# AN EXPERIMENTAL PARADIGM FOR TEAM DECISION PROCESSES

by

Daniel Serfaty

and

David L. Kleinman

CYBERLAB
University of Connecticut
Dept. of Electrical Engineering
and Computer Science
Storrs, CT 06288

## ABSTRACT

The study of distributed information processing and decision making is presently hampered by two factors:

(i) The inherent complexity of the mathematical formulation of decentralized problems (control, detection, data fusion, etc.) has prevented the development of efficient and practical theoretical models that could be used to predict actual performance in a distributed environment.

(ii) The lack of comprehensive scientific empirical data on human team decision making has hindered the development of significant descriptive models. Most of the organizational behavior and applied psychology research in the field focuses on centralized group decision making rather than on team decision making in which the element of decentralization is essential.

As a part of a comprehensive effort to find a new framework for multihuman decision making problems, we have developed a novel experimental research paradigm involving human terms in decision making tasks [1]. The paradigm focuses on the problems of distributed resource management and task processing in an uncertain dynamic environment. The task environment is an abstraction of a Naval Battle Group Command, Control and Communications ($C^3$) system in which a number of geographcally scattered commanders must make coherent decisions based on decentralized information on enemy actions.

This information is presented to each decision maker through graphical and alphanumerical displays providing data on tasks' status, attributes, resources, and communication messages.

The paradigm is flexible enough to be tested across a large range of experimental conditions in which the main independent variables are: the team configuration, the team information and communication structure, the uncertainty level in both inputs and consequences of action, the level of expertise and functional overlapping between the different decision makers. Our first baseline experiment involves a dyad - i.e. a symetric team of two decision makers with no hierarchical relationship. No communication is allowed and silent coordination is assumed with the main variable being the degree of overlapping in the decision makers' functional area of responsibility.

The flexibility of the paradigm will be used to study various cognitive factors which have found empirical evidence in the literature: need and use of communication in a well cooordinated and cohesive team; "risky" or "cautious" shift in team decision polarization; "selfish" behavior and misperception of team reward structure; conservatism and uncertainty avoidance in human organizations.

Attempts to construct parts of an integrated model with ideas from queueing networks, team theory, distributed estimation and decentralized resource management are described. Future development of these normative--descriptive models of human team behavior depends strongly on the availability of data to be provided by the experimental paradigm.

[1] Kleinman, D.L., D Serfaty and P.B. Luh, "A Research Paradigm for Multi-Human Decisionmaking", Proc. American Control Conference, San Diego, CA, 1984.