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Contract N00014-78-C-0340/NR 197-048  
ARPA Order 3563  
September 1978

Experimental Evaluation of Interactive Decision  
Analytic Aids: Scenario Development

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Francois G. Christen  
Michael G. Samet

Prepared For:

Office of Naval Research - Code 455  
800 North Quincy Street  
Arlington, Virginia 22217

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
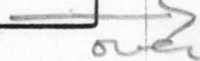
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes progress on a study evaluation the effectiveness of computerized decision aids. The report includes: (1) a description of the process used to select and refine testbed scenarios for use in the study; (2) a description of the experimental method that will be used to empirically determine "correct" decisions for the scenarios; and (3) a status report on the acquisition of the computer hardware and software required to carry out the study. In the next phase of work, the study required to determine "correct" decisions for scenarios will be carried out. Furthermore, materials and 		

*cont'd*

procedure for the main study will be developed, refined, and pilot tested.

*Keywords:*

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## 1. SUMMARY

### 1.1 Report Period

The first quarter of the contract activity consisted of: elaboration of the study design; development of study materials; and acquisition of necessary computer hardware and software. The following specific tasks were accomplished during the report period:

- (1) A task analysis of the decision making experiment was conducted and an experimental procedure -- maintaining as much realism as possible without sacrificing methodological considerations -- was developed.
- (2) Experimental methods to determine decision making norms and quality of decision making were developed.
- (3) A variety of scenarios were reviewed, selected, and modified for use in the study.
- (4) A mini-computer and associated software were acquired in order to implement the study.

### 1.2 Next Period

The contract activity during the next quarter will focus on the derivation of empirical decision making norms and the development of materials and procedures necessary to carry out the experimental study. The specific items of work for the next period include:

- (1) Develop performance monitoring materials for both a preliminary study, designed to obtain a normative or "school" solution for each scenario, and the main study, which is the decision aids evaluation proper.
- (2) Recruit appropriate intelligence analysts in the Washington, D.C. area for participation in the study.
- (3) Conduct the preliminary study with a subset of intelligence analysts to obtain decision making norms for the scenarios to be used in the experimental evaluation.
- (4) Conduct a pilot study to evaluate and refine the performance monitoring materials as required for setting up the main study.

### 1.3 Program Milestones

The milestone chart for the contract is shown in Table 1-1, with the report period illustrated as the shaded portion.

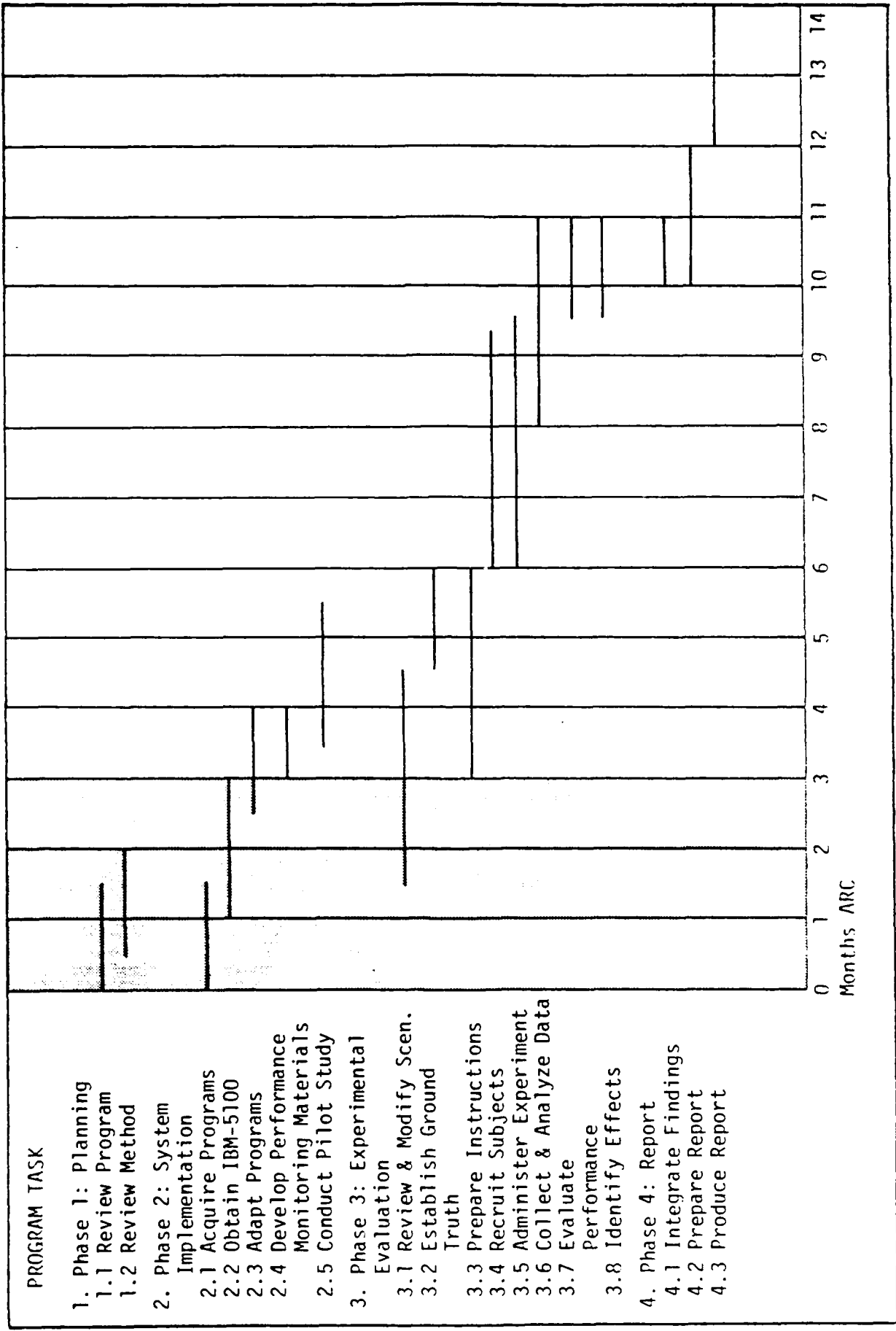


TABLE 1-1. PROGRAM MILESTONES

## 2. PROGRAM OVERVIEW

### 2.1 Statement of Problem

A number of highly sophisticated decision aiding methods have been developed under the auspices of the decision analysis research program sponsored by the ARPA Cybernetics Technology Office and monitored by the ONR Engineering Psychology Programs. These aiding methods have been specifically designed to improve the decision making performance of upper echelon military command personnel. However, the actual effect of the aids on decision making performance remains to be demonstrated. Empirical evaluation can demonstrate which methods have a significant influence on decision performance. Such an evaluation will help identify the areas in which a decision-theoretical approach to military decision aiding is likely to have the largest payoff. The outcome will also serve to enhance user acceptance. The intent of this research program is to provide the necessary evaluation and thereby set the stage for future implementation.

### 2.2 Objectives

The major goals of the proposed program are first, to determine the performance effectiveness of a selected set of decision aiding methods, and second, to determine the locus of their influence on the decision making process. These goals define the following specific objectives:

- (1) Determine the impact of decision aiding upon the *success rate* of decision makers.
- (2) Determine the impact of decision aiding upon the *internal consistency* of decision makers.

- (3) Identify the *components* of the aiding methodology responsible for its effectiveness.
- (4) Determine if the aiding method can be effectively *generalized* over different scenarios.

These objectives will be accomplished by means of a research plan which has the following main components:

- (1) Establish an evaluation test bed by selecting two distinct decision making scenarios.
- (2) Empirically establish decision making norms -- i.e., good decisions -- for the decision making scenarios.
- (3) Obtain a computerized decision-aid and necessary computer software and hardware for its implementation.
- (4) Conduct an empirical investigation with intelligence analysis to assess the impact of the aiding program on decision making performance.
- (5) Document the results of the study in a comprehensive report which includes recommendations for application of decision aids.

## 2.3 Technical Approach

2.3.1 Background. A concept of "bounded" rationality seems to be emerging from current research on human judgment and decision processes. There is, for example, considerable support for the view that man is

subject to systematic bias in his interpretation of unreliable information. Similarly, human choice behavior often violates the tenets of normative theory. These information processing deficiencies present a standing invitation to those who wish to build decision aiding devices. Various ARPA/ONR projects represent a major attempt to meet this challenge.

The decision-theoretic model underlying most of the ARPA aiding methodology is defined by a set of internally consistent axioms. These provide the framework for a formal mathematical representation of the decision making process. The application of these decision-theoretic principles will likely have significant practical value for the military decision maker, but as yet this remains an untested assumption. That is, the aids thus far developed are impressive, and appear acceptable in principle to military decision makers, but lack empirical data documenting their effectiveness. Aside from the obvious value of such data to promote more practical acceptance, it appears that in general, any attempt to develop operational decision aids should be accompanied by an on-going process of evaluation to determine what progress is being made. A set of experimental checks serves to provide direction for the research effort, and to help reveal unwarranted assumptions, which if allowed to persist, might lead to costly and/or ineffectual system development in the future.

2.3.2 Scope of Evaluation. Since the generalizability of the proposed evaluation is crucial, the scope of the research will encompass those decision-theoretic aiding methods known to impact most upon performance. Since time and costs are key factors, the proposed evaluation will be restricted to that subset of methods which are currently operational. Practically, this means that the aids initially investigated will be those already programmed by Decisions and Designs, Inc. (DDI).

A set of aids has been selected for evaluation which provides the decision maker with a complete support system. These aids include: a Probability Influence Model to estimate prior probabilities; a Bayesian Revision Model to update probability estimates according to an optimal algorithm; a Multi-Attribute Utility (MAU) Model for decomposing a task into its attributes; and finally, a Subjective Expected Utility (SEU) Model which provides a decision recommendation based upon a criterion of optimality. The system constitutes a computer aided decision-analytic approach to decision making and, as such, reflects the current state-of-the-art in decision aiding.

2.3.3 Test-Bed Scenario. A decision aiding system is, by definition, designed to function in a limited class of decision making environments. An empirical evaluation of aiding effectiveness, therefore, must be conducted in accordance with a relevant set of task requirements. In the case of the aiding system under investigation, an ideal scenario is one which lends itself to the decision-analytic framework and yet maintains a high degree of task realism. Two scenarios have been found that meet both of these criteria, and have accordingly been selected for use in the proposed research. (See Section 3)

In order to measure the quality of decision making, one must know a priori which are good decisions for a given scenario. An empirical study will be conducted to identify the "expert" or "school" solution to the decision making problems posed to the study participants; hereafter, this solution will be referred to as the "correct" solution.

2.3.4 Performance Criteria. The measurement of decision making performance has been a subject of considerable controversy in recent years. The debate has revolved around the relevance or irrelevance of outcome measures, and the adequacy or inadequacy of consistency measures. The position one adopts with respect to these issues serves to define

a set of empirical questions which an evaluation can and/or should address. The present discussion will outline the arguments and specify the position adopted in the proposed research.

The sole use of outcome measures to define decision making quality has been criticized on the grounds that the decision maker exercises no control over the probabilistic outcome of his decision. Decision theory, and hence decision-theoretic aids, are specifically concerned with insuring the consistency of decision making behavior. The assumption is that internally consistent decisions are preferable to inconsistent ones. Thus the effectiveness of a decision aid is frequently measured by assessing the selected alternative in terms of the set of cognitive expectations (probabilities) and utilities available prior to the decision outcome.

A primary goal of this evaluation is to validate this criterion of internal consistency with an external measure of performance (e.g., decision success). If consistent decisions are uncorrelated with successful outcomes, the prospective user of the aid should be so informed. The availability of an outcome-based evaluation of decision making performance will reduce user ambiguity as to the type of decision-aiding the system under investigation can provide.

The use of an outcome measure, however, can only be applied to a distribution of decisions generated by one or more decision makers. Given a single or isolated instance of decision making, a "sound" decision may have negative consequences due to the inherently probabilistic nature of the environment. The expectation is that over many decisions, an aided decision maker should be more successful than an unaided counterpart. If this is not the case, the criterion of consistency can either be defended as important in its own right, or abandoned due to its lack of pragmatic effect. The decision to adopt a decision-theoretic aid should

be made by a prospective user who is informed of the specific type of aid he will receive. If internal consistency is of primary importance to the user, it becomes a matter of secondary concern as to whether consistency is correlated with external "success". A different user, however, may justifiably adopt the position that "aiding" is only useful when it serves to enhance the probability of a successful decision. Decision making is, after all, the attempt to deal successfully with an uncertain world. If the aiding system does not further this effort, it may be viewed as superfluous.

In summary, in order to provide the necessary information with respect to each type of decision making performance, this evaluation will include both externally- and internally-defined criteria. External criteria will be available as a result of the establishment of "expert" solutions to the decision making problems. Internal criteria will include a statistical evaluation of the reliability associated with subjective ratings (probabilities and utilities). In addition, a decision-theoretic (SEU-based) criterion of optimality will be used to evaluate the consistency of decisions relative to the previously expressed subjective values of each decision maker.

#### 2.4 Experimental Plan

The objective of the decision analysis program is the development of aiding systems to support decision making by military command personnel. The evaluation, therefore, focuses on the effectiveness of the aids in an actual decision making context, as opposed to their possible application in training or group communication. The experimental conditions lie among a continuum ranging from the absence of any aid to the presence of a complete aiding system. Given a difference in favor of aided decision makers, the experimental plan will enable us to identify the primary

source(s) of aiding effectiveness. The following sections summarize the experimental manipulations, and the evaluation questions they are designed to answer.

2.4.1 Aiding versus No Aiding. The initial experiment is designed to assess the overall impact of decision aiding on decision making. The plan is to compare the performance of completely aided subjects with that of comparable but unaided controls. Unaided subjects will be required to perform the same task as their aided counterparts, but without a decision aiding system.

The evaluation will include two different unaided control groups. One group of control subjects will be given no instructions other than to perform the decision making task itself. However, performance under these circumstances may not constitute an entirely appropriate baseline from which to judge aiding effectiveness. A decision aiding system may appear to improve performance relative to an unregulated control by virtue of having required the decision maker to spend more time thinking about the task. This general orienting function is not the main objective of a decision-theoretic aiding system, since it can be achieved more efficiently by simply instructing the subject to attend to the task for a specified amount of time. Therefore, a second group of unaided subjects will be used to control for the possibility of a "time on task" effect. These individuals will be required to provide a brief written account of the rationale underlying each decision they reach. The amount of time they are required to devote to each decision will be approximately the same as in the case of aided subjects. If a "time on task" phenomenon is sufficient to explain aiding effectiveness, this second control condition should perform as well as the completely aided group. Thus the first control condition will permit a measure of elapsed time per unaided decision, while the second will control for this variable by equating

aided with unaided decisions in terms of the "effort" expended by the decision maker.

2.4.2 Aggregation versus Structuring. A componential analysis of aiding functions suggests that either the *aggregation* of subjective input or the *structuring* of task environment (through elicitation), or both acting together, may account for the improved performance of aided subjects. An experimental manipulation was therefore designed to empirically determine the separate contributions of aggregation and structure. This fourth condition will provide the decision maker with task structure by requiring him to interact with various elicitation programs. However, neither the aggregated results nor the decision recommendations typically afforded by the aid will be displayed. If structuring alone enhances performance, then the use of aggregation in a decision-theoretic aiding system may be an attractive, but purely optional, feature.

2.4.3 Detailed versus Global Elicitation. The analysis of aiding functions may be extended to encompass the issue of *detailed* versus *global* elicitation. The elicitation procedures in the aiding system under investigation require subjects to estimate conditional event probabilities and, in addition, to assess utilities separately for each attribute dimension. A less time-consuming and perhaps more efficient strategy is to simplify elicitation by requiring "global" estimates (e.g., unconditional probabilities and overall utilities). Thus another experimental manipulation is planned to determine the contribution of detailed elicitation to aiding effectiveness. Subjects in a separate treatment group will be required to provide global subjective estimates, and as a result, will receive aid computed on the basis of "simplified" input. If aiding effectiveness is not reduced, the use of detailed elicitation may be unwarranted.

In summary, the evaluation will assess the effectiveness of decision aiding relative to a number of unaided control conditions. In the event that aiding proves effective, an empirical analysis will identify the specific aiding functions responsible for the improvement.

2.4.4 Experimental Subjects. Experimental subjects for the preliminary study (for obtaining solution norms) and the main experimental study will be intelligence analysts. They will be obtained through cooperation with intelligence agencies in the Washington, D.C. area. The preliminary study will require a minimum of five analysts who will spend one and one-half hours at an individual decision making task and one hour in a group decision task. The main study will require four subjects in each of the five experimental conditions. The 20 intelligence analysts will spend two to three hours in an individual decision making session.

### 3. STUDY DESIGN

#### 3.1 Overview

The experimental evaluation of interactive decision analytic aids consists of two substudies as well as the evaluation proper. The two substudies will be conducted to (1) obtain norms related to quality of decision making, and (2) assess materials and procedures to be used in the main evaluation. This progress report discusses a number of issues pertaining to various components of the studies and outlines the approach that will be used in obtaining normative data related to quality of decision making.

#### 3.2 Scenario Evaluation and Selection

In order to provide a realistic decision making context in which to evaluate decision-making aids, a number of scenarios have been scrutinized for possible use in the evaluation. These were (1) a Warsaw Pact scenario used in work performed by DDI (Selvidge, 1976); (2) crisis management scenarios developed by CACI, Inc. for the Central Intelligence Agency (CACI, 1977, 1978); and (3) the Tactical and Negotiations Game (TNG) developed by Streufert, Castore, and Kilger (1967) and subsequently modified at Perceptronics.

3.2.1 Warsaw Pact Scenario. The Warsaw Pact Scenario describes a situation where there is a build-up of Warsaw Pact forces in Eastern Europe and the Western USSR. The uncertain event of interest is whether or not these forces will invade NATO countries. The decision to be made is: What alert posture should NATO assume? The DDI Warsaw Pact scenario has a number of desirable characteristics. First, it is a realistic scenario since it involves a political situation of vital importance to

U.S. interests. Second, the scenario uses names of countries and places familiar to intelligence analysts. Third, the scenario has experimental validity since it has been used in previous empirical work by DDI, Inc. (Selvidge, 1976; Brown, Kelly, Stewart, and Uvila, 1975).

3.2.2 Crisis Management Scenarios. CACI has developed a number of realistic scenarios for use in Central Intelligence Agency (CIA) crisis management exercises. The scenarios cover logically plausible incidents that could develop from the current political environment. The occurrence of such incidents pose sufficient threats to U.S. interests or personnel to warrant assembling a CIA crisis task force. There are three fully developed scenarios. These are:

- (1) The Aegean Sea Crisis involving a conflict between Greece and Turkey over off-shore oil rights.
- (2) The Panama Canal Crisis involving failure of the U.S. Senate to ratify the Panama Canal Treaty.
- (3) The Korean Crisis covering potential South Korean retaliation against North Korea for purported terrorist activity.

The CACI scenarios are very realistic since they involve existing countries and their interaction with the U.S. However, each scenario is composed of mini-scenarios -- that is, each scenario describes alternative sequences of events that could occur under the particular conditions described in the scenario's background information. As a result, none of the mini-scenarios are lengthy enough for use in our decision-aids evaluation. Furthermore, the CACI scenarios violate a number of the simplifying assumptions of the decision aid used in the evaluation proper. Specifically, the scenarios provide decision options whose selection impact directly upon the probability of subsequent events. As a result, the probability independence assumption of the decision aid is violated.

3.2.3 Tactical and Negotiations Game. The Tactical and Negotiations Game (TNG), originally developed by Streufert, Castore, and Kilger (1967) and subsequently modified at Perceptronics, is a controllable standard scenario which serves as a basis for comparing decision aiding systems. The TNG has been recommended as such a common vehicle by reviewers of decision aiding research (Slovic, Fischhoff, and Lichtenstein, 1977). This scenario possesses considerable task complexity and provides results with applications to real-world decision making. The scenario requires players to process information messages and made decision assessments concerning the military, intelligence, negotiation, and economic activity of a small underdeveloped nation plagued by an internal revolution and foreign intervention. In some ways, the situation is similar to the type of environment created by recent conflicts in Southeast Asia.

The TNG involves multi-dimensional information (supported by a backdrop map of the geographical area of concern) for multi-faceted C3 decision making, and it has been repeatedly demonstrated in past research to maintain high subject motivation and produce reliable results. It provides a standard structure or background, but it is flexible in that the situational environment and the particular messages generated and received may be modified. Furthermore, a large body of TNG performance data collected under laboratory conditions can be drawn upon to comparatively evaluate an automated information-management aid.

3.2.4 Final Scenario Selection. Both the Warsaw Pact scenario and the TNG were selected for inclusion in the study because of their desirable attributes. The TNG, however, was modified to parallel the Warsaw Pact scenario in message structure and content. Drafts of both scenarios are given in Appendices A and B, respectively, of this report. Although the two scenarios are parallel in important respects, they remain different in degree of familiarity -- e.g., the TNG consists of fictitious countries



#### 4. MEASURING QUALITY OF DECISIONS

The major objective of the decision aids evaluation is to assess whether decision makers reach "better" decisions with the assistance of a decision aid than they do without one. The evaluation will be effected by placing decision makers in a multidimensional decision making environment where they will be required to interpret messages pertaining to a critical situation. Their task will be to select one of a number of decision alternatives given the existence of a number of uncertain alternative outcomes. For example, a military commander might have to decide, on the basis of new information, which would be the best alert position for his troops given an a priori probability of enemy attack.

##### 4.1 Approach

An independent substudy will be conducted to determine the normative or "correct" decisions for both the Warsaw Pact and the TNG scenarios. Each scenario will consist of background information and messages. A number of alternative, fixed decision options will be associated with each scenario. Consensual opinion will be used to determine the best decision alternative for each scenario. The underlying rationale is that in decision-making, "many heads are better than one." That is, although an individual decision maker may fail to identify a correct decision alternative, a group of decision makers should not.

There are two criteria that the scenarios and decision alternative should meet:

- (1) The scenarios should not be so transparent that the correct decision alternative is totally obvious; otherwise a decision aid would not be necessary to attain the best decision.

- (2) There should be one decision alternative that is perceived by the majority of decision makers as being the correct or preferred one. If this condition is not met, "correct" decision making cannot be ascertained.

In order to meet these requirements, more than one iteration of the normative study may be necessary.

#### 4.2 Method

The normative study will consist of three tasks, each of which will serve to either determine or validate the "correct" decision alternative. The three tasks are:

- (1) Initial decision making
- (2) Options rating
- (3) Final decision making

A "correct" alternative is operationally defined as the decision alternative chosen by a majority of the substudy participants.

4.2.1 Initial Decision Making Task. The purpose of the initial decision making task is to investigate whether study participants have an a priori bias to a particular decision alternative. It may be that one alternative is so plausible that it will be chosen as correct irrespective of the message information provided. The initial decision making will occur after the participants have read the scenario's background information. Two favorable outcomes of the initial decision making could result:

- (1) All decision alternatives are perceived as equally good.

- (2) A different decision alternative is perceived as correct on initial decision making than is perceived as correct on final decision making -- viz., before and after reading messages.

Result (1) would indicate that substudy participants are not initially biased towards any alternative. Result (2) would indicate that while there exists initial bias to a particular decision alternative, the message information counters and overcomes the initial bias.

4.2.2 Options Rating Task. The purpose of the options rating task is twofold:

- (1) Assure that decision makers attend to each scenario message.
- (2) Internally validate the ultimate selection of the "correct" decision option.

The validation process is based on an elementary model of information integration. The model assumes that the messages weight the decision options -- that is, messages support or negate the available options. Weights from new messages are cognitively integrated with the weights of previous messages. Thus, if the weight of each message can be measured and the integration rule is specifiabile, then it should be possible to predict decision makers' ultimate preference ranking of the decision options.

A number of integration rules have been postulated and tested in the psychological literature. These have been mainly applied in work on attitude formation and attitude change but also on other work on the general problem of information integration (Wyer, 1974; Anderson, 1974). Fishbein (1967) and Fishbein and Ajzen (1975) have advocated a summation

rule while Anderson (1971, 1974, 1976) has been a proponent of averaging models. However, the basic averaging model can be represented as follows:

$$R_i = \frac{\sum_{m=1}^n w_{m/n}}{n}$$

where  $R_i$  is the final ranking of option  $i$  and  $\frac{\sum_{m=1}^n w_{m/n}}{n}$  is the average of the weights for messages 1 through  $n$ .

The prediction of the final ranking of decision options will be used to validate the ultimate ranking of the options by showing that the message information is in fact used to arrive at the final decision.

In the options rating task, decision makers will individually rate the merit of each decision option after seeing each message. For example, a decision maker might have to decide what alert posture his troops should assume. Thus, he might have the following four options:

- (1) Maintain the status quo.
- (2) Place his troops on military vigilance.
- (3) Place his troops on simple alert.
- (4) Place his troops on reinforced alert.

He then receives the following message: "Two Soviet mechanized divisions are reported enroute to exercise area from the western military districts of the USSR." The decision makers' task will be to rate the "goodness" of each decision option given the message. Ratings will be performed using a seven point scale ranging from poor (1) to good (7). One rating will be obtained for each decision option. For example, after seeing the message given above, the decision options may be given the following values:

Option 1: 2  
Option 2: 3  
Option 3: 6  
Option 4: 3

This procedure will be repeated for each message, and the data will be used to validate the ultimate decision option selection.

The adopted approach assumes that there are no interactive effects among messages. This assumption may not be fully valid. However, scenario messages have for the most part been constructed to be independent from each other -- that is, each message has been composed to stand by itself and, as such, can be removed from the scenario without considerably altering the meaning of prior or subsequent messages.

4.2.3 Final Decision Making Task. Once all messages have been read and rated, decision makers will be asked to individually rank order the decision alternatives. Once this has been completed, a group discussion will be conducted in order to obtain a consensus as to the correct solution for the scenario. The decision option selected by the group as the best will then constitute the normative or "school" solution to be applied for performance scoring purposes in the main experimental study.

## 5. HARDWARE AND SOFTWARE ACQUISITION

An IBM 5110 computer has been acquired to implement DDI's Rapid Screening of Decision Options decision aid. The necessary software had previously been obtained through Jim Allen. However, this software is compatible with the IBM 5100 computer which is a slower machine than the 5110. DDI has offered to make IBM 5110 compatible programs available to us in the near future.

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APPENDIX A  
WARSAW PACT SCENARIO

DATUM 1

February 2

- . Germany, Italy, France and Belgium all report an increase in the number of incidents near military facilities that can be related to foreign-inspired subversive activities, particularly during the past 48 hours.

February 3

- . Soviets warn U.S. that Sixth Fleet is operating dangerously in the Mediterranean and interfering with Soviet fleet operations.
- . An economic mission representing two NATO countries is welcomed in Moscow.

February 4

- . German security personnel report picking up a Soviet undercover agent newly assigned and apparently with the mission of interfering with NATO communications facilities.

DATUM 2

February 5

- . The U.K. reports a usually reliable source has information that some Soviet merchant vessels are being fitted with guns. Agent believes guns have both a surface-to-surface and surface-to-air capability. Description of guns indicates that quad-mounted 12mm, dual-mounted 14mm, and 37mm guns are predominant.

February 6

- . Increased stocking of Warsaw Pact ammo dumps, in excess of announced exercise requirements is reported by one of the NATO nation's national intelligence agencies.
- . Propaganda continues with the tenor being that European nations should quit being U.S. puppets, that they could not depend on U.S., and that peace could be maintained through increased European cooperation with the USSR and reduced relations with the U.S.

February 7

- . Moscow announced that in addition to a reduction in consumer goods, increased energy requirements mean less POL for consumer-related industries.

February 8

- . U.S. reports a build-up of Russian submarines in both the Atlantic and Pacific.

. Articles hint at possible invitation to some senior western military medical personnel to visit the upcoming exercise.

February 9

. Several new military construction projects in exercise area, in excess of what has been observed for previous exercises, are reported by German national intelligence source.

. Unusually large number of trucks carrying military supplies are noted by corridor aircraft flying to and from Berlin.

. Fewer Soviet commercial vessels are noted in western ports. It appears that more than usual numbers of Soviet commercial vessels are in Soviet ports.

. SACEUR has information from an unevaluated source that the USSR has ordered some mobilization, the degree unknown.

. NATO intelligence has received an unconfirmed report of unusual activity at a dispersal airfield in Poland.

DATUM 3

February 10

- . Moscow announces 100% support for coming pact exercise in order to play the game as realistically as possible. The USSR has cancelled some military leaves and is ordering personnel involved to return to their units.

February 11

- . Moscow anti-U.S. and anti-western propaganda reaches a new peak for recent years.
- . Northern NATO nations are warned to keep naval units out of Eastern Baltic or face having them seized.

February 12

- . U.S. and U.K. military attaches are accused of spying; two military attaches are arrested by Soviets. All other U.S. personnel are restricted to embassy area of Moscow.
- . Heavy pact troop movements are noted coming through western military districts of USSR toward front-line exercise area.

February 13

- . Pact military leaders assemble for meeting in Moscow, Pravda states meeting is in connection with exercise plan. Such high-level review has not been observed for previous exercises.

DATUM 4

February 14

- . German intelligence reports a greatly increased number of Soviet technicians currently arriving in Poland, Hungary, and Czechoslovakia.
- . French ambassador to Russia is called to Kremlin and made aware of Soviet's concern for certain military related activities they have observed in France and interpreted as increased military readiness actions.
- . British report confirms earlier report of fitting of Soviet commercial vessels with guns and also reports Soviet Navy was involved in practice laying of a submarine net across harbor in Vladivostok and Murmansk.

February 15

- . Reliable U.S. national sources determine that an unusually heavy concentration of railroad freight and passenger cars are marshaling along main rail routes and rail sidings in western military districts of USSR.

February 16

- . U.S. Navy ships in Pacific and Atlantic report being trailed by Russian vessels.
- . Soviet commercial fishing fleets have returned to the USSR or at least to Soviet waters.



DATUM 5

February 19

- . Reliable British source reports pact air commanders meeting in Warsaw allegedly to finalize exercise rules, a meeting not observed in previous exercises.
  
- . GDR and Czechoslovakia announce that in the interests of safety, the Berlin and Prague corridors will be closed to all commercial aircraft from 24 February through 21 March. They announce that even though the closure starts prior to the planned start date of the exercise, the extensive movement of military aircraft and posturing for the exercise make the curtailment of all commercial flights a necessity.
  
- . The Berlin authorities, posturing immediately, file a formal protest.

February 20

- . GDR alleges two border violations by NATO aircraft.
  
- . Two Soviet mechanized rifle divisions are reported enroute to exercise area from the western military districts of USSR.
  
- . NATO nations protest air corridor closings.

February 21

- . Soviet ground force units deploy to exercise assembly areas.

- . Greatly increased communications as well as new systems and networks are noted.
- . Hungary announces that for economic reasons the two divisions which were planned to be moved to the forward exercise area will participate in place.

February 22

- . The German permanent representative to NATO has learned from the Austrian ambassador at Bonn that serious Communist-inspired incidents, new clandestine radios, and troop assemblies near their border are occurring.

February 23

- . SHAPE intelligence believes pact nations have accomplished many actions normally included in general mobilization. At least all of the front line and reinforcing divisions appear to be filling to 100%
- . GDR claims three border violations by West Germany and states she is being forced to take countermeasures.

DATUM 6

February 24

- . U.S. reports fairly strong indications that stored W.P. military vehicles, reserve tanks, and weapons have been readied for use.
- . SHAPE intelligence identifies 34 standby airfields in Poland, Czechoslovakia, and western USSR that are now considered operational, and all appear to be undergoing a rapid logistics build-up.
- . GDR halts western road and rail traffic to Berlin with detailed, time-consuming inspections.

February 25

- . Moscow announces that all Russian ports will be closed to foreign ships and will remain closed until completion of the exercise.
- . U.S. announces that all Russian military attaches and their families have departed the U.S. for Moscow.

February 26

- . Moscow Navy seizes two Danish commercial ships south of Swedish island of Gotland and forces ships to dock in port of Kaliningrad.
- . Warsaw Pact air defense system goes on maximum alert, announced as the first live play in preparation for the exercise.

February 27

- . Moscow announces suspension of all international Aeroflot flights until completion of the exercise. Aeroflot is placed under control of the military.
- . USSR vetoes U.N. Security Council discussion of Dardanelles, Thrace, or seizure of Danish commercial vessels.

March 1

- . Russia warns that the air corridor to Berlin is closed for the exercise and any commercial or military aircraft attempting to fly to Berlin will be forced to land.

APPENDIX B  
MODIFIED TACTICAL AND NEGOTIATION  
GAME SCENARIO

## Background Information for the Tactical and Negotiation Game

You are about to play a tactical and negotiations game. The object of the game is to resolve the problematic political and military situation in which the country of Shamba is involved.

You represent a powerful nation called the UNION OF NORTH HEMISPHERIC STATES (UNHS). Information about the reasons for the involvement of the UNHS in the Shamba conflict and the level of the UNHS involvement will be given to you below. You are opposed by a rebel movement in the country of Shamba which calls itself the Free Government of the Nation of Shamba. The existence of this movement threatens the freedom of choice of the people of Shamba. It is, in effect, part of a worldwide movement designed to destroy the freedom we have learned to appreciate. This movement is supported by another powerful group of nations called the Socialist Alliance (SA).

As an intelligence officer on the staff of the UNHS Shamba mission, you support the top level representatives. Your task is to assess enemy intentions through the analysis of intelligence reports and make recommendations to your superiors as to the best course of action to support UNHS objectives in Shamba.

The situation in which you find yourself at the beginning of the game is as follows (see map in Fig. A-1):

Shamba has been governed by a quasi-military dictatorship for about twelve years. The government, formed after a military coup d'etat has become unpopular among certain segments of the population. Rebel activity has been mounting. Some five years ago, the rebel movement was in virtual control of the country with the exception of the capital



city of Savin. The rebels established a rival government the so-called "Free Government of the Nation of Shamba" which considered itself to be the legal government of the population of Shamba. At that time, a number of foreign nations, among them Marandi, recognized the rebel government as the legitimate governing body of all Shamba. The embattled military government then called for help from outside the country. Your nation, the Union of North Hemispheric States (UNHS) agreed to aid the government in combatting the rebellion. In return, the UNHS asked that it be permitted to establish a military (naval and air) base at Komsa. The military National Government of Shamba agreed. Since that time the UNHS has been consulted by the government of Shamba concerning most of the important decisions of internal affairs in Shamba and all foreign policy decisions.

With the help of UNHS arms and some troops, the rebels were driven back into the mountains, onto Monque Island, and into the territory of Marandi. (Marandi has for some time tacitly supported the rebellion in Shamba.) Over the past five years certain segments of the population of Shamba have continued to evidence some discontent.

The military strength and negotiations position of the rebel movement have begun to improve at this time due to increased assistance from other nations, especially the Socialist Alliance (SA). Prior to last year, only small gains had been made by the rebels since the defeat of the rebellion five years ago. However, one year ago, the rebellion again became quite open and the rebel cause has subsequently made larger gains.

There are six governments involved in one way or another in the Shamba conflict. These are:

The Free Government of the Nation of Shamba (The Rebels).--At the present time, the rebel government is operating out of Marandi where it has been in exile for the past five years. The diplomatic and military leaders of the rebel movement were recently replaced by new men. These new men were apparently carefully selected and trained by the SA for their current positions by the powers behind the rebel movement.

The Shamba Military Government.--Since the arrival of the UNHS troops in Shamba five years ago there have been a number of military coups d'etats. All governments, however, have given at least tacit support to the cause of ousting the rebels. The present government has been in power for three and one-half months. The current government is preparing a plan for economic development of certain regions of the country. These plans are hampered, however, by the cost of maintaining a large army in order to cope with the rebel movement.

The Involvement of the UNHS.--One year ago UNHS granted permission for your predecessors to open negotiations with the SA which was sympathetic to the rebel cause. Then, two months ago, permission was granted for the opening of direct negotiations with representatives of the rebel movement. These negotiations will start very soon.

Over the past five years the UNHS has steadily increased its military commitments to Shamba to cope with the worsening situation. Due to the failure of your predecessors to achieve any diplomatic or military gains, they were transferred back to the UNHS. Your predecessors had been given explicit instructions for conducting operations in Shamba. However, because of the gravity of the current situation, the group you support has been given virtual freedom to act as they wish--within the following constraints:

- (1) UNHS expects you to improve the diplomatic situation in Shamba.
- (2) UNHS expects you to improve the military situation in Shamba. The air and naval base at Komsa is strategically located and is vitally important to the UNHS.
- (3) You must make periodic individual reports on your progress to your home country.

The Involvement of Marandi.--Officially the government of Marandi is neutral in the current situation. They have tolerated the presence of troop training operations by the rebels, have provided a haven for fleeing troops, and the rebel government maintains operating headquarters in Marandi. At this time, the government of Marandi maintains full diplomatic relations with the military government of Shamba. But Marandi in its attempt to industrialize has become increasingly dependent on economic aid from the Socialist Alliance.

Your government cautions you that any violation of Marandi national boundaries: the middle of the Ondulu River, her territorial waters (12 mile limit), or her air space could result in grave diplomatic and/or military consequences, since Marandi is protected through treaties with other major world powers.

The City-State of Mandero.--Mandero is an independent and neutral city-state on the coast of Shamba. It has served well as an area for recreation as well as for contacts with the enemy. Negotiations with the rebels will be carried on within the territorial limits of Mandero. The UNHS as well as the rebel movement has guaranteed the independence of Mandero.

The Socialist Alliance (SA).--The Socialist Alliance is a major world power much like the UNHS. It has a totalitarian form of government and its aim is to foster its form of government around the world. In the past, the SA has not supported the Rebel cause with direct military aid.

DATUM 1

May 18

. UNHS intelligence officers in Komsa, Savin and McKosam all report an increase in the number of incidents near UNHS military facilities that can be related to rebel subversive activities, particularly during the past 48 hours.

May 19

. Rebels (Free Government of the Nation of Shamba) warn Savin government that Shamba naval units should not approach Monque Island and interfere with their supply routes.

. UNHS and Shamba delegation is welcomed for negotiations to be held with rebel leaders in Marandi.

May 20

. UNHS intelligence reports rebel attempt at sabotaging Komsa/Savin railroad.

DATUM 2

May 21

Shamba intelligence reports sighting of small boat landings on the west coast of Shamba. One boat was captured and found to carry a supply of mortars.

May 22

Agent S, a Shamba businessman residing in Marandi City, reports diminished rebel military presence in that city. Agent S believes the rebels are infiltrating back into Shamba.

Rebel propaganda continues with the tenor being that residents of Shamba should quit being UNHS puppets, that they cannot depend on UNHS presence, and that economic problems could be alleviated by instituting the Free Government of the Nation of Shamba (rebels) instead of the Shamba military dictatorship.

May 23

Marandi announces that an unusually high food demand has created shortages in that country. Intelligence suspects that part of the Marandi food supply is being diverted to the rebels.

May 24

UNHS intelligence reports a greater than usual number of sightings of rebel forces in the countryside near McKosam.

Rebel propaganda messages broadcasted from Marandi hint that some progress has been made at the negotiations being conducted between Shamba/UNHS and rebel delegations.

May 25

Shamba regular troops report a greater number of engagements than usual with rebel forces near Batu.

Unusually heavy traffic is reported along the road from Marandi City towards the Marandi/Shamba border.

Agent Q, UNHS intelligence operative in Mandero City, reports fewer rebels are seen in the city. He speculates that they may be keeping a low profile during negotiations.

UNHS intelligence has information from an unevaluated source that the rebels have ordered an offensive of unknown degree against the UNHS base in Komsa.

UNHS Naval Intelligence has received an unconfirmed report that the Socialist Alliance (SA), a major foreign power supporting the rebels, has sent military advisors to assist the rebels.

DATUM 3

May 26

- . Rebel leaders announce 100% commitment to the current negotiations held in Mandero City. They announce that their forces have been ordered to assume a defensive posture only and fire only when fired upon.

May 27

- . Rebel radio propaganda from Marandi against UNHS presence in Shamba reaches a new peak for recent years.
- . Marandi leaders warn UNHS ambassador that UNHS planes violating Marandi airspace will be shot down.

May 28

- . UNHS diplomatic attaché in Marandi is accused of spying, and arrested by Marandi secret police. All UNHS personnel are restricted to embassy area in Marandi City.
- . Heavy rebel infiltration is reported over Marandi/Shamba border.

May 29

- . Rebel delegation to Mandero City negotiations requests a one-week postponement of discussions in order to confer with rebel leadership.

DATUM 4

May 30

- . Shamba intelligence reports an increased number of SA personnel in Marandi City. It is speculated that these are military advisors.
- . UNHS ambassador to Marandi is called to a discussion with the president of Marandi and made aware of the president's concern for certain military related activities observed on the Shamba side of the Shamba/Marandi border. He fears that UNHS is preparing for an invasion of Marandi.
- . Shamba intelligence reports confirm increased rebel arms shipments to the west coast of Shamba. Two small boats were captured carrying small arms and armunition.

May 31

- . Reliable UNHS newspaperman reports that there is unusually high rebel activity in rebel camps along Ondulus River in Marandi, directly south of Batu.

June 1

- . UNHS units in the komsa countryside report encountering several enemy units during the last few days.
- . Shamba intelligence reports fewer Marandi officials in Savin than usual.

June 2 and 3

. Rebel leaders demand immediate withdrawal of UNHS forces from Shamba.

DATUM 5

June 4

- . Intelligence of a reliable UNHS ally reports sighting rebel military leader arriving at the airport of the capitol city of the SA.
- . SA naval units are seen operating in international waters off the west coast of Shamba.
- . Shamba and UNHS government, posturing immediately, hold press conferences to express their concern about heightened SA military presence in the area.

June 5

- . Marandi alleges two border violations by UNHS aircraft.
- . Two military cargo planes from SA arrive at Marandi City airport. SA announces this is the first shipment of military aid promised to Marandi a year ago.
- . UNHS warns SA that continued military aid to Marandi will result in UNHS economic sanctions against them.

June 6

- . Military aid is unloaded from SA cargo planes and sent to Marandi units operating near Shamba border.
- . Two more SA military cargo planes arrive at Marandi City airport.

. SA announces that naval units off the western coast of Shamba have finished naval exercises and will return to home port.

June 7

. Recently arrived SA cargo planes are unloaded of military equipment at Marandi City airport.

. SA airborne infantry division placed on alert. All military leaves for the division cancelled.

. Marandi officials request rebels to resume negotiations with Shamba/UNHS delegation.

June 8

. Rebel leader seen arriving at Marandi City airport by UNHS informant.

. UNHS Central Intelligence Agency believes SA is in position to strongly support rebel offensive against Shamba Military Dictatorship. SA naval units have not left the waters west of the Shamba coast.

. SA claims UNHS naval fleet is interfering with their naval operations near Monque Island.

DATUM 6

June 9

. UNHS intelligence reports that SA aircraft carrier is sailing towards Shamba region and is estimated to arrive in two days.

. Allied intelligence has discovered that unused airfields along Shamba/Marandi border have been cleared of vegetation and readied for use.

. Marandi closes its border with Shamba on the pretext of Shamba border violations.

June 10

. SA denounces UNHS for imperialistic presence in Shamba and reiterate their support for the rebel cause.

SA naval units in waters west of Shamba are placed on maximum alert under the guise of a naval exercise.

June 11

. Marandi Navy seizes a UNHS commercial ship allegedly violating Marandi territorial waters.

. Three SA military air-cargo planes land in Marandi City. Heavy armor is unloaded.

