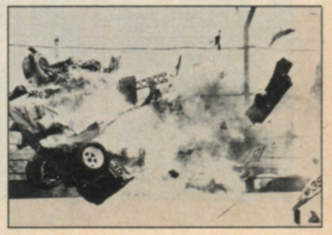
Safer at Any Speed

The dangers of the racecourse have lead to auto safety devices we all can use. by John Sedgwick

H. BUFF HERR

Above: *A pit crew loads fuel.* **Above right:** *A Formula One car.* **Right:** *Gordon Smiley's car hits the wall at 200 mph and breaks up within seconds.*





Mario Andretti was flying around the track in his wedge-shaped, eight-cylinder Lotus practicing for the 1978 Swedish Grand Prix when the suspension system failed and the car spun out, flipped over, and started tumbling end over end. "It happened so fast," says Andretti, "that all I could do was pray." His prayers were answered, for he emerged from the wreckage unscathed—a tribute to the tightened safety standards for racing cars and, with the latest models breaking the 200-mph barrier, to the unexpected payoff of greater security for drivers.

While racing authorities like to say that a racer is safer on the track than a typical driver is on the road, the statistics don't quite bear that out. According to the National Traffic Safety Agency, there are approximately three deaths per hundred million passenger miles on the country's public roads. However, the Sports Car Club of America, a major sanctioning organization, reports about 30 deaths per hundred million driver miles, a figure that experts agree probably holds for the sport as a whole.

Nevertheless, in absolute terms, the sport's safety record is impressive. With as many as a hundred thousand drivers logging countless miles at a thousand tracks every year, annual fatalities average only about six. (For reasons no one can explain, that number swelled to 19 in 1982.) As Dave Hedrick of Goodyear Tire and Rubber—a company with interests on both road and track—puts it, "I wouldn't try to argue that you're safer in a race car at two hundred miles an hour than on the highway at fifty-five. But," he adds, "I will say that it's a whole lot safer than people think."

If that's so, it's because racing authorities lately have taken up the subject of safety with a fervor equal to that of racers going for the checkered flag. And the effort has paid off. In Andretti's case, he credits the then-recent requirement that the open racing-car cockpits be protected by roll bars just behind the driver's head and by a smaller hoop in front near the windscreen to shield the driver during a flip-over. "Otherwise," says An-

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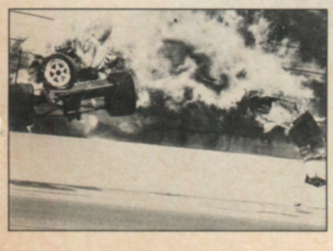

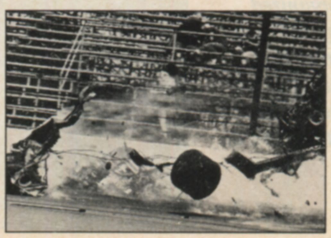

PHOTOGRAPHY: JACK GLADBACK/BLACK STAR

dretti, "I would have been crushed."

Yet more sophisticated safety features also helped him survive that crash and the countless others he has experienced. The exterior shell of the vehicle is designed with sufficient give to absorb impact, and the methanol-filled fuel cells around the driver in the cockpit tub are made of a virtually bulletproof nylon inner tube encased in reinforced steel. The fuel-cell technology was developed to protect helicopter pilots in the Vietnam War. A compartment in the cockpit is loaded with several pounds of fire-extinguishing Freon; some cars are now equipped with heat-sensitive receptors that release the gas automatically in a fire in case the driver is injured and can't flip the switch.

Because Freon works by replacing oxygen in the burning environment, the driver's helmet is rigged to a tank filled with enough air for 60 seconds of breathing. And the clothes—socks, long underwear, jumpsuit, gauntlet gloves, and hood—are made of fire-retardant fibers such as Nomex, which was developed by the aerospace industry. Covering, by regulation, every inch of a driver's skin except the eyelids, the material is engineered to keep flames out for approximately 20 seconds.

Although one might expect that automobile manufacturers would incorporate the racing-car safety improvements in their products, few of these features actually apply to the needs of regular drivers. Fire is the number-one danger feared by racers, but it accounts for less than 1 percent of all deaths on public roads. And concerns about price and gas mileage make car companies reluctant to add the expensive and weighty roll bars and other devices to make cars more crashworthy.

Racers didn't always come out so far ahead of the everyday driver on the issue of protective equipment. Andretti can remember back to the early days of organized racing in the late fifties when Indy 500 drivers took off wearing cotton T-shirts in cars without roll bars down a track walled by bales of hay. "We used to have a meeting of all the drivers at the

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Mario Andretti (top) is known for both his excellence in racing and his stringency about safety. One of the world's leading Indy and Formula One drivers, Andretti fought hard—and successfully—to introduce safety equipment and regulations into organized racing. **Above:** *The dashboards of Formula One cars have been stripped down to the bare minimum and consist mainly of a tachometer, switches for the car's electrical system and fire-extinguishing system, and an oil-pressure gauge.*

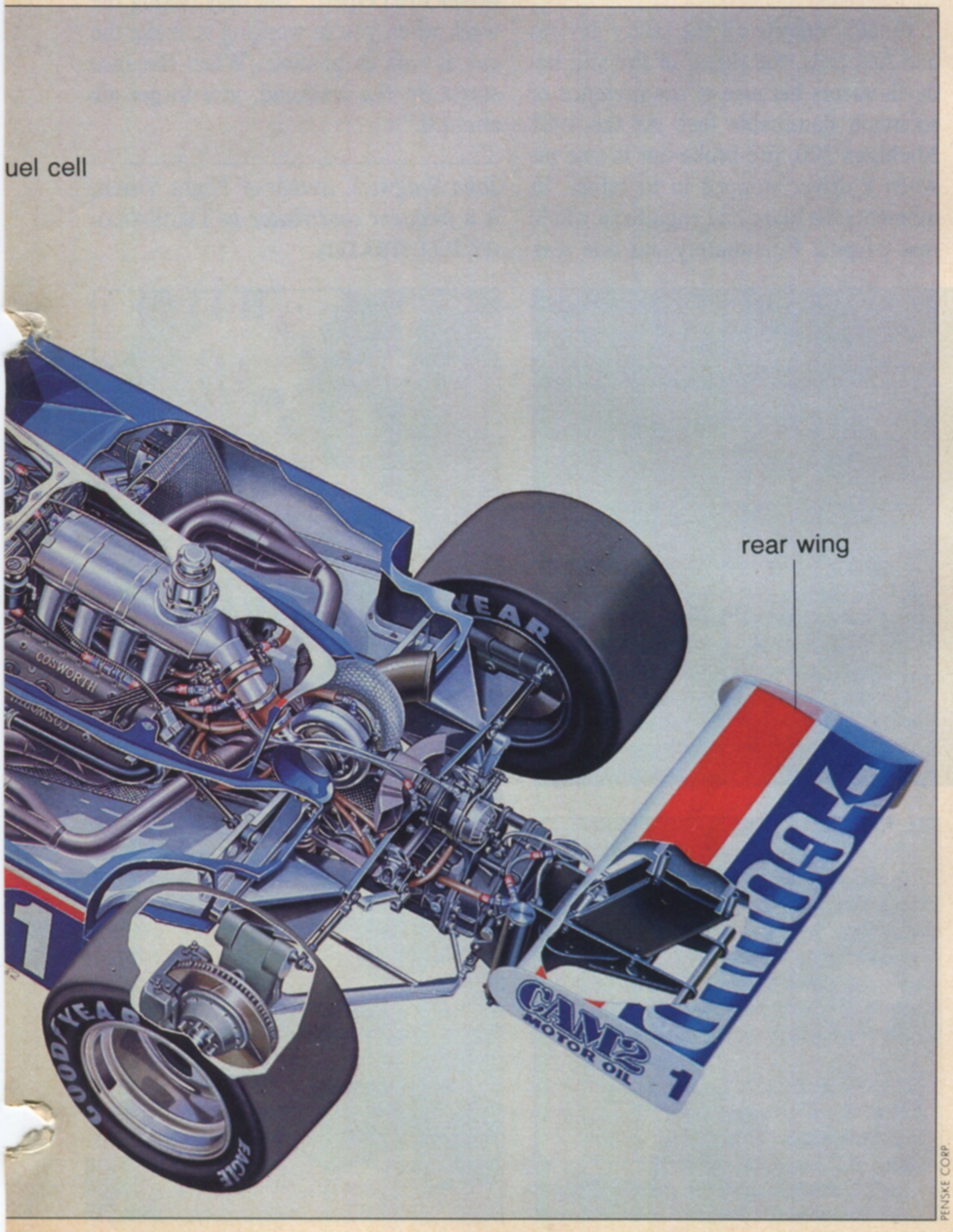
beginning of the year," he recalls. "I'd look around the room and wonder which guys weren't coming back. And a lot of them didn't."

Together with driver Jackie Stewart in the early sixties, Andretti began pressuring racing authorities to require such basic safety measures as sturdy, six-point seatbelts, roll bars, nonflammable clothing, steel track barriers, and trained rescue and fire personnel at the racecourse. Many of these improvements could only come by across-the-board regulation because they slowed the driver's time. Even now, drivers occasionally try for that slight racer's edge by paring down their rearview mirrors to cut drag, skimping on emergency equipment to reduce the load, or going light on Nomex clothing to keep from cooking on a hot track.

While such safety regulations as the recent one limiting the size of Grand Prix engines do indeed hurt finishing times, other safety measures, paradoxically, have come as spin-offs of the quest for higher speeds. The stiffer chassis of the Trans-Am cars, for instance, made possible by the use of mild steel tubing, are a prime example. "A flexible chassis acts like a spring," explains Mac Demere of the Sports Car Club of America, "and all that bouncing slows you down." Flexibility also makes the car harder to handle—an obvious safety hazard.

Interestingly, one method currently employed to stiffen these sedan-type cars, generally considered the safest of all racing vehicles, is to use the safety roll cage as a skeletal frame that attaches directly to the suspension system. When this possibility was first raised, various auto club rules committees forbade the idea of using a safety device to increase speeds as somehow antithetical to the spirit of racing. They have since rescinded their verdict. Now, says SCCA technical director John Timanis, "Instead of building a car and sticking a roll cage in it, teams start with the roll cage and build the car around it."

In the same spirit, engines are being placed lower in the car to drop the car's center of gravity and improve its cornering—which means fewer trips over the



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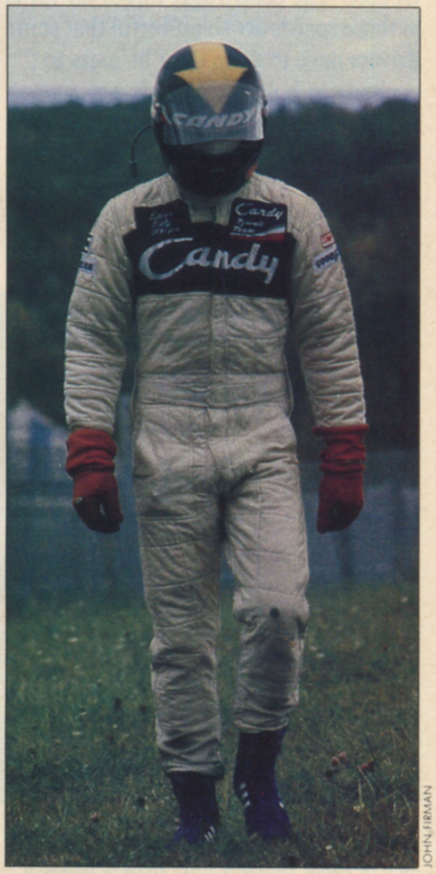

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Left: *Safety devices of the Gould Charge include a tubular frame of light steel, roll bars, six-point seatbelts, durable fuel cells within the fuel tank, and a fire-extinguishing system complete with heat-sensitive actuators. Since Rick Mears drove the car to win last year's Indy world series championship, changes in regulations have moved the rear wing forward and eliminated the skirt around the car, thereby reducing the ground effects that help hold the car down on the road.* **Above:** *Wearing a suit made of fire-retardant fabric, a driver is protected everywhere but the eyes.*

wall. But a more dramatic development along these lines involves a cluster of aerodynamic improvements on Indy-type cars known as ground-effects technology. Essentially, some of the airstream is channeled under a rounded "air wing" as the car whooshes along. The effect is to suck the car down into closer contact with the ground, a critical position in fast corners where races are won. With these upside-down airplane wings, the drivers have been able to take the old 60-mph turns at speeds of over 100. Says Timanis: "The ground-effects technology is so effective that at a hundred and twenty miles per hour, those cars could run upside down on the ceiling." It's the drivers who are having trouble. The centrifugal forces on turns at those speeds are so powerful that some drivers have to strap their helmets to the cockpits to hold their heads up.

Yet, inevitably, each new advance brings new challenges. The stiffer chassis delivers more of the course's bumps to the drivers, making it harder for them to focus their eyes on the road. And the ground-effects technology actually enables drivers to go too fast. Most tracks were designed for speeds now easily surpassed, thereby endangering both drivers and spectators. So this year's racing rules limit use of certain technologies and prohibit others altogether.

Early Indy drivers raced in T-shirts down a track walled by bales of hay.

Finally, despite all the safety devices and fuel cells, the threat of fire still bedevils racers because of the presence of so much flammable fuel. At the 1981 Michigan 500, fire broke out in one pit when a driver stopped in to refuel. In moments the blaze had engulfed a whole row of pits. Fortunately, no one was killed, but the race had to be stopped.

And, of course, the escalating speeds put increasing stress on the critical safety device—the driver. In one of the most terrifying accidents in recent memory, Gordon Smiley missed the turn coming off the straightaway at the Indianapolis 500 and slammed into a restraining wall at 200 miles per hour. The car was destroyed, and Smiley was killed instantly. The accident investigation committee was left with little evidence from which to determine the cause. The crash was chalked up to driver error, which at that speed can mean just the slightest slip at the wrong time.

But the race goes on. "Sure drivers worry about the dangers," says retired driver Fred Opert, "but only during the week when you're working to make the car as safe as possible. When the race starts on the weekend, you forget all about it."

John Sedgwick, author of Night Vision, *is a frequent contributor to* TECHNOLOGY ILLUSTRATED.

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Above: *At the Grand Prix Formula One race in Long Beach, Calif., drivers follow a circuit along regular city streets, as do racers in traditional European competitions. Averaging 100 mph, they can reach 200 mph on long straightaways. Whether in tight packs or twos and threes, they tailgate one another, each merely inches from the next.* **Right:** *Goodyear's Bill Ludwick tests a crashworthy fuel tank designed to prevent fuel spills after high-speed crashes. Encased within three-eighths of an inch of ballistic felt, the tank survived repeated blows.* **Far right:** *Mario Andretti prepares for the Grand Prix.*