

I.

QUANTITATIVE ASSESSMENT OF THE RISK

The first day's deliberations were devoted to the presentation and assessment of several mathematical models of the risk of accidental war, and to a general discussion of the utility of a quantitative analysis of risk in this context. Presentations were made by Ms. Barbara Leonard, Dr. Linn Sennott, Dr. Brian Crissey, and Dr. Daniel Frei; the commentator was Dr. Anatol Rapoport.

Barbara Leonard's paper contained a mathematical model of accidental nuclear war which she and Bill Rosenberg had developed. The model's equations simulate what would happen if a *de facto* "launch-on-warning" policy were in effect during a crisis alert. The paper took as its starting point the assumption that, if an unresolvable alarm were to occur when the system was in a launch-on-warning state, a war would be triggered.

According to the model the probability of an unresolvable alarm occurring during a crisis is the product of the interaction of four parameters: (1) the number of days per year that the system is in *de facto* launch-on-warning; (2) the length of time available to make a decision; (3) the number of false alarms per year; and (4) the time required to resolve a false alarm. Using unclassified American data to estimate these parameters, Leonard and Rosenberg made five key predictions. First, on the basis of a small number of crisis days per year, a 7-minute decision time, and the existing rate of increase in false alarms, there is a high probability of accidental nuclear war occurring within the next decade. Second, if the average time allowed for the resolution of a false alarm is no more than 3 minutes, there is a 95 per cent chance of accidental nuclear war within 6 years. Third, if the average resolution time is 2 minutes and there are as few as 5 crisis days per year, there is still a 50 per cent chance of accidental nuclear war within 11 years. Fourth, even if it is assumed that an unresolved alarm will not trigger a launch without a second confirming signal, there is still a 50 per cent probability of accidental nuclear war within 16 years. Their final and most crucial finding is that the probability of accidental nuclear war is dramatically affected by the amount of decision time available. With only one minute of decision time, there is a risk of accidental nuclear war occurring in less than a year. With a three-minute decision time, it is likely to occur within 3 years and with a four-minute decision time within 14 years.

The paper presented by Linn Sennott outlined two models, one of overlapping alarms and another of dual phenomenology. Both of these models build upon an earlier one developed by Wallace, Crissey and Sennott, which was published in the *Journal of Peace Research*. Each incorporates salient characteristics of NORAD's Early Warning System.