

6.12 Case Study No. 12
Lower Control Arm for
Light Duty Truck

Component name:	Lower Control Arm for Light Duty Truck
Forging Process:	Hot impression die
Size, mm (in.):	500 x 500 (20 x 20) footprint
Weight, kg (lb)	13 (28)
Alloy:	Microalloy steel
Alternate process:	Fabrication, casting

A front suspension for a light duty truck encountered an unusual problem, which required an unusual solution. The existing fabricated lower control arm, shown in Figure 6-12A, permitted debris to accumulate on top of the wide, cup-shaped surface inboard of the ball stud assembly (left end as shown). In the most rugged four-wheel off-highway applications, the accumulation caused damage to the front wheel drive boot seal. Loss of sealing caused rapid failure of the drive line.

Truck product design engineers sought a manufacturing process and material that would allow a configuration providing a clear space directly under the drive line, eliminating the possibility for debris buildup. For various reasons, both the original fabricated arm and various cast designs were ruled out for the heaviest duty and severest vehicle applications.

The design constraints were reviewed by a forging company, who identified two major problems. First, the large plan view area made forging look impractical. Second, it was necessary to form the hexagonal torsion bar restraint, which is oriented 90° to the plane of forging, in a cost effective manner. The forging company developed novel but practical methods for accomplishing both, and subsequently obtained patents on the process.

The forging company constructed a three dimensional model, shown in Figure 6-12B, and ran extensive stress analyses using available Computer Aided Engineering and Finite Element Analysis software. When the predicted stress levels were approved by the truck manufacturer, prototype arms were forged in the selected microalloy steel, and subjected to rigorous laboratory and field tests. The tests included very severe low temperature impact resistance, extended full load fatigue, full lock steering clearance in worst case events, and severe ball stud retention tests.

Upon successful completion of the testing program, the forging company began supplying the truck manufacturer with fully assembled lower control arms.

Figure 6-12A Fabricated lower control arm.

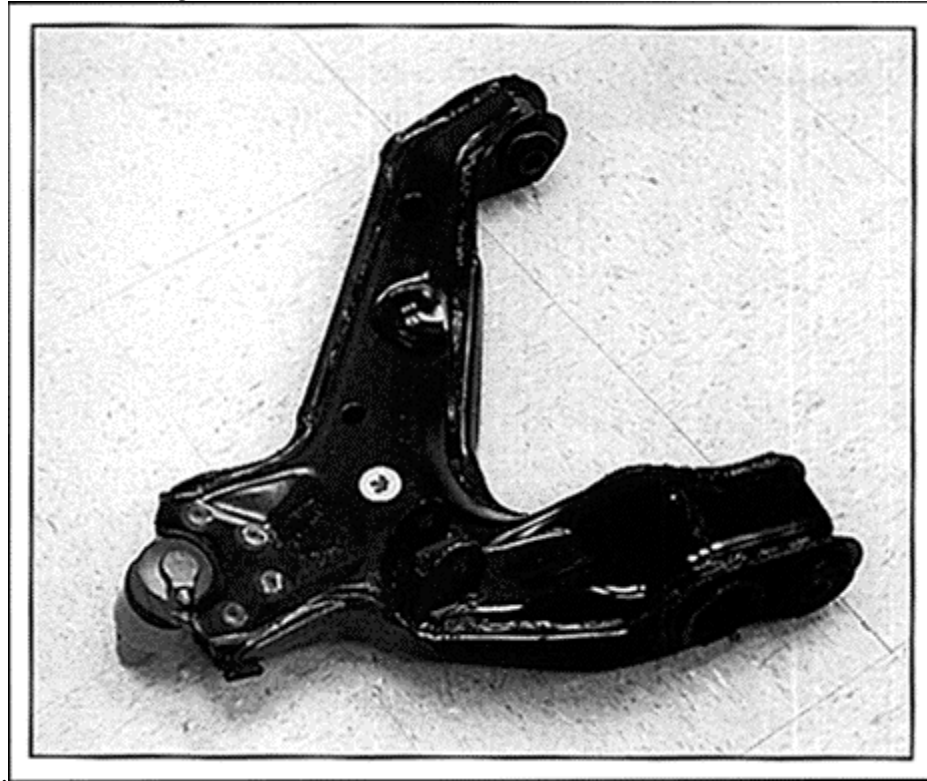


Figure 6-12B Computer model of forged lower control arm.

