2. Tabulations and Statistics

The government requires vast amounts of information--educational, occupational, geographic, economic--on people, activities and places within the country. For this data to be meaningful, it must be filed, assimilated and summarized, a task often requiring advanced statistical techniques.

The largest survey the government makes is the decennial census. Its order of magnitude is reflected in the fact that the tape or memory file in the computer used by the Dominion Bureau of Statistics for this task stored more than one billion characters of information for the 1961 census. The degree of detail that can be extracted from this mine of data by computer methods is immeasurably greater than would have been possible by manual methods alone. Introduction of the computer has meant not only that the same results are produced more economically, but also that signficantly more refined results can be produced from the same raw data.

3. Mathematics and Science

Early computers found their first area of application in scientific fields, and only later in business data-processing. The necessity for carrying out calculations beyond human capabilities was the primary spur to computer development in the 1940's. The level of achievement now reached can be gauged from the fact that a modern computer can perform in one hour as much calculating as a man could do in ten years using a desk calculator. The use of computers in research, in the analysis of test results, in development, in carrying out design calculations, and in the production area has had a tremendous impact on scientific and engineering endeavour in the last 20 years. At Atomic Energy of Canada Limited, National Research Council, and the Department of Mines and Technical Surveys, computers are being used to assist scientists and engineers in these tasks. Areas of application range from the calculation of the behaviour of atoms inside a molecule to the gravitational effect of one celestial body on another, from the microscopic to the celestial.

Computers have also proved their worth in problems studied by simulation or modelling by making it possible to replace a physical model of an airplane, a dam, or an atomic reactor with mathematical formulas that describe how the actual device would behave under specified circumstances. In the case of an airplane, for instance, the mathematical model reflects, by number values assigned to each, all the factors that would determine how the airplane would fly, such as weight, wing span, and engine thrust. By varying the numbers and working out the formulas in the computer, the researcher can determine what the airplane would do under a far greater variety of conditions than could ever be portrayed by a physical model of the airplane tested in a wind tunnel.

The same simulation technique can be used for something as abstract and complex as an economic system. For example, econometricians in the Department of Finance and the Bank of Canada are attempting to determine the mathematics of the behaviour of Canada's economy. Exercises performed on this model might be of great value in predicting the effects of changes in government policies.