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bombs with enormous destructive power.

Taylor, a former nuclear weapons designer who is now president of NOVA, Inc., an energy development firm, predicts that a third generation of nuclear weapons will soon be developed. "These weapons," Taylor writes, "would be as removed from current nuclear weapons in terms of military effectiveness as a rifle is technologically distant from gunpowder."

Unlike that of current weapons, energy produced by third-generation nuclear weapons will be targetable and controllable. Designs now under consideration at the Lawrence Livermore National Laboratory can theoretically direct nuclear energy towards a target, perhaps by converting the explosion energy into pulses of electricity with magnetohydrodynamic generators. The wavelengths of the radiation produced by the explosion can also be modified to produce increased levels of microwaves, gamma rays, or neutrons.

Containing and directing radiation from nuclear weapons is particularly important in space, where the products of a nuclear explosion could affect a much wider area than a similar explosion in the Earth's atmosphere. Because there is no resistance to objects propelled through space, even small explosions can yield large results. For example, converting five percent of the energy produced by a one-kiloton explosion in space could produce enough microwaves to severely damage electrical equipment over 250 square kilometers, an area larger than Washington, D.C.

Deployment of third-generation nuclear weapons will depend on the support the Soviet Union and the United States give to their respective weapons research laboratories. Taylor predicts that if the two superpowers continue underground nuclear testing, "it will probably be just a matter of time before these new types of offensive and defensive nuclear weapons are developed."

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Rubber Numbers

"Whom Do You Trust? An Analysis of Executive and Congressional Economic Forecasts" by Mark S. Kamlet, David C. Mowery, and Tsai-Tsu Su, in *Journal of Policy Analysis and Management* (Spring 1987), 605 Third Ave., New York, N.Y. 10158.

In a December 1981 interview in the *Atlantic Monthly*, David Stockman, then director of the Office of Management and Budget (OMB), charged that the Reagan administration had created "political numbers" in preparing economic predictions for the 1982 fiscal year budget statement. Stockman declared that unduly optimistic economic predictions had been used to justify the 1981 round of tax cuts.

But Stockman was only partially right, say Kamlet and Mowery, associate professors, and Su, a doctoral student, all at Carnegie-Mellon University. The long-range economic forecasts released by the Reagan administration in 1981 were overly optimistic, predicting that the gross national product (GNP) would grow at an average rate of 1.5 percent more each

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year than it actually did.

However, the authors say, "the Stockman critique of the 1981 long-run forecasts overlooks widespread bias in long-run Executive branch forecasts prior to 1981." The 1981 long-range economic forecast was *more* accurate than the forecasts of 1976, 1977, 1978, and 1979. The mean annual overestimation of long-range GNP growth made between 1962 and the start of the Reagan administration was 2.1 percentage points; the Reagan administration has reduced the error to 0.9 percentage points.

While short-run government economic forecasts "appear to be accurate and unbiased," long-run forecasts often face political pressures. For example, the Carter administration's long-run economic forecasts were prone to error because the Humphrey-Hawkins full-employment bill required that forecasts be prepared as if full employment would be reached "in the more distant years" of the projection. The authors expect OMB forecasts prepared under the 1985 Gramm-Rudman-Hollings deficit-reduction law will continue to be overly optimistic.

The authors suggest that private forecasters are likely to issue more reliable long-range forecasts. Unlike the government, the authors conclude, private forecasters "have a considerable financial incentive to issue forecasts with the least bias and greatest accuracy possible."

Some Lessons In Development

"Why Isn't the Whole World Developed? Lessons from the Cotton Mills" by Gregory Clark, in *The Journal of Economic History* (Mar. 1987), Hagley Museum and Library, P.O. Box 3630, Wilmington, Del. 19807.

What causes some countries to be less developed than others? Developed countries, says Clark, an assistant professor of economics at Stanford, use labor more efficiently than their less-developed competitors.

Clark makes his case by studying Britain's domination of the world textile market in the years before the First World War. In 1911, Britain produced 81 percent of the world's cotton yarn and cloth exports with only 40 percent of the world's cotton-spinning mills. Yet all of Britain's cotton had to be imported, and British wages were over five times as high as Japanese and Chinese wages and twice as high as wages paid to Italian and Russian workers.

British workers earned their high wages by being much more efficient than their counterparts in competing nations. Workers in British mills could tend four times as many looms as workers in Indian or Chinese mills and twice as many looms as workers in Spanish, Italian, or Portuguese mills, even though most mills in the world used British looms and many used British mechanics.

Efficiency was related neither to experience nor to a worker's origins. Employees of Southern U.S. mills tended 30 percent more looms than British workers, yet Southern mills usually hired "hill farmers and their families, who were completely inexperienced not only in textiles but in any kind of factory work." In Italy, between three and six times as many workers were required per machine as in New England.