

For an automotive designer at one of Detroit's Big Three the annual facelift of last year's model can become a pretty routine assignment. Even the introduction of a new design using the same criteria as the old model it replaced can be less than challenging. However, on rare occasions they get to sit down at the drawing board with a blank sheet of paper and design something truly different.

This is exactly what the truck designers at Ford had the opportunity to do with their new small pickup—the Ranger. The pickup truck concept was not new to Ford though. Henry Ford's very first vehicle

offered for sale was a panel truck and the 1917 Model T could be fitted with a pickup body. In 1925 Ford produced their first U.S.-made light-duty pickup, offering a pickup body in place of the standard deck.

Since then, the Ford pickup has become the company's best-selling nameplate—car or truck—the top selling vehicle worldwide and has been for years.

This popularity continued on into the late '70's despite the fuel shortage and consequent price escalation in 1973. Research by Ford following this shortage indicated that a smaller more fuel-efficient,

but still functional pickup would be needed to satisfy the needs of the buyer in the '80's.

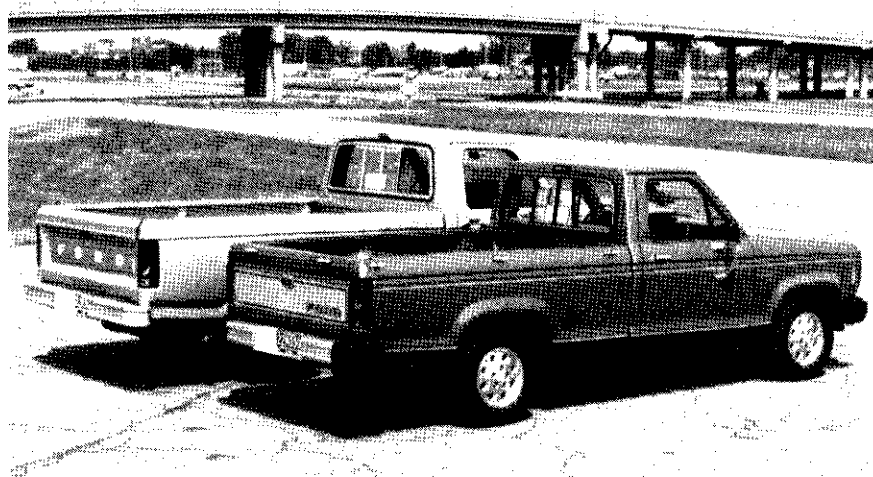
To meet this need they embarked on a design project costing well over \$600 million dollars to develop a new family of compact pickups. When Ford began the project the market was about 95 percent full-size pickups—today it is 80-20 big to small. By 1985, Ford anticipates a 50-50 split and over a million per year could be compact pickups.

Ford began the five-year Ranger development program back in 1976 with emphasis on producing a quality product, the

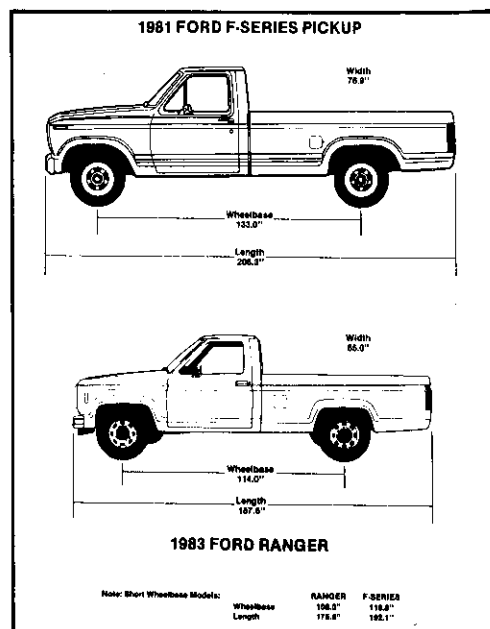
DEVELOPMENT OF THE RANGER

BY JIM CLARK

A Recap of The History of The Ford Ranger From Concept to The Consumer.



A side-by-side comparison of the '81 Ford full-size pickup with the Ranger long-bed prototype illustrates the difference in size between them. The diagram at the right gives more specific data on the differences for the long-beds and information at the bottom pertaining to the short wheelbase models.



number one motivator—along with fuel efficiency—for today's buyer. Before that development could begin though, they had to determine what criteria to use in establishing the objectives for the finished product. To accomplish this Ford put together a group to do the long-term planning. They began their work just after the '73 fuel embargo had ended.

Countless variables were fed into Ford's most sophisticated computer to work out complex gaming studies for measuring precisely where every possible combination of vehicles would lead. The results revealed that according to the

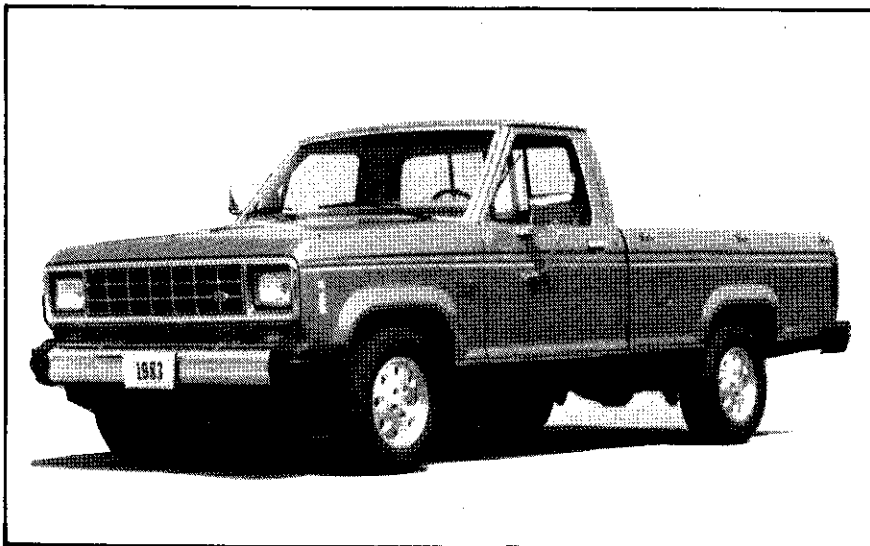
computer results, if significant fuel economy were to be achieved by the mid-'80's some 40 to 50 percent of the truck fleet would have to have 4-cylinder engines.

To Ford the implications were clear: the trend would have to be toward smaller trucks that are designed around smaller engines.

Once their direction had been established they defined their criteria for the Ranger as follows: Comparable fuel economy to the imports, toughness of the full-size trucks, high standards for quality, durability, reliability, ride and handling, both functional and personal use appeal and to

fit in as an integral part of the total truck plan.

All of these goals sound good, but how do you convert them into a finished pickup truck. To answer this question the planning team developed several concepts for the new vehicle and took 3/8-scale and full-scale models into the field for evaluation by the owners of all sizes of pickup truck. This research revealed that the consumers wanted "real" trucks that were solid, tough, and versatile. A three-passenger cab with headroom and legroom for a six-footer, little details like five-bolt instead of four-bolt wheels and a



One of the criteria that was set for the Ranger was room in the cab for three across seating plus head and legroom for a six-footer. The standard bench seat provides this due to the wider than standard mini-truck width.

trailer towing package.

These elements were incorporated into the plan and the program's final objectives defined as follows: first, the Ranger 4x2 would be the standard-bearer of a full-line small truck family; then, over the next two years, a 4x4, a diesel engine, a five-speed transmission and a totally new utility vehicle — The Bronco II. Plus a fuel

most 500 hours) where frontal projection, A-pillar design and wind turbulence in the pickup box were modified. Also, a functional spoiler was added up front. The result, a 20-percent improvement over the original theme and the lowest drag rating of any pickup on the road. This contributed one mile per gallon to Ranger's fuel economy rating.

gine durability. A new valve train was designed to reduce friction thereby improving on fuel economy. This new drivetrain was then subjected to approximately 1,700,000 miles of in vehicle durability testing. These engines can be teamed with either the 3.08 rear-axle ratio for maximum economy or the 3.45 rear-axle ratio where more pulling power is desired.

The third area where fuel savings could be gained was in vehicle weight reduction. To achieve a low curb weight without sacrificing any of the durability Ford used sophisticated computer-based structural analysis techniques to optimize design of parts and components without adding weight . . . and innovative use of premium lightweight materials. The use of lightweight materials alone, produced a 20 percent saving in Rangers's weight — about four-fifths of which resulted from the use of high-strength steel. Some of these applications are: a magnesium clutch housing, an aluminum 4x4 axle differential case, low-sulfur HSLA steel wheels, a magnesium brake & clutch pedal support bracket, a reduced asbestos clutch disc and non-asbestos brake linings.

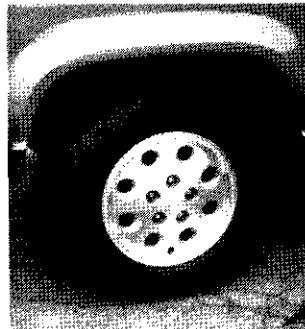
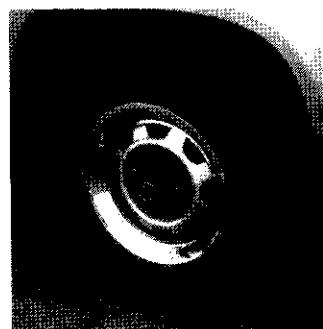
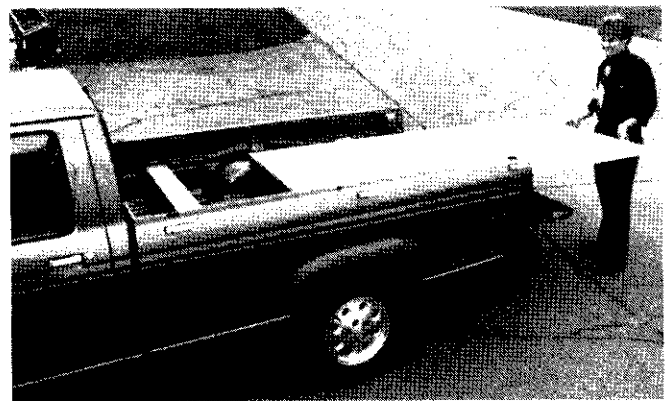
Once they felt their fuel economy and

DEVELOPMENT OF THE RANGER

economy target in the high 20 mpg (city) range was established.

Once the final plan was approved in late 1979 they set out to produce the finished product. The first of their three major technical challenges was to achieve maximum fuel economy. First the aerodynamic shape had to be optimized through extensive wind tunnel testing (al-

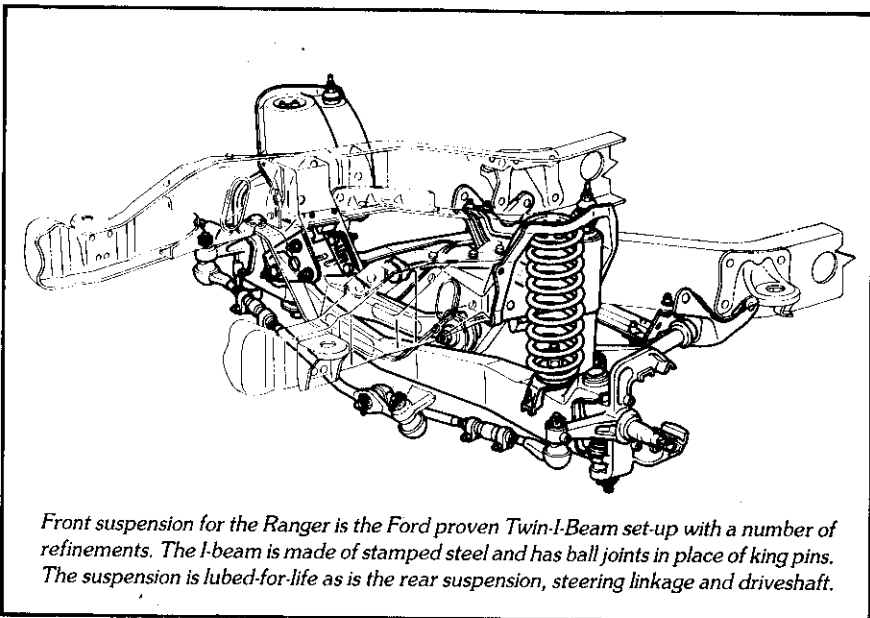
Second was the powertrain. Two existing four-cylinder engines, the 2.0-liter and the optional (except California where it will be standard) 2.3-liter were selected for the new truck. Then they were redesigned with a new intake manifold, a revised camshaft, and a one-barrel carburetor to provide improved low-end torque for load pulling capability and en-



performance objectives had been met they turned to the area that most impressed me when I drove the two prototype vehicles—ride and handling. The ride is something that can only be described as smooth. Both the short-bed and long-bed versions ran around the test track at better than legal highway speeds in the smooth lane and the rough (paved off-road) lane with little indication of which lane you were in. And with none of the pitching, body roll and back slap so characteristic of big or small pickups.

These results are consistent with Ford's two major design objectives with regard to suspension. One, to balance front and rear wheel rates to achieve the minimum possible pitch and bounce and two, design-in enough suspension travel to achieve the lowest spring rates and lowest ride frequencies possible.

Once again the answer came through the use of the computer. Several hundred suspension combinations were tested and it was determined that a 310-pound front spring rate was not only superior for all ride and handling characteristics, but also eliminated the need for a standard front stabilizer bar and permitted alignment setting for uniform tire-tread wear under al-



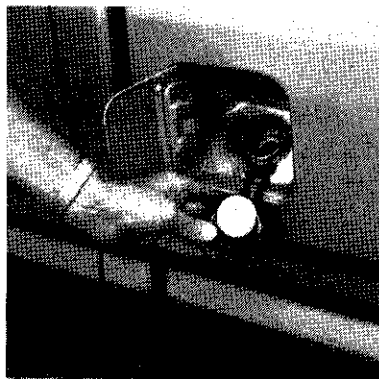
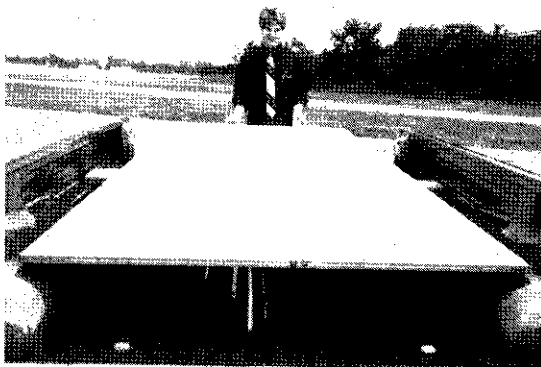
Front suspension for the Ranger is the Ford proven Twin-I-Beam set-up with a number of refinements. The I-beam is made of stamped steel and has ball joints in place of king pins. The suspension is lubed-for-life as is the rear suspension, steering linkage and driveshaft.

most any conditions. An optional front stabilizer bar will be available for those who wish to stiffen up the already excellent-handling front suspension. However, the sway bar will act to transmit some of the irregularities in the road surface to both sides simultaneously.

After the front spring rate was determined, the rear springs were lengthened to establish the most acceptable ride fre-

quencies. This excellent ride will be achieved with every Ranger (until we raise it, lower it or modify the hell out of it) by individually computer selecting the front and rear spring rates according to the options and payload of every vehicle. This also contributes to directional stability and an acceptable vehicle attitude, loaded or unloaded.

Reduced maintenance also was a con-



A measure of the usable space available in an American made pickup over the years has been whether a 4x8 sheet of material could be carried in the bed stacked flat. There isn't enough space between the wheelwells, but flat recesses in the inner walls allow two 2x6's to be inserted and the material to be placed on top of them. Another handy feature is Ford's removable tailgate. It is a double wall unit with a center release and can be removed from the truck without tools whenever necessary. The filler cap has been installed on a tether strap to prevent losing it during fill-ups. Two styles of wheels are scheduled as options on the line, one steel the other aluminum.



sideration in the design of the Ranger. The most dramatic improvements are made in the stamped steel Twin-I-Beam front suspension with its lubed-for-life ball joints instead of king pins, lubed-for-life steering linkage, rear suspension and driveshaft. Of those systems needing service, intervals have been extended, for example the air filter and spark plugs are

Designing the truck to meet all of the criteria was only half the task however. Producing them in quantity at a reasonable price and at a high standard of quality is the real challenge. To facilitate better quality control Ford instituted a new Ranger Employee Involvement program. Not just another exercise in creating posters and buttons to display around the

opinions, concerns and suggestions.

Management received a total of 376 quality and reliability improvement proposals, of which more than half were incorporated into the Ranger program. Many of these applied to the engine compartment "clean-up campaign." I have not included any engine compartment photos of the prototype models as these changes were not made on them yet. Most of them deal with routing or location of components. A quote from one of the employees sums it up best: "I couldn't design it from scratch . . . but I can look at the design and see from my experience what has to be done . . ."

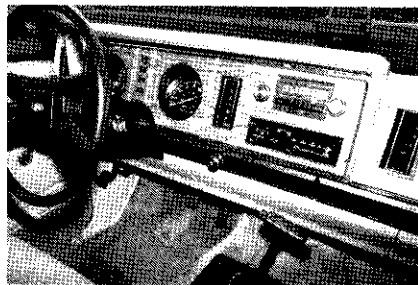
The other half of the production story is the Louisville plant. It is outfitted with the most modern equipment including extensive use of robots and other automated techniques which make it possible to attain much higher assembly line speeds (75 Rangers per hour). Ford's fastest vehicle assembly line with the highest quality standards.

Whether Ford has met all of its objectives with the Ranger will ultimately be decided where it always is—in the marketplace. My limited exposure to the only two existing prototypes left me extremely

DEVELOPMENT OF THE RANGER

recommended for replacement every 30,000 miles. Access to many systems has been improved and for anyone who has tried to change a rusty muffler, the exhaust system can be easily removed or replaced due to the use of a flat flange joint between the catalyst and muffler inlet pipe as well as slip on hangers that do not require the removal of a bolt.

plant, but an honest-to-goodness hands-on employe involvement in the actual project. Eighteen months before production was to begin employes from all levels were involved in a system-by-system review with prototype assemblies right in the plant where they were to be produced. After each review, the participants were asked for their comments,



Contoured reclining bucket seats w/lumbar supports in a cloth and vinyl combination have 5½-inches of travel, are optional.



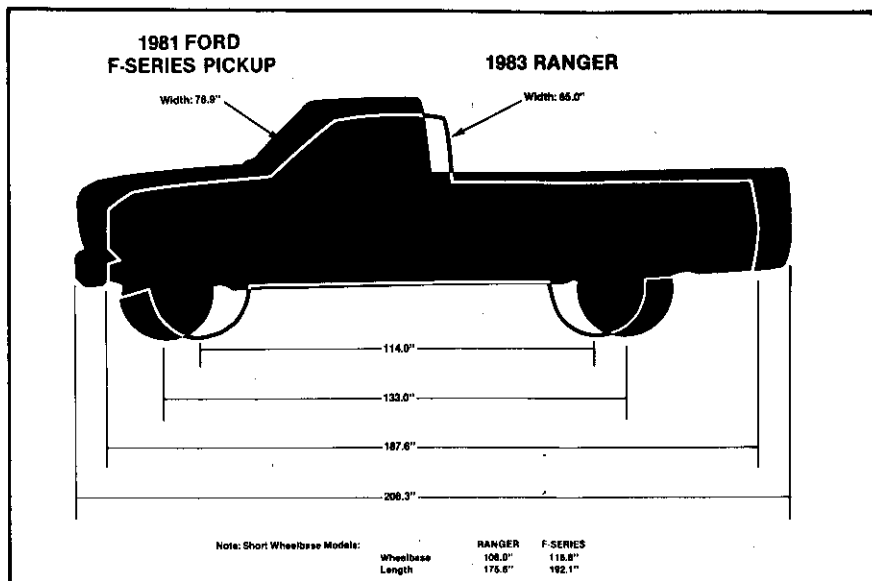
Standard bench seat has 5½-inches of travel and features 4-inch foam on Flex-O-Lator suspension w/helical springs.

impressed with what they had accomplished. The seating position was excellent. Both the bench seat and the buckets offer exceptional comfort and adjust with enough range to provide good head and legroom for even those over six-foot.

The dashboard layout is appealing and well laid out. A tachometer would be a nice addition to the package for those of us who use one for determining shift points. Interior noise levels were very low and the ride very quiet, even by passenger car standards.

The long-bed version had the 2.3-liter engine and automatic transmission. Not the most exhilarating combination, but then a small four-cylinder coupled with an automatic trans has yet to prove much as a performer in any make so far. It was also equipped with the power steering (U.S. made by Ford) and it proved to be far superior to the manual steering on the short-bed prototype model. The tendency to jerk the wheel out of your hand when hitting a rough spot was gone with the power steering equipped model. Not so with the (Toyo Kogyo supplied) manual steering.

The short-bed prototype model had the smaller 2.0-liter engine and 4-speed



manual trans. which proved to be a very snappy performer. It was really quite fun to drive though the 2.3-liter engine and the proposed V-6 to come later will probably be even more desirable to the performance minded. It will be a while before a V-6 will be available, so I wouldn't wait around for it. I suspect that the stick-equipped prototype may have had the 3.45 rear-axle ratio, rather than the standard 3.08 unit, which would have added

to it's good low end performance.

The Ranger is scheduled for introduction to the public in February of '82 and I am anxiously awaiting the opportunity to do a more thorough evaluation of the finished product. With the extensive design and development program that has gone into the Ranger I don't see how it can come out as anything but a WINNER. Something only you the consumer can ultimately decide.



Ease of maintenance and serviceability were high priorities in the design and development program for the Ranger, so towards the end of the program dealership service managers and technicians were invited to participate in a serviceability review of prototype Ranger vehicles. They were asked to rate serviceability. They were pleased with the ease of overall access and made a few recommendations for improvement that were incorporated into the finished models.

