

II.

AUTOMATING COMMAND SYSTEMS: PROBLEMS AND RISKS

The second day's deliberations dealt with the dangers posed by the increasing use of computers in the nuclear command and control process, and with their inherent inability to provide an "error-free" command system. Presentations were given by Dr. Severo Ornstein and Dr. Henry Thompson. The commentator was Dr. Joseph Weizenbaum.

Severo Ornstein's paper gave a detailed account of the limitations of computers in all their applications, including military decision-making. He pointed out that, since computers process most information in today's weapons systems, computing has taken over from physics as ". . . the technology at the cutting edge of the arms race." He suggested that computing software presents ". . . the most serious and least tractable problems in using computers in critical applications", and asserted that there is no way to completely rectify those problems or to ensure that "residual problems will not have catastrophic consequences."

As far as Ornstein was concerned, people had been effectively eliminated from military decision-making in time of crisis. He believed that people couldn't think fast enough to cope with the current level of "decision density" and that

. . . if decision-making is based only on simplified summaries presented by computers, then the ingredients necessary for informed judgement are absent and you might as well let the computers make the decision.

He also warned his audience that computers, while extremely fast at some types of tasks, were slow at others, especially pattern recognition. Central to Ornstein's argument was his description of how computers work. Basically computers execute software which may be defined as ". . . successive simple instructions which, when put together in meaningful sequences, can perform complex tasks." A computer's greatest power is not to move quickly but to make choices based on designated external or internal conditions while the program is running. Computers both react to and act upon the outside world. Most computers do not compute but process non-numeric information; they apply *ad hoc* rules more often than they implement equations. Thus, most computer programs are not founded on mathematically-precise models, but on other less formal models, the validity of which it is difficult to test.

As yet computers are capable of limited performance. According to Ornstein they do not have the ability to think for themselves, or to go beyond prescribed rules. Although some computers have been given a few rudimentary skills, their progress, when measured against a "human