

Automotive Design

Analytical Design Service Corporation (ADSC), Ann Arbor, Michigan, specializes in solving problems faced by automotive companies engaged in design and product improvement programs. ADSC researchers get an assist from NASA technology, specifically from use of the NASTRAN (NASA Structural Analysis) computer program in tests on automotive parts to diagnose problems and help redesign structures in the interest of customer acceptance and passenger safety. NASTRAN was supplied to ADSC by NASA's Computer Software Management and Information Center (COSMIC)[®] at the University of Georgia (**see page 140**).

NASTRAN analyzes a design and predicts how a particular part will perform on the road under certain conditions of loading and stress. NASTRAN gets input from a preprocessor-created database containing geometry, boundary conditions and material properties; the program uses this input to calculate and display the stress, deflection and dynamic characteristics of the part. A typical

NASTRAN-developed image is pictured **at left below**; it shows the temperature distribution of an exhaust manifold, with red areas hottest. **At bottom left** is a NASTRAN image of the stress distribution in a universal joint yoke (red represents greatest stress).

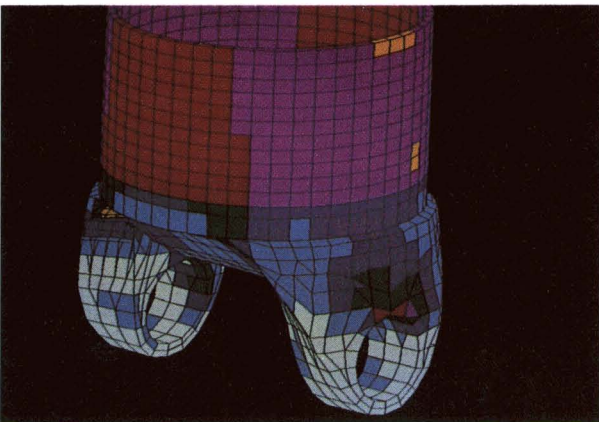
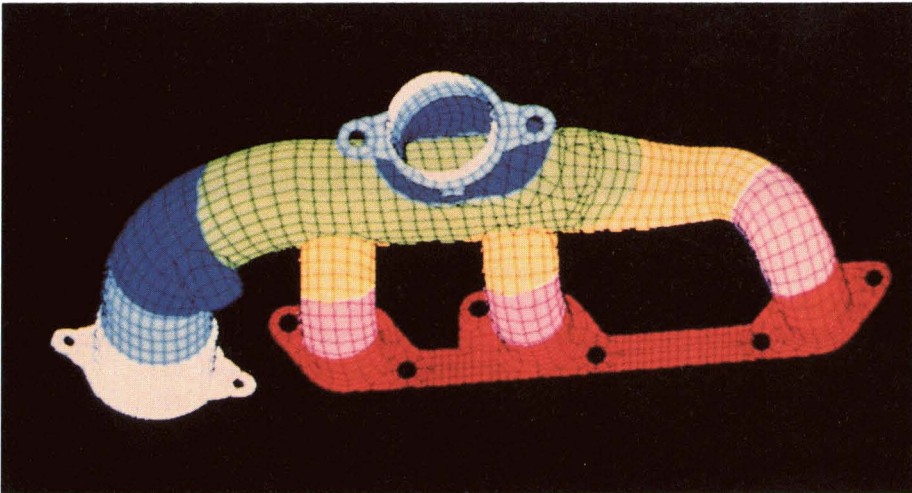
When the stress exceeds designated limits, ADSC analysts can change the design or specifications to improve the part's performance. The NASTRAN program has been used successfully in redesigning manual and automatic transmissions, engine cooling systems, internal engine parts, body components and other automotive subsystems.

ADSC also uses NASTRAN to produce designs for future automobiles which, says Dr. Khalil Kabiri, Senior Research Engineer, will be smaller, lighter and more fuel efficient. He believes that, by the end of the century, about 30 percent of a car's mass will consist of composites and plastics, lighter yet stronger than the metals they will replace; they will be used mainly in body panels and bumpers. The outer body will have a smoother, more rounded

aerodynamic design to reduce drag and improve fuel economy.

Analytical software, such as NASTRAN, can save auto companies and design consulting firms millions by allowing computer-simulated analysis of an auto's operational performance before prototypes are actually built. Computer simulations also reduce the need for expensive and time-consuming impact tests.

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