The fallacy of 'benchmarking'

by Jonathan Tennenbaum, Rüdiger Rumpf, and Ralf Schauerhammer

Lyndon H. LaRouche, Jr., in an article on "The Coming Scientific Revolution" published in EIR *on April 30, 1999, discussed the recently popularized bit of corporate-industrial lunacy known as "benchmarking," giving the example of the celebrated disaster of Mercedes' famous "A-Class" automobile. The following documentation was researched by Rüdiger Rumpf and Ralf Schauerhammer, and will be featured in a forthcoming article in the German magazine* Fusion. *Jonathan Tennenbaum, director of the Fusion Energy Forum in Germany, translated the article and provided some commentary.*

Two years ago, the world-famous automobile manufacturer Daimler-Benz—manufacturer of the legendary Mercedes-Benz automobile and now partner of Chrysler in the greatest mega-merger in industrial history—triumphantly introduced into the world market for low-priced compact cars its own, specially designed model called "A-Klasse." Not only would A-Class offer people with small pocket-books the prestige and "feel" of driving a "Mercedes," but the car itself boasted extraordinary features. Instead of the engine being located in front of (or behind) the passenger cabin as in other cars, the A-Class has its engine placed *underneath,* with the passenger cabin built on top. This so-called "sandwich" construction, never before utilized in this sort of car, offers greater flexibilities in the use of space, while at the same time the passengers sit significantly higher off the ground than in other cars.

On Sept. 23, 1997 test drivers in Denmark found that the A-Class tilted onto two wheels during a swerving maneuver (i.e., a sharp turn of the sort needed to steer around an object) at 55 kph (34 mph). A month later, on Oct. 30, an A-Class Mercedes flipped over and landed upside-down during the so-called "Elk Test" at 60 kph (37 mph), slightly injuring three test drivers in the car. (The "Elk Test" simulated the maneuvers needed to avoid hitting a large animal in the road.)

The serious issue raised by these events is not so much the obvious design weaknesses of the Mercedes A-Class; what is significant is the kind of faulty *thinking,* embedded in the process of design and development of the car, which ultimately caused the embarrassing and commercially disastrous result. In fact, the main weakness in the design and development process of A-Class lay in dependence on so-called "benchmarking" methods.

Switch to computer simulation

Up until recently, Mercedes has traditionally devoted much more time and investment to develop new models, than Japanese firms for example. In order to improve its "competiveness," in the case of the A-Class, Mercedes set the goal of reducing the development time from the traditional seven years (84 months) or so, to a mere 32 months! Yet, the comparison with the development time of Japanese makes it unrealistic and misleading, because Japanese producers typically concentrate on improving already-established and proven designs. In that case, only about 20-40% of the components must be newly constructed, even to make a new model. But in the case of the Mercedes A-Class, for example, 100% of the components had to be newly developed.

Although Mercedes is a leading automobile manufacturer, its engineers had never before built a compact car with front-wheel drive. Furthermore, the "sandwich" construction had never before been used in a small car. Setting these goals, while cutting the development time from 84 to 32 months, placed huge strains on the development department of Mercedes. That pressure greatly strengthened the existing tendency to think that computer simulations could replace actual, real-life driving tests.

In order to save development time and costs, in April 1993 Daimler-Benz engineers input the available projected basic design parameters of the A-Class into a computer simulation system designed to simulate the dynamic behavior of the car. This was done even before the components and parts of the automobile had been constructed. These imaginary driving tests, according to Mercedes, were supposed to be sufficient to provide "all the answers" concerning certain important design decisions, such as which of three alternative construction types (*Mehrlenker, Verbundlenker,* or *Längslenker*) should be chosen for the rear axle assembly. On the basis of those simulations, the cheapest of the three was chosen.

As a further test for the projected driving characteristics of the Class-A (which had not yet been built, even in prototype), "engineers put themselves behind the wheel of a Mercedes S280 [a completely different model—ed.] which had been programmed to simulate the dynamic behavior of the Class-A," a Mercedes report boasts. "During a double lane change [similar to the "Elk Test"] which reveals the handling characteristics of an automobile as well as its safety reserves in marginal situations, the *Längslenker* axle performed convincingly. . . . In the context of the total concept of the A-Class, the *Längslenker* demonstrated itself to be the best compromise." The compromise referred to, was between handling characteristics and cost. And here the fact that the *Längslenker* was much less costly, clinched the decision in its favor. All other Mercedes-Benz models are equipped with the *Mehrlenker* axle, which is much costlier, including in comparison with the systems used in competing models.

In an informational brochure on the A-Class, Mercedes also wrote: "This time there was not enough time to carry out the extensive basic investigations with different axle types, which are normal procedure for the development of a completely new automobile type."

Other German producers calculate up to 12 months for the costly process of harmonizing and adjusting the chassis and related assemblies in connection with electronic systems such as an anti-lock braking system (ABS) and electronic stability program (ESP). This is normally done only after three years of testing with prototypes or rebuilt older models, in order to determine the proper design of the axle. This is what Mercedes itself had always done before.

For example: In 1989, driving tests in extremely demanding, mountainous areas revealed—contrary to the results of computer simulations—that the braking system of the newly-designed Class S auto (V-12 motor with up to 400 horsepower) was far from meeting the full stress performance requirements. The entire brake system had to be completely redesigned. But at that stage, the projected beginning of mass production of the auto was still two years in the future.

In the case of the A-Class, Mercedes not only did not have the necessary time, but also lacked sufficient capacities in its development department: in just the period from June 1993 to October 1997, nine new models were premiered. Jürgen Stockmar, Director of Development at Opel, was quoted as saying that many employees in the development departments of automobile producers today are working beyond the limits of their endurance, and that the overworked condition of the employees ran like a red thread through a series of technical breakdowns and other problems.

After the disaster in October 1997, Mercedes was finally able to bring the problems of the A-Class under control—although only after three separate attempts and after company head Schrempp had intervened to halt deliveries until further design and development had been carried out. But the methods used to "solve" the problem were rather dubious.

The electronic stability program, which was originally planned to be sold as an option for 1,700 deutschemarks, was now included as standard equipment on all A-Class autos and was delivered to the buyer without additional cost. The ESP had originally been conceived as a supplementary program for safe and stable cars, to assist control of the vehicle under extreme conditions such as wet or slippery roads. But in the A-Class, the ESP became indispensable even to carry out a simple avoidance maneuver on a dry surface—something which competing models had never had problems with.

The fact that Mercedes now claims it has solved the problems of A-Class by supplementary installation of the ESP, demonstrates that the fundamental problem behind the A-Class disaster has not penetrated to the conciousness of the company's board members. They are still holding to their belief in benchmarking and computer simulations.

This becomes obvious from the fact that the board of Daimler-Chrysler still refuses to withdraw its even bigger disaster, the regrettably misnamed "Smart," from the market. "Flop" would be a more appropriate name for this totally misconceived and technically defective product. Besides sharing problems with the A-Class—shorter wheelbase and elevated center of gravity—the developers thought they could simply ignore problems that had been known for decades. These are the problems which arise when one attempts, as with the "Smart," to implement rear-motor, rear-wheel drive in a vehicle with a short wheelbase, leading to a situation where nearly two-thirds of the car's weight falls on the rear axle.

Ignoring the long and problematic history of constructions of this type, the Mercedes engineers even installed an over-powerful engine (after all, the car was supposed to be "smart"!), with the philosophy that "electronics will fix everything." Since the car was known to be unstable, the maximum speed was set at 130 kph (about 70 mph). But even below that speed, the electronics cannot compensate for the fundamental fallacies in the design. Physics prevents this! The cheap electronic stabilizing program, called "Trust," has revealed itself, in all tests which were not designed in advance to give a positive result, as a failure.

The axiomatic problem

Readers will not have failed to recognize a recurring syndrome of today's larger world in our story of the A-Class: Rather than correct fundamental, axiomatic fallacies in the design of policy, the reponse to each ensuing disaster is: "We'll fix it!" The "successful" result is to carry the axiomatic fallacies forward into the next, even worse phase of disaster, whose onset has been rendered inevitable by the follies of such linear "crisis management."

Note, also, a second point: In a multiply-connected manifold, "dimensionalities" can never be treated as Cartesian independent variables. In substituting or modifying even an apparently minor technical component within a complete functional system such as an automobile or a space vehicle, the potential nonlinear impact of that change upon the characteristic functioning of the whole system is an issue of physics, not mathematics. In a unique experiment, the components of the experimental apparatus and their characteristics, taken in and of themselves, seem to be fully "known." But the composition of the experiment generates an irreducible anomaly, refuting exactly the sort of linear "curve-fitting," which turned Mercedes' proud creation into a thorough flop.