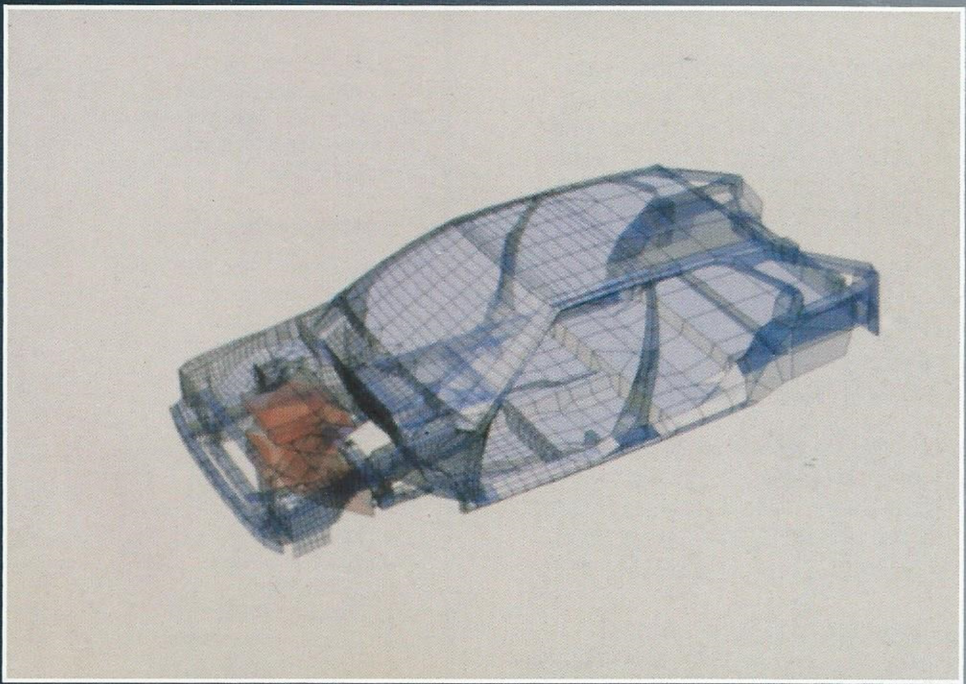
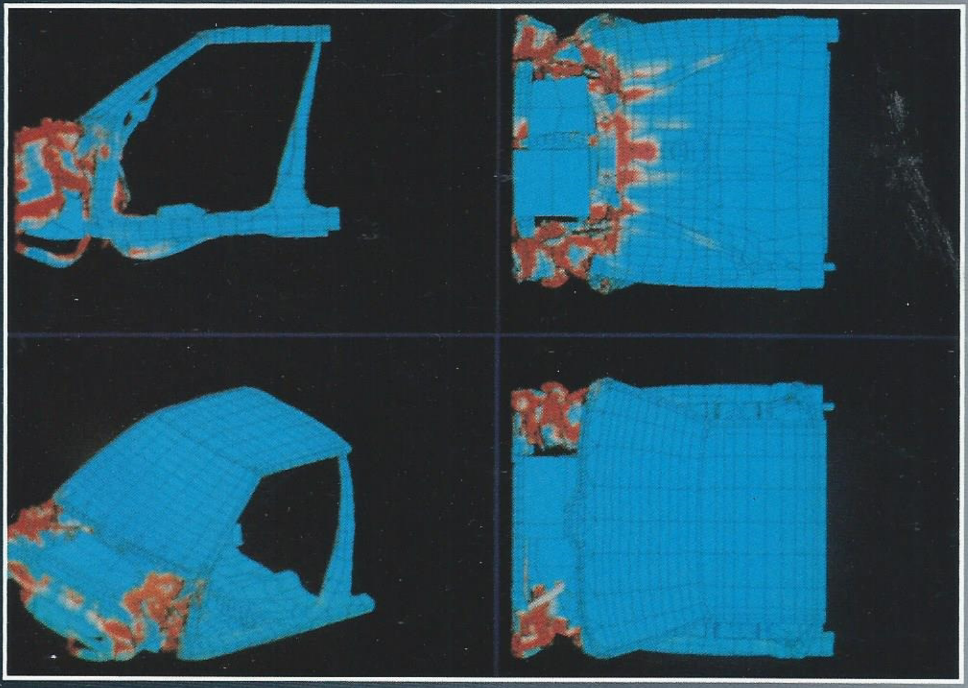
The Imagined Becomes a Reality...





Crash Analysis

Cray supercomputers allow completion of engineering analysis that could not be attempted before. Computer simulations whose computing time make them prohibitive for conventional mainframes are practical on Cray supercomputers. For structural analysis, more detailed — and hence more accurate — finite-element models can be developed. The additional insight into the behavior of structures leads directly to improved designs and saves the cost of extensive testing.

In automotive crash analysis, the computational needs of the engineer can be met only with a supercomputer. Government regulations require automobile manufacturers to verify the crashworthiness of their vehicles. Until now, this could be done only with expensive tests, where prototype cars are actually crashed into walls. A successful simulation of this testing was recently performed using the PAM-CRASH program on a CRAY X-MP supercomputer.

To model this highly nonlinear problem accurately required a finite-element model of the complete automobile. The computer model contained 6957 nodes and 7942 elements. The image at upper left shows the complete model created interactively on a CRAY X-MP supercomputer using the transparency feature of the MOVIE.BYU solid-modeling program.

A key feature of the analysis, the contact surface algorithm, is crucial for simulating how components "slide" along opposing surfaces and how thin metal crushes. In the simulation, the structure moved at 35 miles per hour, contacted a rigid surface representing a wall, then stopped. To perform the complete analysis required 19,300 central processor seconds on one processor of the CRAY X-MP supercomputer. The final, deformed structure is shown at lower left, with deepest red representing highest strain. The four images were generated using the split-screen feature of the PATRAN postprocessor on the CRAY X-MP supercomputer.

Analyses like this not only save money and time compared to physical testing, but they also provide engineers with more detailed information than the physical test can. For example, the structure can be "cut" in half so that engineers can see what happens as the engine hits the lower dash. In addition, making design changes can be done easily during the computation, while rebuilding a structure during a physical test is not practical.

Doing in hours an analysis that would take days or weeks on conventional mainframes is now a reality on Cray supercomputers.

Credits: BX car model courtesy of PSA (Peugeot S.A.) Group.

Making the Imagined a Reality. . .

Making the imagined a reality has become commonplace using Cray supercomputers. Previously insolvable problems in the aerospace, petroleum, and automotive industries and in science, engineering, and graphics are being solved today using the power and flexibility of Cray supercomputer systems. In each discipline the Cray supercomputer is used to simulate a real-world process in less time and at less cost.

To support these applications, a wide range of graphic software systems is offered for Cray supercomputers by third-party vendors. Device-independent line-drawing systems like GK-2000 and DI-3000 from Precision Visuals, Inc., TEMPLATE from Megatek, Inc., and DISSPLA from ISSCO, Inc., are being used now on many Cray supercomputers.

Systems for CAD/CAM and pre- and postprocessing like PATRAN from PDA Engineering and MOVIE.BYU from Brigham Young University support a variety of engineering design activities. In those cases where photographic-quality scene generation is the objective, the designers, artists, scientists, and movie-makers are turning to Cray systems to do what could not otherwise be done.

If your application or graphics task requires extraordinary computer power . . . the problems you **can** do are much smaller than the problems you **would** like to do . . . if you need a general purpose powerhouse to run a variety of simulation, engineering, or scientific codes . . . you need a Cray supercomputer!

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