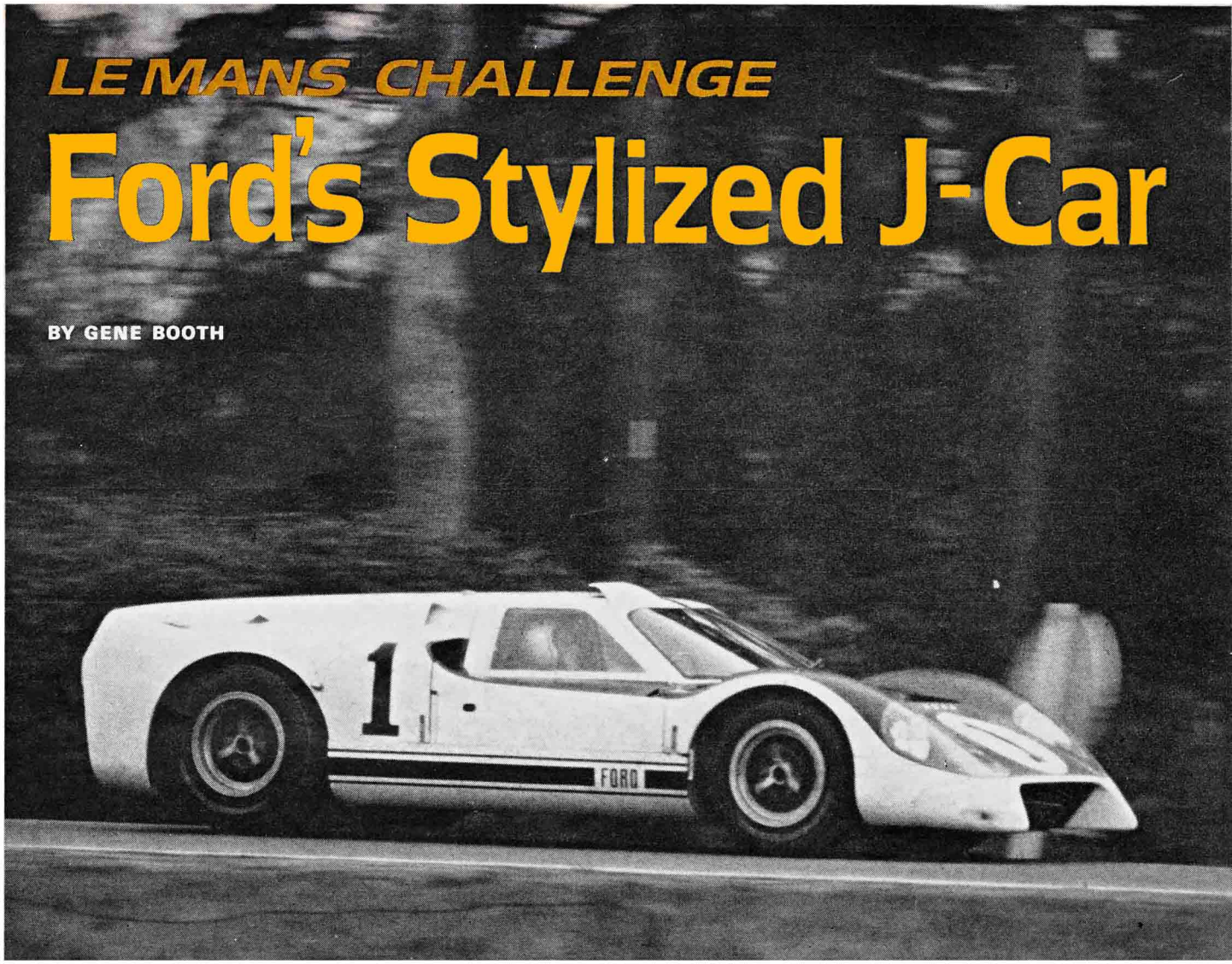
LE MANS CHALLENGE

Ford's Stylized J-Car

BY GENE BOOTH



DISAGREEMENT MAY exist about the extent to which styling and aerodynamics are compatible, but Ford Motor Co. has attempted to find an answer to the question. The vehicle for this exercise is the GT-P, latest variant on the Ford international GT racing car theme (others following the original have been the GT-40, GT-44, GT Mk. II, and GT-X). Guidelines for the car, to inhabit the speed realm above 200 mph, were roughly sketched by Ford's special vehicles department. From that point on, stylists had a virtually free hand to produce the car. The only goal: An aerodynamically perfect car built to the new international Appendix J formula that could dominate the long ultra-high speed events.

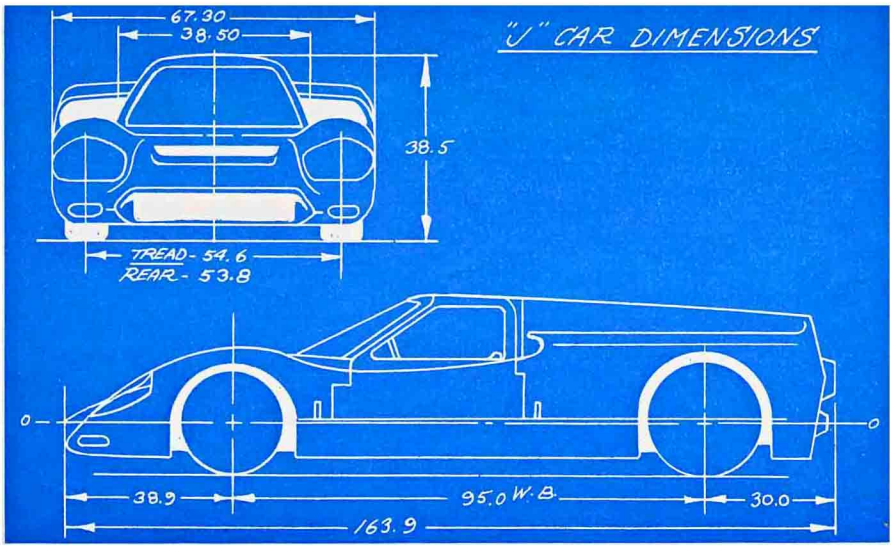
Though the car was developed with the GT-P designation, Ford performance officials have changed the name to simply "the J car" for the sake of accuracy. That is the prototype class it was designed to fit, rather than the GT class, and continuation of the GT-P reference would only have been confusing, it was felt.

Basic hardpoint dimensions, such as 95-in. wheelbase and front/rear tread of 54.6/53.8 in. respectively, were dictated by the shared mechanical and chassis components of the other cars. Stylists were to package the bones and the 427-cu. in. muscle in an envelope of minimal frontal area, extreme low drag coefficient, acceptable lift forces and maximum stability. The aerodynamic considerations for a peak speed of 250 mph were primarily twofold: An exterior shape designed to pack air onto the upper surfaces to hold the car on the ground, and an equally important provision to release air pressure from wheel housings, engine compartment and cockpit. Yet, even bug deflection had to be a subject of investigation.

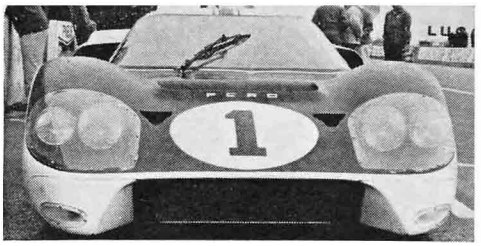
"With this car, we've tried to bring about a marriage of function and esthetic form," explains Homer C. LaGassey Jr., head stylist who directed day-to-day development over a 5-month period. "We don't believe that speed and esthetic styling are necessarily incompatible." The finished clay model, though still to be modified in several areas, nonetheless was labeled the "Bread Van" because of its Conestoga-wagon-with-fenders shape.

The shape of the car, however, has been deceiving. Several moves which had been made to reduce frontal area also resulted in a car somewhat smaller than its companions. For example, overall height was pared down to an irreducible minimum of 38.5 in., where the roofline barely cleared the top of the engine. Cabin sides were pinched inward as far as possible, for airflow considerations as much as to limit frontal area. The result was a car which, while it occupied as much ground space as the others, displaced significantly less air space.

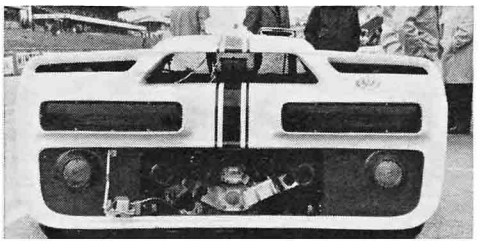
A select crew had plunged immediately into the project, first building ▶



FORD STYLISTS followed design dictates imposed by rules for "J" class cars—a category for prototypes differing in some respects from GT cars.

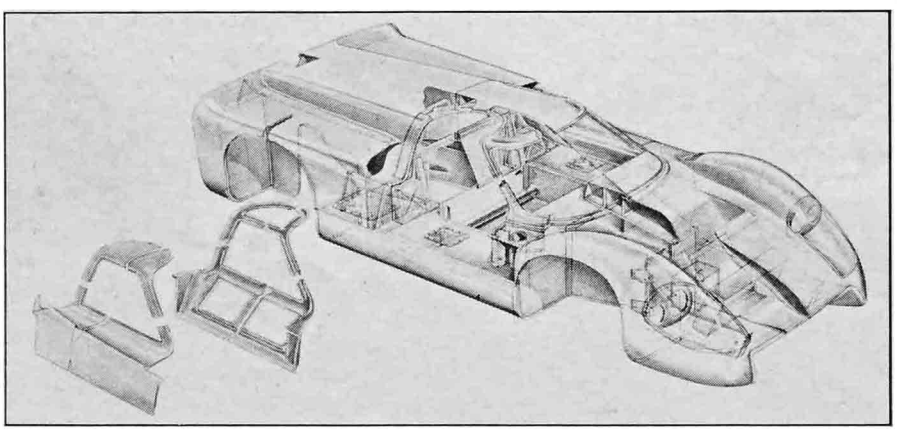


MINIMAL frontal area should provide low drag coefficient.

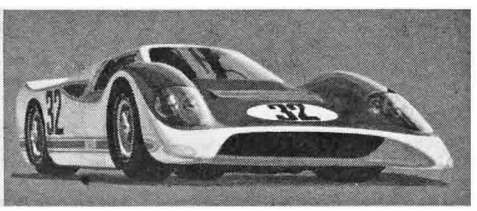


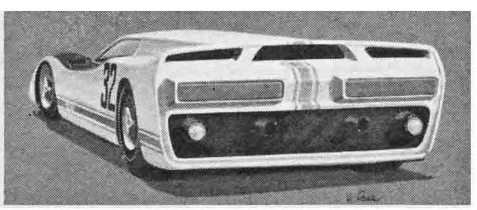
KAMM-effect tail and spoiler lip required some redesign.

FRONT AND rear bulkheads and floorpan are formed of aluminum sandwich material which provides great strength and rigidity for its total weight.



MID-POINT stylists' drawings jelled ideas for finished J.





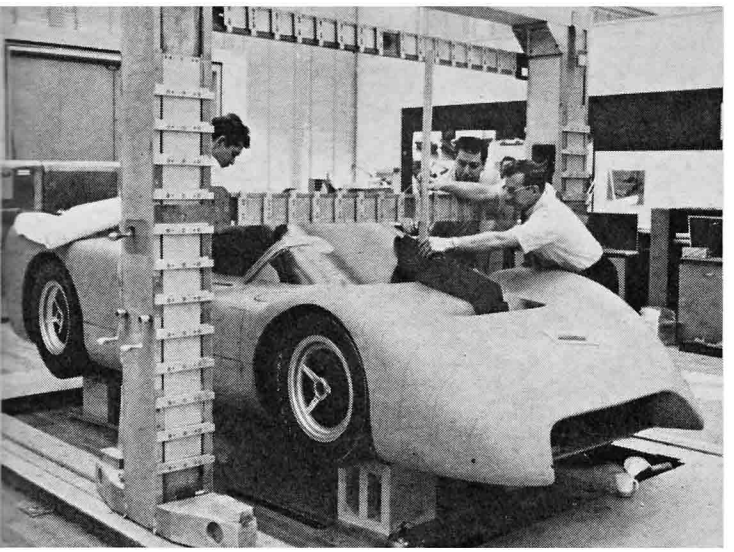
J-CAR

the special steel armature and modeling buck that were required for the unique car and constructing a full-scale modeling table on rollers. Clay modelers rapidly formed the car's overall shape within three days after the buck arrived in mid-October. Proceeding at a careful but quick pace, stylists transferred their concepts from paper to the clay mold. There was continual double-checking of the model against the FIA Group Six rules, which governed the class, on a multitude of points—side window size and area, luggage space allowance and other precise stipulations.

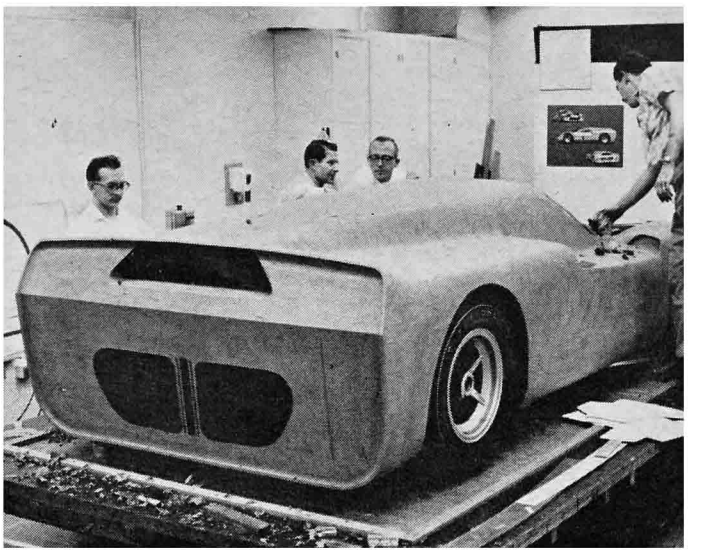
About the time the initial modeling was finished, a thorough perspective drawing also was completed which would then serve as the reference for final arbitration of any questions arising over the concept or styling directions during the remainder of the work. The press of time encouraged an interesting departure from the normal method of ordering specially built panels and structural members—usually from complete layout drawings and elaborate die models in mahogany. Instead, stylists designed the parts 3-dimensionally in clay; molds of these were then made for casting the part in fiberglass or fabricating it in metal. Kar Kraft Inc. of Dearborn, Ford's captive specialty car factory that was to build the finished car, managed to roll the car out months earlier because of this technique.

Similarly, plaster hammer forms were shipped to Troutman-Barnes in California, where inner- and outer-door panels and roof panels were to be formed of lightweight aluminum. But the stylists, using similar forms, molded the same panels in thin-shell fiberglass as an experiment, found they were lighter than the aluminum sections, and ultimately used their own fabrications in the car. The majority of the remaining major body sections —seat structure, hood, front end, rear canopy and rear end—also were molded right in the styling studio.

WHEN THE car was proposed early in October, one assumption was for extensive use of lightweight aluminum honeycomb panels which have achieved such widespread service in the aircraft industry. Front and rear bulkheads therefore were fashioned from 1-in. thick panels of the material while 0.5-in. sheets were formed into other parts. The panels, composed of aluminum core sandwiched between sheets of aluminum 0.02 in. thick, provide great strength and rigidity for their weight. The floorpan, another major part of the structure, is formed of a single sheet curving up both sides in an elongated U. This provides added protection for the twin pontoon fuel tanks—also built of the thinner panels —as well as a drag free underside.

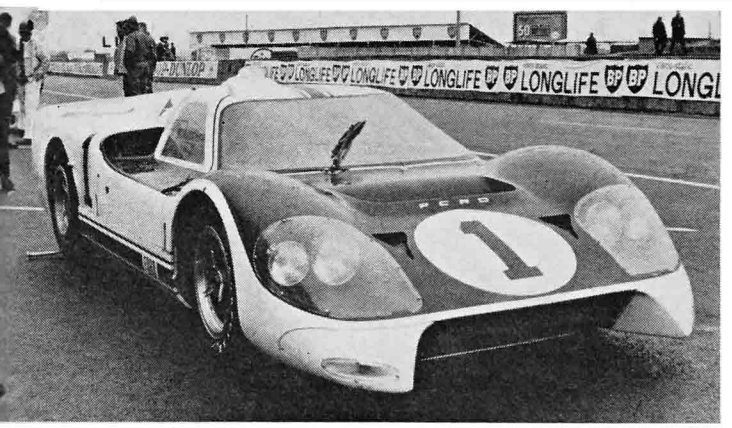


DESIGN CONCEPTS were transferred from drawings to this full-scale clay model. FIA rules were double checked.

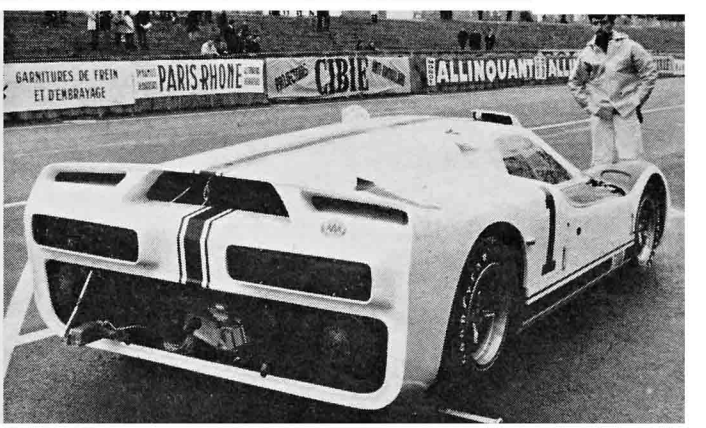


MOLDS WERE made from clay model to speed fabrication of fiberglass and aluminum components. Months were saved.

PRELIMINARY TESTS at Le Mans resulted in a reduction of cooling inlet area and loadings of rear tires.



THE 24-HOURS of Le Mans for 1966 may decide whether Ford stylists are racing-car-design specialists.



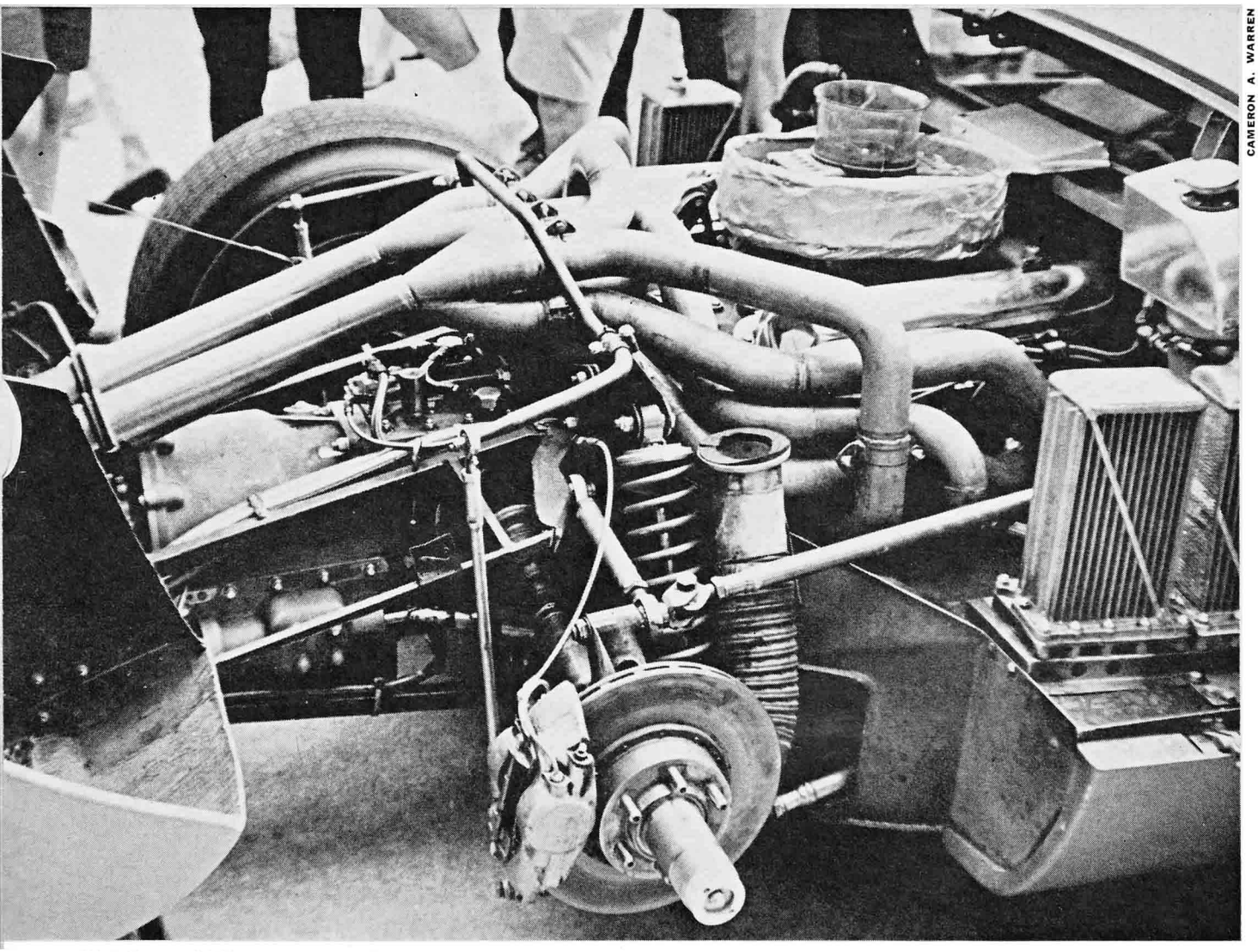
Of particular interest, because it has immediate application in the present atmosphere of passenger car safety considerations, is the serious struggle to integrate rearview mirrors into the vehicle design. Early in the design, mirrors were to be mounted in fairings along the sides of the car with viewing ports for the driver cut through the cabin sides. Later, an attempt was made to fair the mirrors into the tops of the front fenders. Both proposals, added onto and then deleted from the clay model, were rejected because they failed to provide adequate rearward vision. The ultimate solution was simplest—formation of an open scuttle above the windshield header and mounting of a wide angle mirror there. A subsidiary boon was the outlet for cabin ventilation provided by the open hole.

While the airflow is affected by this parasite (peri-sight?), subsequent tests indicated it was of little importance. Initially, the intake opening for the carburetors had been centered on the canopy rear directly behind the new mirror location. But tests proved that the airflow was so closely clinging to the skin that warmed air from the radiator exit duct was being drawn up over the windshield and into the engine. To avoid that performance-robbing effect, the finished car had new intake holes (NASA type for surface bleed-in) to each side of the canopy rear.

ADDITIONALLY, A clear plexiglass air box was placed around the carburetor intakes so the driver could have some vision between cylinder banks and out the openings in the rear. That chopped Kamm-effect tail with spoiler lip also went through some design modifications before it was considered right. Much of this involved proper placement and size of the outlets, necessary to extract built-up air pressure and heat from the wheelhouses and engine compartment. There also was an exterior aerodynamic balance to achieve so that slipstream pressure would be enough to keep the driving wheels sufficiently loaded for optimum traction and control.

During initial design stages the nose was to be rounded, sloping down to a point and reversing itself toward the bottom. Cooling air then would have been sucked upward through an undernose opening, ramming through the radiators and out the cowl duct to flow up over the top. However, on the basis of early tests, this was modified to the present crab claw nose with cooling inlet cut into the front edge. The change made it necessary to lengthen front overhang by 2.9 in., but the same length was removed from the rear to retain the overall length hardpoint.

To the stylists' everlasting credit, not even design purity was allowed to compromise the quest for lightness. A case in point is the choice of taillight assemblies, originally (as shown) to be wide rectangular units for unmistakable braking signals under the brightest sunlight. Almost immediately smaller ▶



CAMERON A. WARREN

PEAK SPEED of 250 mph from the 427-cu. in. engine is the Ford J-car goal. Suspension is almost current Formula I design. The transmission is a 2-speed automatic—a torque converter with planetary gears. Brakes are Girling-Ford combination.

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lights weighing 3 lb. less were substituted. Even the electrical harness was carefully pieced together to save a few ounces of weight over more readily available wiring strands. As a result, the finished car could tip the scale below 1900 lb., giving a power-to-weight ratio, with the 427 racing engine, of less than 4.1:1!

Despite tests and precautions, however, the finished car still needed revision once it was put into its element on a race course. The immediate change was to reduce the engine cooling inlet area and mildly redirect some of the airflow to that point. This was accomplished by raising the line of the side fairing, creating more of a wind fence along the outboard side, achieved by molding different exterior panels for the doors. It also developed that airflow over the rear deck provided too much down pressure, so it was modified somewhat to provide a more balanced loading for the rear tires.

Whether the stylists were successful in wedding their visual art to the serious commerce of the high speed racing circuit remains to be decided during the annual 24 Hours of Le Mans in mid-June. From Styling Vice President Gene Bordinat on down, they are convinced of it. ■

-CAR SPECIFICATIONS

General
- Curb weight, lb., no fuel 2050
- Weight distribution (no driver) ..... n.a.
- Wheelbase, in. 95.0
- Track, front/rear 55.6/54.8
- Overall length, in. 163.9
- Width 69.3
- Height 38.5
- Fuel capacity, gal. 41

Wheels ..... 15 in. cast magnesium
- Rim size, front/rear 8.0/12.0

Brakes ..... dual line hydraulic, with 4-wheel discs and calipers
- Type ..... Ford ventilated rotor 11.5-in. dia., Girling calipers
- Swept area, sq. in. ..... n.a.

Engine
- Type & make: V-8 ohv Ford with aluminum heads
- Bore x stroke, in. ..... 4.24 x 3.78
- Displacement, cu. in. 427
- Carburetion ... Holley 4V 7800 cfm downdraft
- Ignition ..... Autolite
- Bhp @ rpm ..... 475 @ 6200
- Torque, lb.-ft. @ rpm ..... n.a.
- Transmission Type: Torque converter, planetary gearbox
- No. speeds 2

Suspension
- Front: Unequal-length arms, coil springs, telescopic shock absorbers, anti-dive geometry, anti-roll bar.
- Rear: Double trailing arms, single transverse top link, lower A arm, springs, telescopic shock absorbers, anti-lift and anti-squat geometry, anti-roll bar.

Chassis & Body
- Type: Pontoon side monocoque with lightweight honeycomb sandwich aluminum panels and bulkheads.
- Body shell: Lightweight aluminum and fiberglass-reinforced plastic.