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RESEARCHER'S MANUAL TO ACCOMPANY THE YUGOSLAV DILEMMA
(A COMPUTER SIMULATION)

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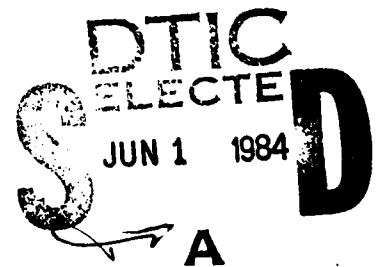
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FOREWORD

This document is one in a series which reports on research conducted by the Behavioral Sciences Research Center at Science Applications, Inc., under Contract No. MDA 903-79-C-0699 with the U.S. Army Research Institute for the Behavioral and Social Sciences. The work on this contract has involved designing and developing a management assessment training and simulation system (MATSS), which includes a computer simulation called the "Yugoslav Dilemma," used to assess the decision-making strategy used by executive level managers. Decision making has been found to be one of the most prevalent factors in organizational management. The major documents produced by this project include:

Swezey, R. W., Streufert, S., Criswell, E. L., Unger, K. W., and van Rijn, P. Development of a computer simulation for assessing decision-making style using cognitive complexity theory. (SAI Report No. SAI-84-04-178) McLean, VA: Science Applications, Inc., 1984.

This report is the project final report. It describes the history of the project, theoretical (cognitive complexity theory) rationale for the simulation and its assessment measures, and a complete description of the simulation. Interested readers should refer to this report for an overview and description of the project.

Baudhuin, E. S., Swezey, R. W., Foster, G. D., and Streufert, S. An empirically derived taxonomy of organizational systems. (SAI Report No. SAI-80-091-178) McLean, VA: Science Applications, Inc., 1980.

This document describes the factor analytic procedures used to cluster and rank order over 350 variables involved in systems theory and organizational management. The procedure yielded six factors. Factor one was multidimensional information processing including decision making. This factor lead to the decision-making emphasis of the MATSS simulation.

Swezey, R. W., Davis, E. G., Baudhuin, E. S., Streufert, S., and Evans, R. A. Organizational and systems theories: An integrated review. (SAI Report No. SAI-80-113-178) McLean, VA: Science Applications, Inc., 1980.

This 300-page literature review provides an integrated discussion relating the diverse fields of organizational and systems theory. Its contents are organized according to the taxonomy developed in Baudhuin, Swezey, Foster, and Streufert (1980).

Unger, K. W. and Swezey, R. W. Programmer's manual to accompany the Yugoslav dilemma (a computer simulation). (SAI Report No. SAI-83-08-178) McLean, VA: Science Applications, Inc., 1983.

This manual describes the eight programs which run the Yugoslav Dilemma. Each program is listed and annotated. Some possible program manipulations are described.

Criswell, E. L., Unger, K. W., Swezey, R. W., and Streufert, S. Researcher's manual to accompany the Yugoslav dilemma (a computer simulation). (SAI Report No. SAI-84-02-178) McLean, VA: Science Applications, Inc., 1984.

The manual 1) explains the researcher's responsibilities in running participants through the simulation, 2) describes all materials necessary to operate the simulation, 3) provides step-by-step operating procedures, and 4) presents instruction for interpreting participant profiles.

Criswell, E. L., Unger, K. W., and Swezey, R. W. Participant's manual to accompany the Yugoslav dilemma (a computer simulation). (SAI Report No. SAI-84-03-178) McLean, VA: Science Applications, Inc., 1984.

This manual presents 1) instructions on how to interact with the computer during the simulation, and 2) fictional background information to set the stage for the Yugoslav Dilemma.



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RESEARCHER'S MANUAL TO ACCOMPANY THE YUGOSLAV DILEMMA (A COMPUTER SIMULATION)

EXECUTIVE SUMMARY

Requirement:

The Yugoslav Dilemma is a computer simulation designed to assess the decision-making style of high-level managers in complex situations. Each participant is assisted by a researcher. The Researcher's Manual documents the duties of the researcher.

Procedures:

The contents of the Researcher's Manual include an introduction, prerequisites for being a researcher, researcher responsibilities, and procedures. The procedures contain step-by-step instruction for 1) setting up and running the Yugoslav Dilemma and the Storm scenario practice session, and 2) computer generation of participants' decision-making style profiles. Researchers are also taught how to use preliminary unvalidated norms in discussing profiles with participants.

Findings:

Given experience as a participant and the Researcher's Manual, the researcher can run participants through the Storm and Yugoslav Dilemma simulations and tentatively interpret the results of the assessment.

Use of Findings:

The Researcher's Manual is a necessary tool for researchers working with the Yugoslav Dilemma.

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I. INTRODUCTION

This Researcher's Manual accompanies the computer simulation, "The Yugoslav Dilemma." This manual also accompanies the Storm simulation, which is usually used as a practice session for the Yugoslav Dilemma.

The goal of the Yugoslav Dilemma is to assess a participant's "decision-making style." This assessment is thought to tell if a participant, in a characteristic way, requests and acts on information when conditions are difficult and stakes are high. This assessment is an application of cognitive complexity theory. See Streufert and Swezey (1982) for a description of cognitive complexity theory.

As a researcher, you will have specific responsibilities which are discussed in the next section. Procedures for operating the simulation and interpreting participants' data are also included in this manual.

Prerequisites for being a researcher include:

- Be a participant yourself.
- Be thoroughly familiar with the Participant's Manual (Criswell, Unger, and Swezey, 1984).
- Thoroughly read this manual.
- Verify that you can operate the computer to run the simulation.

One need not be a seasoned computer programmer or operator to function as researcher. This Researcher's Manual is not designed to teach the complexities of the programs involved. See Unger and Swezey (1983) for program details. At this point, however, some computer operating guidelines may be offered:

- The] symbol must be showing when you make an entry.
- The ← and → keys move the cursor (□) forward and backward. The cursor indicates your present location on the screen.

- Check your typing. If you enter SIMYD,OBJ or SIMYD. OBJ instead of SIMYD.OBJ, you will get an error measure.
- Find the CTRL key. This control key works like a shift key. You press CTRL and another key at the same time. This key commands the computer; it does not type. For example, if you enter CTRL C correctly, you will not see a C on the screen.
- Whenever the computer says PRESS ANY KEY TO CONTINUE, it means to press any key except CTRL, SHIFT, RESET, or REPT. Pressing any of those four keys has no effect. However, if you press CTRL and RESET at the same time, you will end the program; so do not press CTRL and RESET at the same time unless you want to end the program.
- If you have a problem, hit CTRL and RESET at the same time. This produces the] symbol so you can backtrack and start entering again.
- Call an expert if you have major problems.

Using this manual, a researcher should be able to run a participant through the Storm and Yugoslav Dilemma simulations and generate and interpret the participant's decision-making style profile. Should major computer problems arise, however, the researcher will need to call a computer expert. Make sure all programs and data are duplicated on floppy disks in case anything happens to the floppy or hard disks during a session.

Chapter II of this manual lists the researcher's responsibilities.

Chapter III describes all the materials needed to run participants through the Yugoslav Dilemma and its practice session, the Storm scenario.

Chapter III also includes a suggested room arrangement based on human factors considerations.

Chapter IV includes detailed, step-by-step instruction in operating each simulation. For each simulation, standard and alternate operating procedures are given. The alternate procedure allows a researcher to select certain parameter values whereas the standard procedure sets all parameters for the

researcher. Chapter IV introduces program changes that may affect simulation timing and information load; however, programming these changes is explained in Unger and Swezey (1983).

Chapter V provides detailed step-by-step instruction in generating decision-making style profiles. The researcher is taught to copy data files from the hard to the floppy disk then print out the profile. Chapter V also provides preliminary norms and information about interpreting and discussing a profile. This information takes into account the early developmental stage of both the simulation itself and the measures of complexity generated.

II. RESEARCHER RESPONSIBILITIES

Your responsibilities as researcher include:

- Having all materials ready for the participant.
- Engaging computer so that the simulation will begin.
- Briefing the participant; answering questions as necessary before the simulation begins.
- Answering participant questions as necessary during the simulation; assisting participant with computer operating problems should they develop.
- After the session, operating the computer to generate the participant's decision-making style profile.
- Reviewing and discussing participant's profile with him or her.

Figure 1 presents the sequence of events for the researcher. These events are all described in this manual.

DAY BEFORE

Set up computer room.

Provide Participant's Manual for participant.

STORM SCENARIO

Load Storm scenario.

Brief participant.

After participant completes simulation, verify participant knows all simulation procedures.

YUGOSLAV DILEMMA

Load Yugoslav Dilemma simulation.

Be available as needed while participant completes simulation.

DECISION-MAKING
PROFILE

Generate participant's decision-making profile:

- Rename participant's files on hard disk.
- Copy participant's files from hard disk to floppy disk containing profile program.
- Print out participant's profile.
- Copy participant's files to a storage disk.
- Delete participant's files from profile program floppy disk and hard disk.

Discuss profile with participant.

Figure 1. Researcher activities.

III. MATERIALS

The researcher should ensure that all the following materials (A through E) are available for each participant.

A. Computer Equipment

The computer equipment used to run the simulation includes:

- Apple II Plus computer (with Apple operating manuals)
- Amdek (or comparable) color monitor (with operating manual)
- Integral Data Systems printer with grappler interface (and paper) (with operating manual)
- Maezon hard disk drive (with operating manual) with software necessary to run the simulation (See Unger and Swezey, 1983.)
- Apple floppy disk drive
- Floppy disk labelled "MSM"
- Floppy disk labelled "PROFILE 1/84"

The floppy disk "MSM" (for Maezon System Manager) is used to activate the simulation programs which are stored on the hard disk. The "PROFILE 1/84" disk is used to generate participants' decision-making style profiles.

B. Participant's Manual

The Participant's Manual is a document which provides basically two types of information to the participant. First, the manual provides procedures about how to participate in the simulation and how to enter responses in the computer. Second, the manual provides political, economic, historic, geographic, and military information as background to the Yugoslav Dilemma. THE RESEARCHER

MUST BE COMPLETELY FAMILIAR WITH THE PARTICIPANT'S MANUAL. THE CONTENT OF THAT MANUAL IS NOT REPEATED IN THE RESEARCHER'S MANUAL.

C. Decision Alternatives

Decision alternatives are the choices of action available to the participant. Each scenario, the Yugoslav Dilemma and the practice session for that dilemma called "Storm," has its own set of decision alternatives. Decision alternatives for the practice session Storm are listed in the Participant's Manual and are also printed separately on one sheet of paper with the computer code number for each choice. They are also contained in Appendix A of this document.

Decision alternatives for the Yugoslav Dilemma are listed in the Participant's Manual and are also printed in a pamphlet with four two-sided pages. They are also contained in Appendix B of this document.

D. Note-taking Form

The participant uses this form to keep track of messages received and action taken. Participants are not required to use this form, but an adequate number of copies (50 to 100) should be available. This form appears in Appendix C. Detailed instructions regarding its use are contained in the Participant's Manual.

E. Maps

One map is required for the Storm scenario. The map has grid squares which are labelled by their x, y coordinates. During the scenario, the participant may need to enter into the computer the location of people or things. The computer

is programmed to accept and use only those coordinates from the scenario map. If a participant incorrectly enters a coordinate, the computer gives an error message and instructs the participant to enter a two-letter x coordinate and a one or two-digit y coordinate. These coordinates must be obtained from the scenario map.

Several different maps of Yugoslavia are available although only one is required for participation. The required map is the hand-drawn map of the Yugoslav region with grid squares. Each grid square may be named by using its x, y coordinates. As with the Storm scenario, the Yugoslav Dilemma simulation is programmed to accept and use only coordinates obtained from the scenario map. Other maps available are commercially prepared maps of the world and the Yugoslav region.

Appendix D contains the maps required for the Storm and Yugoslav Dilemma simulations.

F. Room Arrangement

Figure 2 presents a suggested room arrangement (for right-handed participants).

Figure 2 shows a table with large workspace. A large desk (approximately six feet long and three feet wide) will have enough table space to hold all the equipment and provide clear workspace. Maps may be hung on the adjacent left wall within the participant's eyesight.

The printer may be located on the left of the table. The front of the printer (the side with the label) should face the front edge of the table. The printouts should be easily within the participant's reach, and there should be room for the printout to stack on the table, not on the floor.

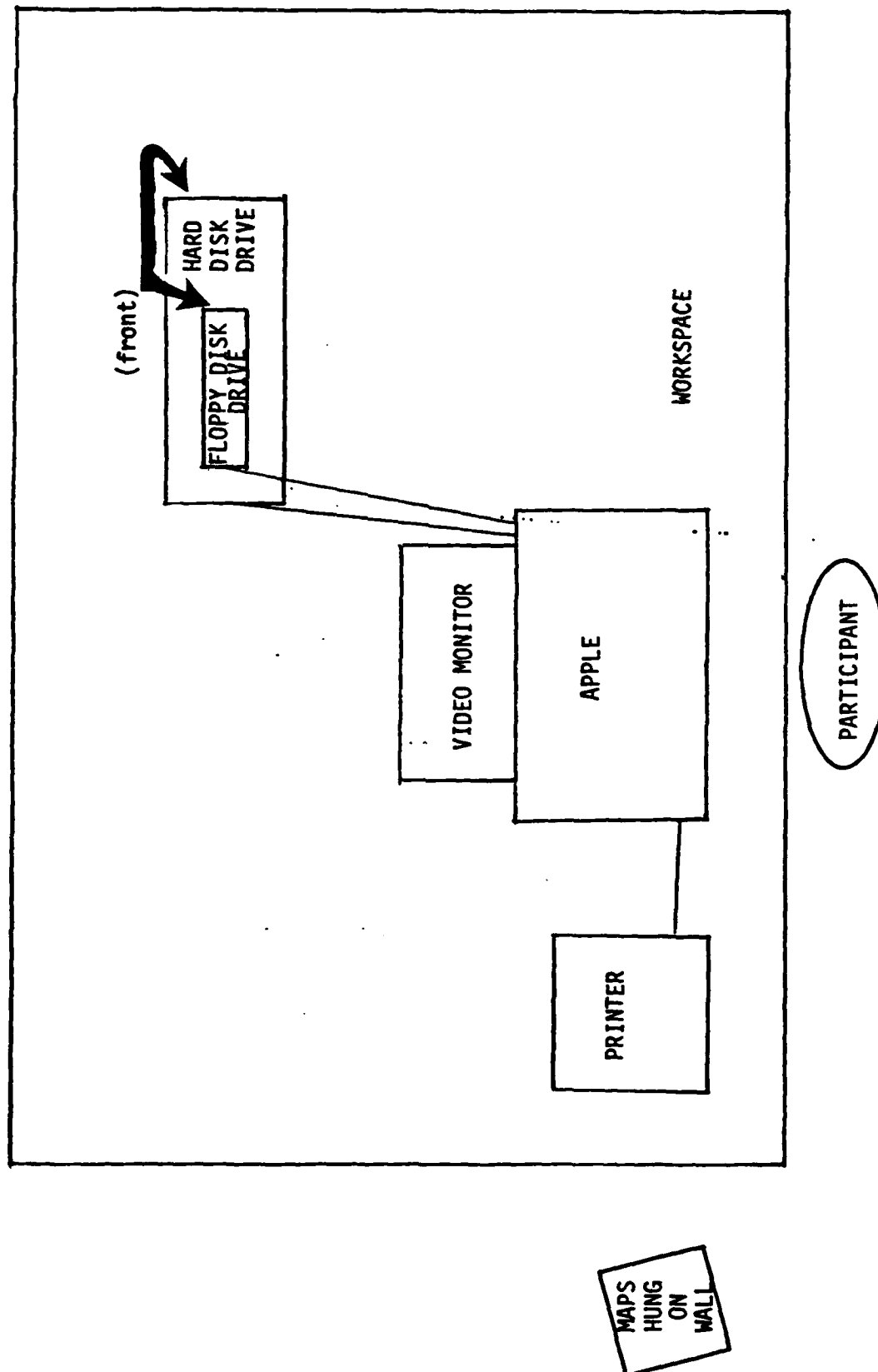


Figure 2. Recommended room arrangement.

The video monitor should sit on top of the Apple computer with the computer near the center of the front edge of the table.

The floppy disk drive should sit on top of the hard disk drive. The floppy disk drive cable is short, so both disk drives must be close to the back of the Apple. The front sides of the disk drives point away from the Apple and sit perpendicular to the Apple. This arrangement accommodates short cable length and leaves an area clear for workspace.

Table space to the right of the Apple is workspace. This space should be large enough for the participant to store the materials and write on the note-taking forms.

Ambient lighting is important. To the extent possible, use the following guidelines for ambient lighting (Davis and Swezey, 1983):

- Diffuse rather than direct lighting should be used. Direct lighting may cause glare, fatigue, and decreased visual efficiency.
- Reduce glare by using several low intensity light sources rather than one high intensity light source.
- Dull colors should be used on workspace.
- Light colored walls are recommended.
- Place hood or shield over monitor if necessary to reduce glare.

Chair comfort and table height are also important. To the extent possible, use the following guidelines for chair and table (Davis and Swezey, 1983):

- Seat width minimum is 18 inches.

- Backrest reclines 103° and participant need only move body forward 3 inches to bring eyes to "eye line."
- Chair should be padded.
- Chair height should be adjustable and chair should be on rollers.
- Knee room should be at least 20 inches wide and 18 inches deep.
- Table height should be 29 inches.

IV. SIMULATION PROCEDURES

This chapter presents step-by-step instructions for running the Storm scenario and the Yugoslav Dilemma.

The Storm scenario is a brief practice session. Its purpose is to familiarize the participant with 1) how to enter responses into the computer, and 2) how simulations progress. Because the Storm scenario is just practice, the participant should go through it quickly. The participant should follow the step-by-step exercise in the Participant's Manual, but encourage the participant not to get bogged down -- the actual decisions made do not matter. The computer stores response data, but no assessment of decision-making style will be made using the Storm scenario.

The Yugoslav Dilemma takes data on participants' decisions and assesses decision-making style. It usually takes three to six hours for a participant to complete the simulation.

Section A of this chapter provides step-by-step procedures for operating the Storm practice session. Section B gives procedures for the Yugoslav Dilemma. For each simulation, there are two operating procedures: a standard run and an alternate procedure.

A. The "Storm" Practice Scenario

The Storm scenario may be run using either one of two procedures depending on whether the researcher wants to specify certain parameter values. The parameters that may be specified are:

- Long or short form instructions to participants.
- Use of printer and which type interface.
- Participant code name.
- Display of minute markers.

If you wish to set the parameters yourself, see Section A3 ("Alternate Steps 15 and 16 Change Parameter Values"). The parameters are explained in Section A3.

The standard run procedure sets all parameters for you. The default values (given in Section A3 below) for the parameters will be useful in running most participants.

To run the Storm scenario, follow:

- Steps 1-21 Set Up the Computer (Substitute Steps 18 and 19 with Alternate Steps 18 and 19 if you set your own parameter values.)
- Steps 22-27 Run the Scenario

1. Steps 1-21 Set Up the Computer

- Step 1. Check that all computer equipment is connected and plugged in. Call an expert if you have questions.
- Step 2. Open front door on floppy disk drive by gently pulling the door straight forward and up.
- Step 3. With your thumb and forefinger, grasp the floppy disk labelled MSM by the label. Keep the label facing up and away from you. Take care not to touch the disk anywhere but on the label or else the disk may be ruined.
- Step 4. Insert the disk into the disk drive. (The non-labelled edge goes in first.) When the disk is in, you will hear a click.
- Step 5. Close the door on the disk drive.
- Step 6. Turn the Apple on. The switch is on the back of the Apple on the left. If the room is arranged following the Figure 1 sketch, it is easier to reach around and with your left hand feel for the switch than it is to walk around behind the computer and look for the switch. Switch to "on" and you will hear a bleep and the disk drive whirl.

- Step 7. Turn the monitor on by pulling the "On/Vol" knob located on the right side of the front of the monitor.
- Step 8. Adjust monitor contrast by turning the "Contrast" knob located under the "On/Vol" knob.
- Step 9. You will see

DOS VERSION 3.3	08/25/80
Apple II PLUS OR ROMCARD	SYSTEM MASTER
Run ☐	

- Step 10. To turn on the printer, there are two switches. The "On-Off" switch is on the back upper left corner of the printer. When you switch "On," a red light "PWR" appears on the front upper right side of the printer. Over the red light you will see two red indicators. Move the left indicator to ONLINE. A red light below it will come on. The right indicator stays straight up.

Make sure plenty of paper is loaded in the printer. To load the printer, follow instructions in the printer manual or call an expert.

NOTE: If you are not using a printer, you should follow the ALTERNATE operating procedures in Section III.3 below.

- Step 11. Now you will run a program on the floppy disk to activate the programs on the hard disk. (You will load the hard disk later.) Type HH (but do not press RETURN).
- Step 12. Press the white switch on the front of the hard disk drive on the "write enabled" side (the right side).
- Step 13. The next two bulleted tasks must be done quickly in sequence, so please read the Step 13 directions completely before completing the tasks.

- Find the hard disk drive "Off-On" switch and switch-on the hard disk drive. The switch is on the back of the hard disk drive on the top right corner. (The connecting cable comes from the top left corner on the back side.) If the room is arranged following the Figure 1 sketch, it may be easy for you to feel with your right hand for the switch.
- Press RETURN on the Apple.

You will hear the hard disk whirl; the old screen disappears and a new one appears. If you turn on the hard disk before you type HH RETURN, the hard disk drive will make a loud rattle. If this happens, quickly switch off the hard disk, and try again.

Step 14. The new screen is:

```

HARD DISK READY
MSM (Y/N)? ☐

```

Type in N. You will then see the] symbol.

Step 15. Type EXEC STORM,V030
Press RETURN
You will see]

Step 16. In a few seconds you will see

ENTER SIMULATION VALUES
ENTER D#,P#:
ALL MOVES SUCCESSFUL? (Y/N):☐

PRINTER? (P,G,N):☐

PRINTER? (P,G,N):☐
ENTER PARTICIPANT CODE:
ENTER SCENARIO:

DISPLAY MINUTE MARKERS? (Y/N):☐

NEW OR RESTART? (N/R):☐
NEW OR RESTART? (N/R):☐

You simply wait about 30 seconds while the scenario on the hard disk is loading. You will see the boxes on the screen blinking.

Step 17. After the scenario is loaded, you will see

PRESS ! TO BEGIN

You press ! (SHIFT and the number 1).

Step 18. Next you will see

WELCOME TO THE.....

MANAGEMENT ASSESSMENT AND
TRAINING SIMULATION SYSTEM

----- M A T S S -----

THE MATSS SIMULATIONS WERE DEVELOPED
FOR THE U. S. ARMY RESEARCH INSTITUTE
BY THE BEHAVIORAL SCIENCES RESEARCH
CENTER OF SCIENCE APPLICATIONS, INC.

PRESS ANY KEY TO CONTINUE

You press any key.

Step 19. Next you will see

THE MATSS CONSISTS OF TWO SIMULATIONS:

1. THE STORM SCENARIO
(A SHORT PRACTICE SIMULATION)
2. THE YUGOSLAV DILEMMA
(A MILITARY POLITICAL DILEMMA WHICH
ASSESSES DECISION-MAKING STRATEGY)

PRESS ANY KEY TO CONTINUE

You press any key.

Step 20. Next you will see

GENERAL INSTRUCTIONS FOR PARTICIPATING
WILL BE PRESENTED ON THE COMPUTER.

PLEASE REFER TO THE PARTICIPANTS MANUAL
FOR DETAILED INFORMATION.

PRESS ANY KEY TO CONTINUE.

You press any key.

Step 21. Next you will see a full color graphic with
the title MATSS above a puzzled decision-
maker.

[NOW YOU BRING THE PARTICIPANT INTO THE
ROOM. WE DO NOT WANT THE PARTICIPANT TO
SEE THE SCREEN DISPLAYED IN STEP 16.]

2. Steps 22-27 Run the Storm Scenario Session

The researcher may complete Steps 1-21 before the participant arrives. If there are any computer problems, they may be taken care of before the participant arrives. When the participant arrives, instructions should be given, as outlined in Step 22 below.

- Step 22.
- a. Greet participant, have him or her sit down at the table.
 - b. Explain that he or she will be working on two computer simulations involving crisis situations in which he or she will make decisions and take action.
 - c. Explain that the first simulation is a brief practice session, called "Storm." The purpose of "Storm" is to familiarize the participant with the computer and with procedures for making decisions.
 - d. Inform the participant that during the second simulation, the Yugoslav Dilemma, the computer will take data on his or her decisions or reactions during the simulation. Those data will be compared to

other participants' data for the purpose of determining what reaction pattern(s) or "decision-making styles" the participant used during the simulation. Assure the participant such things as intelligence or aggressive tendency are not being tested. Tell the participant that after the simulation, the computer will generate a profile, and you will discuss the profile. Tell the participant that the simulation is not validated and is highly experimental.

e. Provide agenda (all approximate times).

60 minutes - Read Participant's Manual.

30 minutes - Practice Storm simulation.

60 minutes - Part I Yugoslav Dilemma.

15 minutes - Break.

60 minutes - Part II Yugoslav Dilemma.

15 minutes - Break.

60 minutes - Part III Yugoslav Dilemma.

30 minutes - Debriefing.

NOTE: Participants may read their manuals on their own time before reporting to the session. Breaks last as long as you wish.

f. Answer questions about the Participant's Manual. Encourage participant to practice the step-by-step exercise in the Participant's Manual during the Storm scenario.

g. Provide note-taking forms, decision alternatives, maps, and pencils for the Storm scenario.

Step 23. The screen from Step 21 is displayed. The participant now follows the direction on that screen and presses any key to continue. The participant may now be left alone providing all materials (Participant's Manual, decision-making alternatives, maps, note-taking forms, pencils) are available.

Step 24. Next, three text frames, one graphic frame, and eight text frames follow. (These frames are described in the Participant's Manual.) The participant advances each frame by pressing any key.

Step 25. The participant then receives the following screen:

TIME 1200:00	2 APR 1985
HIT ! TO START SIMULATION.	

To hit !, the participant presses SHIFT and 1 (one) at the same time.

Step 26. The participant goes through the Storm simulation. The researcher may be needed if the computer malfunctions. The participant should refer to his or her Participant's Manual for the answer to most questions.

Step 27. After the session, verify that the participant knows:

- Use of decision alternatives
- Use of note-taking form
- Use of computer printout
- How to enter decisions
- How to enter planned future decisions
- How to enter previous messages
- How to enter previous decisions
- Time compression and progression

ALL THIS INFORMATION IS CONTAINED IN THE PARTICIPANT'S MANUAL AND HAS NOT BEEN DUPLICATED IN THIS MANUAL. Additional information about time compression is presented in Section V of this manual. If the participant has completed the step-by-step exercise in the Participant's Manual, he or she is probably ready to participate in the Yugoslav Dilemma.

3. Alternate Steps 15 and 16 Change Parameter Values

As mentioned earlier, the standard run procedure sets parameter values for you. The list of these default parameter values follows:

```
ENTER D#,P#:-1,-1
ALL MOVES SUCCESSFUL? N
PRINTER? G
ENTER PARTICIPANT CODE: (left blank)
ENTER SCENARIO: STORM
DISPLAY MINUTE MARKERS?: N
NEW OR RESTART? N
```

(An explanation of the parameters is given below.)

The alternate run procedure allows the researcher to change parameter values. An explanation of the parameters follows.

For the alternate run procedure:

- Follow Steps 1 through 14 above.
- The following screen is displayed:

HARD DISK READY

MSM (Y/N)?

Now go to Alternate Step 15 below.

- ALT Step 15.
- a. Type BLOAD RUNTIME,V030
Press RETURN
] is displayed
 - b. Type BLOAD SIMSTORM.OBJ
Press RETURN
] is displayed
 - c. Type MAXFILES 2
Press RETURN
] is displayed
 - d. Type CALL 6064
Press RETURN
] is displayed

ALT Step 16. Answer the next seven questions (a-g):

- a. ENTER D#,P#:-1,1
Press RETURN (runs long form of instructions to participants throughout simulation - See Appendix E for text of instructions.)
- or
- ENTER D#,P#:1,-1
Press RETURN (runs long form of instructions through the first decision, then runs short form of instructions throughout simulation)
- or
- ENTER D#,P#:1,1
Press RETURN (runs long form of instructions in first period, then runs short form through remainder of simulation)
- or
- ENTER D#,P#:-1,-1
Press RETURN (runs short form of instructions throughout simulation)
- b. ALL MOVES SUCCESSFUL (Y/N) N
(Do NOT press RETURN) (Y option is not used in this most current version of the simulation; see Unger and Swezey (1983) for changes necessary to use this option)
- c. PRINTER? (P,G,N): G
or
PRINTER? (P,G,N): P
or
PRINTER? (P,G,N): N
(Do NOT press RETURN)
- (for grappler interface; presently used with Integral Data Systems 445 printer)
- (for other parallel interface cards)
- (for no printer)
- d. ENTER PARTICIPANT CODE: NAME (type in code name)
Press RETURN
- e. ENTER SCENARIO: STORM
Press RETURN

f. DISPLAY MINUTE MARKERS? (Y/N): N

or

DISPLAY MINUTE MARKERS? (Y/N): Y

Minute markers are the two right-most digits on the first line (the "time" line) of screens appearing during the simulation. The first of these two digits counts real time minutes of elapsed simulation time. The second number tells the real time minute of elapsed simulation time during which the next message can appear. Normally, minute markers are not displayed for participants because we do not want them to figure out when the next message is coming.

g. NEW OR RESTART? (N/R): N (for new session)

or

NEW OR RESTART? (N/R): Y (to continue previously begun session; ignore coding on the screen after you type Y)

Now you are back at Step 17.

B. The Yugoslav Dilemma Scenario

The Yugoslav Dilemma may be run using either one of two procedures depending on whether the researcher wants to specify certain parameter values. The parameters that may be specified are:

- Long or short form instructions to participants.
- Use of printer and which type interface.
- Participant code name.
- Display of minute markers.

If you wish to set the parameters yourself, see Section B3 ("Alternate Steps 3 through 5 Change Parameter Values"). These parameters are explained in Section B3.

The standard run procedure sets all parameters for you. The default values (given in Section B3 below) for the parameters will be useful in running most participants.

To run the Yugoslav Dilemma, follow:

- Steps 1-6 Prepare to Run the Simulation
(Substitute Steps 3, 4, and 5 with Alternate Steps 3, 4, and 5 if you set your own parameter values.)
- Steps 7-11 Run the Simulation

After the participant completes the simulation, refer to Chapter V for procedures on generating and discussing the decision-making profile.

1. Steps 1-6 Prepare to Run the Simulation

Step 1. Before beginning the Yugoslav Dilemma, each participant should have 1) read the Participant's Manual, and 2) gone through the Storm scenario. Storm scenario procedures are contained in this manual.

Step 2. If the computer is on and if the participant has just completed the Storm scenario, press CTRL and RESET at the same time. You will see the] symbol.

or

If the computer is off, complete Steps 1 through 14 above (under Procedures, Practice Session). At the end of Step 14, you will see the] symbol.

Step 3. Type EXEC YD,V030
Press RETURN

You will see]
]
]

Step 4. Next, this screen appears

PROGRAM SIM
ENTER D#, P#:
ALL MOVES SUCCESSFUL? (Y/N):☐
PRINTER? (P,G,N):☐

PRINTER? (P,G,N):☐
ENTER PARTICIPANT CODE:
ENTER SCENARIO:

DISPLAY MINUTE MARKERS? (Y/N):☐
NEW OR RESTART? (N/R):☐
NEW OR RESTART? (N/R):☐

You simply wait about five (5) minutes while the simulation is loading. You will see the boxes on the screen blinking.

Step 5. After the simulation is loaded, you will see

PRESS ! TO BEGIN

You press ! (SHIFT and 1).

Step 6. Next you will see a U.S. flag.
[NOW YOU BRING THE PARTICIPANT INTO THE ROOM. WE DO NOT WANT THE PARTICIPANT TO SEE THE SCREEN DISPLAYED IN STEP 4.]

2. Steps 7-9 Run the Simulation

Step 7. If all materials (Participant's Manual, decision alternatives, pencils, maps, note-taking forms) are available, the participant may now be left alone. After the U.S. flag, comes two more graphic frames and six frames of text. The participant advances each frame by pressing any key. (These frames are described in the Participant's Manual.)

Step 8. The participant then receives the following screen:

TIME = 0800:00	12 JUL 1988
HIT! TO START SIMULATION	

To hit 1, the participant presses SHIFT and 1 at the same time.

Step 9. The participant continues through the simulation. The researcher will direct the participant when to end the simulation.

The researcher now continues with procedures in Section V, Assessment of Decision-making Style.

3: Alternate Steps 3 - 5 Change Parameter Values

As mentioned earlier, the standard run procedure sets parameter values for you. The list of these default parameter values follows:

```
ENTER D#,P#:-1,-1
ALL MOVES SUCCESSFUL? N
PRINTER? G
ENTER PARTICIPANT CODE: (left blank)
ENTER SCENARIO: YUGOSLAV DILEMMA
DISPLAY MINUTE MARKERS?: N
NEW OR RESTART? N
```

(An explanation of the parameters is given below.)

The alternate run procedure allows the researcher to change parameter values. An explanation of the parameters follows.

For the alternate run procedure:

- Follow Steps 1 and 2 above.

- The screen will look like (or be similar to):

```

HARD DISK READY
MSM (Y/N)?
]

```

- Now go to ALT Step 3 below.

- ALT Step 3.
- a. Type BLOAD RUNTIME,V030
Press RETURN
 - b. Type BLOAD SIMYD.OBJ
Press RETURN
 - c. Type MAXFILES 2
Press RETURN
 - d. Type CALL 6064
Press RETURN

- ALT Step 4. Answer the next seven questions (a-g):

- a. ENTER D#,P#:-1,1
Press RETURN

or

ENTER D#,P#:1,-1
Press RETURN

or

ENTER D#,P#:1,1
Press RETURN

or

ENTER D#,P#:-1,-1
Press RETURN
- (runs long form of instructions to participants throughout simulation - See Appendix E for text of instructions.)
- (runs long form of instructions through the first decision, then runs short form of instructions throughout simulation)
- (runs long form of instructions in first period, then runs short form through remainder of simulation)
- (runs short form of instructions throughout simulation)
- b. ALL MOVES SUCCESSFUL (Y/N) N (Y option is not used in this most current version of the simulation)

c. PRINTER? (P,G,N): G

(for grappler interface;
presently used with
Integral Data Systems
445 printer)

or

PRINTER? (P,G,N): P

(for other parallel
interface cards)

or

PRINTER? (P,G,N): N

(for no printer)

d. ENTER PARTICIPANT CODE: NAME
Press RETURN

(type in code name)

e. ENTER SCENARIO: YUGOSLAV DILEMMA
Press RETURN

f. DISPLAY MINUTE MARKERS? (Y/N): N

or

DISPLAY MINUTE MARKERS? (Y/N): Y

Minute markers are the two right-most digits on the first line (the "time" line) of screens appearing during the simulation. The first of these two digits counts real time minutes of elapsed simulation time. The second number tells the real time minute of elapsed simulation time during which the next message can appear. Normally, minute markers are not displayed for participants because we do not want them to figure out when the next message is coming.

g. NEW OR RESTART? (N/R): N

(for new session)

or

NEW OR RESTART? (N/R): Y

(to continue a previous
session)

ALT Step 5. About five minutes later, the following screen appears:

WELCOME TO THE YUGOSLAV DILEMMA
PRESS THE ! KEY TO BEGIN

You press the ! key.

Now you are back at Step 6 of the standard run procedure and may continue on from there.

4. Simulation Timing

a. Progression

The "time" line found above each frame in the simulation looks like the sample below:

TIME = 2050:00 12 JULY 1988 4 6

IF YOU WISH TO MAKE A DECISION, HIT THE
'D' KEY.

Four kinds of time are involved in the simulation:

- Real time
- Simulation time of day
- Simulation time
- Real minutes of simulation time

Real time is the time that is measured by normal clocks and watches. The computer does not keep track of real time.

Simulation time of day is given in hours and minutes (seconds are always 00). In this example, the time is 20 hours 50 minutes, or 8:50 pm.

In both simulations, simulation time progresses one hour for every 30 seconds of real time. Thus, in 30 real time seconds, the simulation time of day shown in the example above will be 2150. (Interruptions to this time progression are noted in 4C below.)

Real minutes of simulation time are real time minutes counted only while simulation time progresses. The Storm scenario has one period of nine real minutes of simulation time. Because simulation time does not progress during decisions, the real time length of the session varies depending on how long the participant spends making decisions and entering plans. If the participant makes no decisions, the Storm scenario will last nine real minutes. In simulation time, however, 18 hours pass in the Storm scenario.

The Yugoslav Dilemma has three periods, each with 30 real minutes of simulation time. Again, real time elapsed varies depending on how long the participant spends making decisions and entering plans. If the participant makes no decisions, the scenario will last 90 real minutes. In simulation time, 2.5 days elapse in each period and there are 7.5 days in the total dilemma.

The ratio of real time to simulation time elapsed is set in the LEDIT program. Under the present program, the time multiplier is 120 which means that 120 simulation seconds pass for each second of real time, or one hour of simulation time for every 30 seconds of real time.

LEDIT also stores the day, month, and year of the beginning of each scenario. The date progresses with simulation time and is displayed in the center of the "time" line. In the screen above, the date is July 12, 1988.

The researcher may modify the real-to-simulated time ratio and the day, month, and year of scenario origin using the LEDIT program. Use of LEDIT is discussed in Unger and Swezey (1983).

As mentioned earlier (in IV.A.3.f above), minute markers may be displayed on the "time" line. If displayed, they are the two right-most digits on the time line. In the screen above, the minute markers are 4 and 6.

The first digit counts real time minutes of elapsed simulation time. This marker is a real time clock and need not have its value changed.

The second digit displays the real time minute of elapsed simulation time at which the next message will be displayed. This marker is related to the information load value used. Load values may be manipulated and changes in load value will be reflected in the second minute marker. Manipulating load is discussed in Section IV.4.b below.

b. Information Load

Information load refers to the number of messages presented to the participant per real time minute of simulation time. There are two types of messages, fixed and responsive. Fixed messages do not address a participant's inquiries, but responsive messages specifically address a participant's action.

Presently, information load is fixed (not free to vary depending on a participant's responses), but load has different values in different parts of the simulations. In the Storm scenario, one message is delivered every three real minutes of elapsed simulation time. For periods one, two, and three of the Yugoslav Dilemma, the values are 1 message/3 minutes, 1 message/6 minutes, and 1 message/2 minutes, respectively.

Presently, a minimum number of fixed messages per period is programmed. Table 1 shows the minimum number of fixed messages by period. For example, during period two of the Yugoslav Dilemma, a fixed message is always delivered as the third and fourth message. If responsive messages are due, they will be delivered as the first, second, and fifth messages. If no responses are due, a fixed message will be delivered each time. However, if a response is due, it will be delivered instead of the fixed message. Information load is fixed.

TABLE 1

TOTAL NUMBER OF MESSAGES AND
MINIMUM NUMBER FIXED MESSAGES
DELIVERED BY SIMULATION PERIOD

<u>Scenario</u>	<u>Number of Messages Delivered</u>	<u>Mandatory Fixed Message Numbers</u>
Storm	3	1
Yugoslav Dilemma:		
Period 1	10	1, 5, 9, 10
Period 2	5	3, 4
Period 3	15	2, 6, 7, 9, 10, 14

Other message distributions are possible with program changes. The timing of fixed and responsive messages may be manipulated using the TEDIT and DEDIT programs. Use of these programs is described in Unger and Swezey (1983).

c. Interruptions

When the participant makes a decision, the simulation clock stops. The clock remains stopped until:

- The decision is executed.
- Any future planned decisions are entered.
- Any previous decisions made while current action was planned (which lead to current action) are entered.
- Any previous messages which lead to current action are entered.

When the participant re-enters the scenario, the simulation clock progresses *one hour*. This value may be changed using the LEDIT program. See Unger and Swezey (1983).

Because the simulation time stops during decision times, total length of session in real time cannot be predicted. Real time session duration increases with time spent making decisions and entering plans.

V. ASSESSMENT OF DECISION-MAKING STYLE PROCEDURES

This chapter provides: 1) step-by-step procedures for generating a participant's decision-making profile, 2) information on interpreting the profile, and 3) information on the decision-making styles of subject matter experts.

A. Computer Generation of the Profile

To obtain the profile, follow:

- Steps 1-7 Rename Files
- Steps 8-22 Copy Files from Hard to Floppy Disk
- Steps 23-28 Generate the Profile
- Steps 29-31 Profile Printout

1. Filing System

The decision-making style profile is generated using the PROFILE.OBJ program. The program requires that the printer be operational.

As outlined in preceding sections, the Yugoslav Dilemma may be activated using a standard procedure or an alternate procedure. You may recall that if the standard procedure was used, the participant's data are stored under no name; the default for participant code name is blank. Thus, the participant's data should be renamed before copying to the floppy disk. If two sets of files have the same code name, or have blank code names, the subsequent set will replace the older set if stored on the same disk.

Data for each participant, regardless of procedure, are stored in three files on the hard disk. For the standard run procedure, the three files are named:

A/
R#/
R/

If the alternate procedure is used, the files are named:

A/PARTICIPANT CODE
R#/PARTICIPANT CODE
R/PARTICIPANT CODE

To use the PROFILE.OBJ program, the three participant's data files must be copied from the hard disk to the floppy disk which contains the PROFILE.OBJ program. (The PROFILE.OBJ program is on a disk labelled PROFILE 1/84; it is not on the MSM disk.)

2. Steps 1-7 Rename Files on Hard Disk

Follow Steps 1-7 if your files have no participant code (from standard run procedures) or if you want to change the code name. Be sure to use the same name for all three files.

Step 1. Hard disk drive must be on. (If it is not on, follow Steps 1-14 under Storm scenario procedures, then go to Step 2 below.

Step 2. Type CTRL and RESET at the same time.
] will appear.

Step 3. Type CATALOG,V032
You will see the list of participant files contained on the hard disk.

Step 4. Rename all three files.
Type RENAME A/OLD CODE,A/NEW CODE
(Leave one blank space for OLD CODE if code is blank.)
Press RETURN

Step 5. Type RENAME R#/OLD CODE,R#/NEW CODE
Press RETURN

Step 6. Type RENAME R/OLD CODE,R/NEW CODE
Press RETURN

Step 7. Type CATALOG
Press RETURN
Check the catalog and see that your renaming has taken place.

3. Steps 8-22 Copy Files from Hard Disk (Volume 32) to Floppy Disk (PROFILE 1/84)

Step 8. Hard disk drive should be on. If it is on, go on to Step 9 below. If not, follow Steps 1-14 under Storm scenario procedures.

Step 9. Type EXEC HFID,V001
Press RETURN

Step 10. Screen displays:

MENU

1 through 9

WHICH WOULD YOU LIKE? ☐

Type 0
Press RETURN

(0 option not listed on menu.)

Step 11. This step identifies the floppy disk volume.
Screen displays D = ☐
Type 1 (Do not press RETURN.)
Screen displays D = 1 V = ☐
Type 254
Press RETURN

Step 12. This step identifies the hard disk volume.
Screen displays D = 1 V = 254
D = ☐
Type 2 (Do not press RETURN.)
Screen displays D = 2 V = ☐
Type 032
Press RETURN

Step 13. Screen displays D = ☐
Press RETURN

Step 14. This step selects copy function.
Screen displays MENU
Type 1
Press RETURN

Step 15. This step identifies source as the hard disk.

Screen displays SOURCE SLOT? ☐

Type 6

Press RETURN

Screen displays DRIVE? ☐

Type 2

Press RETURN

Step 16. This step identifies floppy disk as destination.

Screen displays DESTINATION SLOT? ☐

Type 6

Press RETURN

Screen displays DRIVE?

Type 1

Press RETURN

Step 17. Screen displays FILENAME?

Type =/PARTICIPANT CODE

Press RETURN

(Use one blank space
for the code if code
is blank.)

Step 18. Screen says "DO YOU WANT PROMPTING?"

Type N

Press RETURN

Step 19. Screen says "INSERT DISKS."

Remove MSM disk from floppy disk drive

Insert PROFILE 1/84 disk

Close disk drive door

Press any key to continue

Step 20. Now the computer searches for each file.

First it finds A/PARTICIPANT CODE.

After the file is copied, DONE appears
on the screen.

Then it copies R#/PARTICIPANT CODE,
then R/PARTICIPANT CODE.

If your file has already been copied or
if your files have the same name as
another file on the floppy disk, the
computer will say TYPE IN A NEW FILE
NAME FOR THE COPY OR (RETURN) TO REPLACE
EXISTING FILE OR (CTRL-C) (RETURN) TO
CANCEL COPY. You follow directions as
necessary.

If your floppy disk is full, you should
copy excess data files onto another disk.
To do this, follow procedures in the Apple's
DOS Manual under FID program. You will avoid
filling up the PROFILE disk by copying all
data files to another disk immediately after
you generate each profile as described in
Section 6 below.

Step 21. After all files have been copied, the screen directs you to PRESS ANY KEY TO CONTINUE.

Press any key to continue.

Step 22. The menu returns.
Type 9 (for QUIT)
Press RETURN
The screen displays the] symbol.

4. Steps 23-28 Generate the Profile

Once the participant files are copied onto the floppy disk labelled PROFILE 1/84, you may proceed to generate the profile.

Step 23. Disk labelled PROFILE 1/84 in disk drive.
Type PR#6
Press RETURN
The screen displays a message and the] symbol.

Step 24. Type BRUN DOS MOVER
Press RETURN
You will hear the floppy disk whirl, and a message and the] symbol appear.

Step 25. Type BLOAD RUN TIME
Press RETURN
You will hear the floppy disk whirl, and the] symbol appears.

Step 26. Type BRUN PROFILE.OBJ
Press RETURN

Step 27. The following screen appears:

PROGRAM MEASURE ENTER PARTICIPANT CODE:

If standard run procedure generated the data files, press RETURN.

or

If alternate procedure generated the data files, type CODE (whatever the code was), press RETURN.

Step 28. The screen asks DATA LIST? (Y/N)
If you want the profile printout to include all measures in the profile plus data regarding each individual decision the participant made, type Y.

or

If you want the profile to include all measures without individual decision data, type N.

5. Steps 29-31 Profile Printout

Step 29. The computer begins printing. The following information is printed:

- Number of minutes in simulation
- Number of messages
- Number of decisions
- Number of periods
- List of decisions and decision data (if DATA LIST? Y was entered)
- Number of categories
- List of 14 measures for each period

(There may be brief pauses (about a minute) during printing. If so, length of pauses varies directly with length and complexity of the participant's session.)

When the printout is complete, the screen displays the] symbol.

Step 30. If you want to generate another profile,
Type BRUN PROFILE.OBJ
Press RETURN
Go back to Step 27 above;
Otherwise, go on to Step 31.

Step 31. To advance the printout so you can tear it off the Integral Data Systems 445 printer:

- Move the left red indicator on the front right side of the printer from ONLINE to PAPER.
- Move the right red indicator towards the right (towards LF for line feed).

(For other printers, refer to the printer manual for directions.)

- Release the line feed indicator when a perforation in the paper appears above the paper holder.
- Tear off the printout.

6. Steps 32-34 Permanent Storage

It is suggested that participant files be stored permanently on a floppy disk or on a dedicated volume of the hard disk, and deleted from hard disk Volume 032 and the PROFILE floppy. This prevents you from ever getting a DISK FULL message in the middle of a session. Therefore, after generating the profile, it is suggested that you:

Step 32. Copy files from the PROFILE disk elsewhere for storage.

Step 33. Delete files from Volume 032 on the hard disk.

Step 34. Delete files from the PROFILE floppy disk.

To copy files from the PROFILE disk to a volume of the hard disk, follow copy procedures, described in Steps 8-22 above (source drive will be 1, destination drive will be 2). To copy to another floppy, follow procedures outlined in the Apple DOS Manual under FID program.

To delete files from the hard disk:

- Activate the hard disk (see Steps 1-14 under Storm scenario procedures)
- Type CATALOG,V032
Press RETURN

The contents of volume 032 will be displayed.

Press RETURN again and again if necessary to display all contents. When all contents have been displayed, the] symbol appears.

- Write down the file names you can delete. (If you are at all uncertain about what to delete, call an expert.)
- For each file to be deleted:

Type DELETE FILENAME
Press RETURN
- After you delete all unnecessary files, type CATALOG, press RETURN, and check that you have deleted correctly.

To delete files from the PROFILE disk:

- Insert PROFILE disk into drive 1
- Type PR#6
- Type CATALOG, press RETURN
- Type DELETE FILENAME and press RETURN for each file to be deleted
- Type CATALOG, press RETURN to check that you have been deleted correctly.

7. Step 35 Turn Off the Computer

Step 35. To turn off the computer:

- Switch the hard disk off.
- Push the Apple video monitor knob off.
- Switch the Apple computer off.
- Switch the printer off using the switch on the left back of the printer.
- Store disks in jackets.

B. Interpreting the Profile

After the researcher generates the participant's profile, the researcher and participant engage in discussion. This discussion includes five topics:

- Purpose of the simulation
- Decision-making styles
- Components of the printout
- Participant's decision-making strategy (or strategies)
- Expert strategies

The researcher should use the information in this section as the basis for the discussion.

1. Purpose of the Simulation

The Yugoslav Dilemma was designed to measure decision-making style. Style refers to the process or structure of the decisions, not to the quality or success of the decisions.

Decisions made do not affect the outcome of the simulation. Two types of messages are delivered: fixed and responsive. Fixed messages do not address participant action, but they unfold the scenario. Responsive messages answer the participant's action, but still do not change the course of the dilemma. War cannot be prevented or encouraged by the participant.

Participants react differently to the news that the simulation has no outcome. Some are indifferent; some, relieved; and some participants are chagrined to hear that their hard work on the dilemma could not have changed its course.

While explaining the purpose of the simulation during the debriefing, you may ask the participant not to discuss the simulation with potential participants. Advance knowledge that the simulation's outcome cannot be affected by participant action may discourage some participants from trying to solve the dilemma.

The simulation data provide information about the decision structure or strategy used by a participant confronted with a difficult, complex, critical, ill-defined problem. It is important to make the distinction between structure and content.

All of us make decisions nearly all of the time. Most of these decisions are minor, are based on previously established habits; we may not even be aware that we have just made a decision. An example of a minor decision might be whether or not to jog to some specific mailbox or wait to mail the letter until we find another more convenient mailbox. Decisions are different in their content; the decision where to mail a letter and whether to have a sandwich or a salad for lunch differ greatly. As a result, it is difficult to scientifically analyze decision content unless we restrict ourselves to some limited range of decisions. For example, if mailing the letter at a distant mailbox and having a salad for lunch are all related to health (jogging to the mailbox and eating fewer calories), then we may have some basis for judging the content of the decisions. For most decisions made on a day-to-day basis, however, contents are so diverse that qualitative comparisons are difficult to make.

Decision structure, in contrast to content, provides an opportunity for scientific study. The structural approach considers how decisions are made rather than what decisions are made. In determining the "how" of decision-making, we can analyze whether decisions are meaningfully related in a strategy, to how many goals they relate, and whether the decision maker conceptualizes the task setting in terms of some overall interactive system or operates on several unrelated subsystems. To determine the structure which underlies a decision maker's functioning, several measures relating to a participant's performance have been developed. This information is contained on the printout.

2. Decision-making Style

The Yugoslav Dilemma was designed to assess the decision-making structure used by a participant in the dilemma. Using the dilemma, it is possible to categorize participants' data into three different structures or styles. These three decision-making types are based on an interactive complexity theory of information processing (Streufert and Streufert, 1978, 1981).

Complexity theory is concerned with information processing from a structural vantage point. It focuses on the decision-making environment and on the decision-making process within an organism. That organism might be a person, a decision-making group, an organization, or organizational component. Information is received, analyzed (or "differentiated"), matched to stored information (such as attitudes, beliefs, intents, goals, plans, or strategies), and finally, decisions are

made. Complexity theory is not concerned with what specific decisions are made, but is concerned with how the decision makers or the organization arrived at the decisions.

The three decision-making styles identified by the Yugoslav Dilemma are categorized according to the simplicity or complexity of the planning strategy employed and the degree to which diverse bits of information (called dimensions) are or are not combined or integrated into a strategy.

The three styles of decision making assessed by the Yugoslav Dilemma are:

- Unidimensional
- Multidimensional differentiative
- Multidimensional integrative

Within multidimensional integrative style, both low-level and high-level integrators may be identified. Theoretical discussions of the terms above may be found in other documents (for example, Streufert and Swezey, 1982). The descriptions below simplify the theoretical definitions and use everyday terms to the extent possible.

A person employing unidimensional decision-making style bases judgments on one categorized aspect or dimension (such as good versus bad) of the thing or event, is not apt to consider shades of meaning, and usually does not consider multiple aspects of the thing or event being judged. For example, a unidimensional person might describe a "conflict" as a bad occurrence, would probably not describe conflict as healthy under certain

conditions, and would probably not consider aspects of a conflict other than good or bad (such as solvable - not solvable, long-standing - recent, impacting one person - many people, etc.). Should any additional considerations be made, they would likely be related to good or bad, such as very good, terrible, or slightly bad.

The actions of a unidimensional person tend to be in direct response to environmental events and less (or not at all) in response to any plan the person may have formulated. Strategy is not characteristic of a unidimensional decision maker. If a strategy is used, it is usually a "plan not to plan."

It is not "bad" to be a unidimensional decision maker. The style is not correlated with intelligence, and many unidimensional decision makers are highly intelligent. We all make countless decisions every day, and to a large extent, complex strategies for making decisions are not required and may even be harmful for most daily decisions. In complex situations, such as the Yugoslav Dilemma, however, multidimensional or more complex strategies probably characterize the decision-making structure of military experts. We will be able to determine optimal strategies as work on the simulation continues. Nevertheless, it is important to note that one style is not worse than others. Each style is optimal in certain environments.

In contrast to a unidimensional person, a multidimensional decision maker usually considers many aspects or dimensions of the thing or event, and also considers shades of meaning. Within multidimensional, the style of multidimensional differentiators is characterized

by differentiation, or consideration of many different dimensions of a thing or event, but not by integration or the formation of a summary judgment based on all dimensions considered. The differentiator may view the dimensions as unrelated or even mutually exclusive. Some differentiators generate an inordinate number of considerations (or dimensions) about a thing or event and differentiate into finer and finer subdimensions. This may delay or even prevent any conclusions (or integrations) from being drawn.

The decision-making style of differentiators is not characterized by strategic planning. Although this person may consider multiple dimensions or aspects of the event, generally these aspects are not integrated. Where strategy occurs, it probably is not well-developed, but would occur more frequently than for unidimensional persons.

The style of multidimensional integrators contains strategy. The integrator, like the differentiator, usually considers many dimensions of a thing or event; but unlike the differentiator, sees relationships between dimensions and forms summary opinions (or integrations) based on multiple dimensions. The integrator, unlike the differentiator, may cease considering new dimensions, make a decision (integration), and then begin again to collect new information. In addition, an integrator may employ one or more dimensions as rules or procedures in combining sets of decisions.

Within multidimensional integrators, the simulation may be used to distinguish low- and high-level integrators. The integrations of a low-level integrator

typically last a short time, and the integrations are not woven into other integrations. High-level integrators, on the other hand, execute long-term and complex plans. As mentioned earlier, it is not automatically "good" to be a multidimensional integrator. That structure is beneficial in some situations, but not in all. A multidimensional integrator may have difficulty making the myriad of simple decisions we all make every day.

3. Components of the Printout

The printout contains 31 pieces of data. These are listed in Table 2. As shown in Table 2, 10 of the 31 items are used to classify a participant's decision-making as unidimensional, multidimensional differentiative, or multidimensional integrative. The other items describe the simulation run in general and individual decisions in detail.

A description of the printout for a sample participant named "Complex Test" appears below. A copy of the entire printout appears in Appendix F.

TABLE 2. MEASURES ON PROFILE AND MEASURES USED FOR CLASSIFICATION

<u>DATA ON PROFILE PRINTOUT</u>	<u>DATA USED FOR CLASSIFICATION</u>
1. Participant code	-
2. Number of minutes in simulation	-
3. Number of messages	-
4. Number of decisions	-
5. Number of periods	-
For each decision:	
6. Computer file identification	-
7. Decision text	-
8. Real time minutes of simulation time of decision	-
9. Period of decision	-
10. Number of messages preceding decision	-
11. Decision number in sequence	-
12. Simulation time of decision	-
13. Decision code number	-
14. Future decision codes	-
15. Decision numbers of decisions on which present decision based	-
16. Message numbers of messages on which present decision based	-
17. Number and list of decision categories used in total simulation	-
For each period:	
18. Number of decisions	-
19. Number of respondent decisions	X and in combination with #25*
20. Number of decision categories used	-
21. Number of forward integrations	In combination with #30
22. Multiplexity F	X
23. Weight	X
24. Number of backward integrations	X

*Note, therefore, that Measure No. 19 is employed in two ways:
1) by itself, and 2) in combination with Measure #25.

TABLE 2. MEASURES ON PROFILE AND MEASURES USED FOR CLASSIFICATION, CONTINUED

DATA ON PROFILE PRINTOUT

DATA USED FOR CLASSIFICATION

25. Number of unintegrated respondent decisions	In combination with #19
26. Quality of integration strategies (QIS)	X
27. Weighted QIS	X
28. Average response speed	-
29. Number of serial connections	-
30. Number of planned but not executed integrations	In combination with #21
31. General unintegrated decisions	X

"Complex Test" Example

Profile:

ENTER PARTICIPANT CODE:
COMPLEX TEST
DATA LIST? (Y/N):Y
NUMBER OF MINUTES IN SIMULA-
TION:74

NUMBER OF MESSAGES=24
NUMBER OF DECISIONS=38
NUMBER OF PERIODS=3

Explanation:

]Participant code name
]Data list option

]Total real time minutes of
simulation time

]Number of messages delivered
]Number of decisions made
]Number of periods completed

Next, if data list option was selected, decision data for each decision
made are printed out as follows:

.....
R1/COMPLEX TEST
YOUR DECISION TO REDUCE CREDIT TO YUGOSLAVIA BY 1 MILLION DOLLARS
@!-28>25@
TIME=32.5
PERIOD=2 MESSAGES=12
DECISION NUMBER=17 TIME=06/18 21:53:38
(;D1331.1)
FUTURE DECISIONS:(;D1211.1)
BASED ON DECISIONS:9;10
BASED ON MESSAGES:0

Information given for each decision is described below.

Profile:

R1/COMPLEX TEST

YOUR DECISION TO REDUCE CREDIT
TO YUGOSLAVIA BY 1 MILLION
DOLLARS @!-28>25@

TIME=32.5

Explanation:

]Identifying information for
computer file

]The decision (ignore coding
at end of text)
]Real minute of simulation time
during which the decision was
made; minutes cumulate across
periods

Profile:

PERIOD=2

MESSAGES=12

DECISION NUMBER 17

TIME=06/18 21;53;38

(;D133.1)

FUTURE DECISIONS:(;D1211.1)

BASED ON DECISIONS:9;10

BASED ON MESSAGES:0

Explanation:

]Period during which decision was made

]Total number of messages received preceding the decision

]Decision number in sequence from start of simulation

]Simulation time of decision: month/day hour;minute;second

]Decision code number

]Code number of future decisions planned at the time of this decision (other planned decisions printed out in separate parentheses).

]Decision numbers of decisions on which this decision was based

]Message numbers of messages on which this decision was based

Next is printed the total number of decision categories and a list of all category numbers selected during the simulation. (Category selection frequencies are not provided.) Number of categories per period is provided later in the printout.

NUMBER OF CATEGORIES=19

111
112
121
122
131
132
133
211
212
213
221
222
223
231
232
311
321
322
411

Category numbers come from decision alternative code numbers. Each decision alternative has its own unique decision code. Each digit in the code represents a position on successive branches of a tree containing all decision alternatives. Figure 3 shows how the decision code numbers are determined for eight decisions in the economic area. For example, the code number for "Reduce exports of high technology products to Russia" is (D)1121.

A decision category is any decision choice sequence through the first three choice options; a category number then is the first three digits in the decision alternative code. Using Figure 3 and the information below, see how the following two decisions are in the same category:

	<u>Decision 1 (Code 1121)</u>	<u>Decision 2 (Code 1123)</u>
Option 1	Economic	Economic
Option 2	Reduce Exports	Reduce Exports
Option 3	Of High Technology	Of High Technology
	Products	Products
Option 4	To Russia	To Yugoslavia

However, the decisions below are in different categories. These decisions do not share the first three digits of their codes.

	<u>Decision 1 (Code 1121)</u>	<u>Decision 2 (Code 1111)</u>
Option 1	Economic	Economic
Option 2	Reduce Exports	Reduce Exports
Option 3	Of High Technology	Of Food
	Products	
Option 4	To Russia	To Russia

Finally, the printout lists the participant's score on each of 14 measures for each simulation period. The sample below is for Period 1 for participant "Complex Test."

PERIOD 1	<u>Explanation:</u>
1-MEASURE=15 (# OF DECISIONS)	]Period number
2-MEASURE=5 33% (# OF RESPONDENT DEC.)	]Number of decisions
	]Number of respondent decisions, and per- cent of total decisions

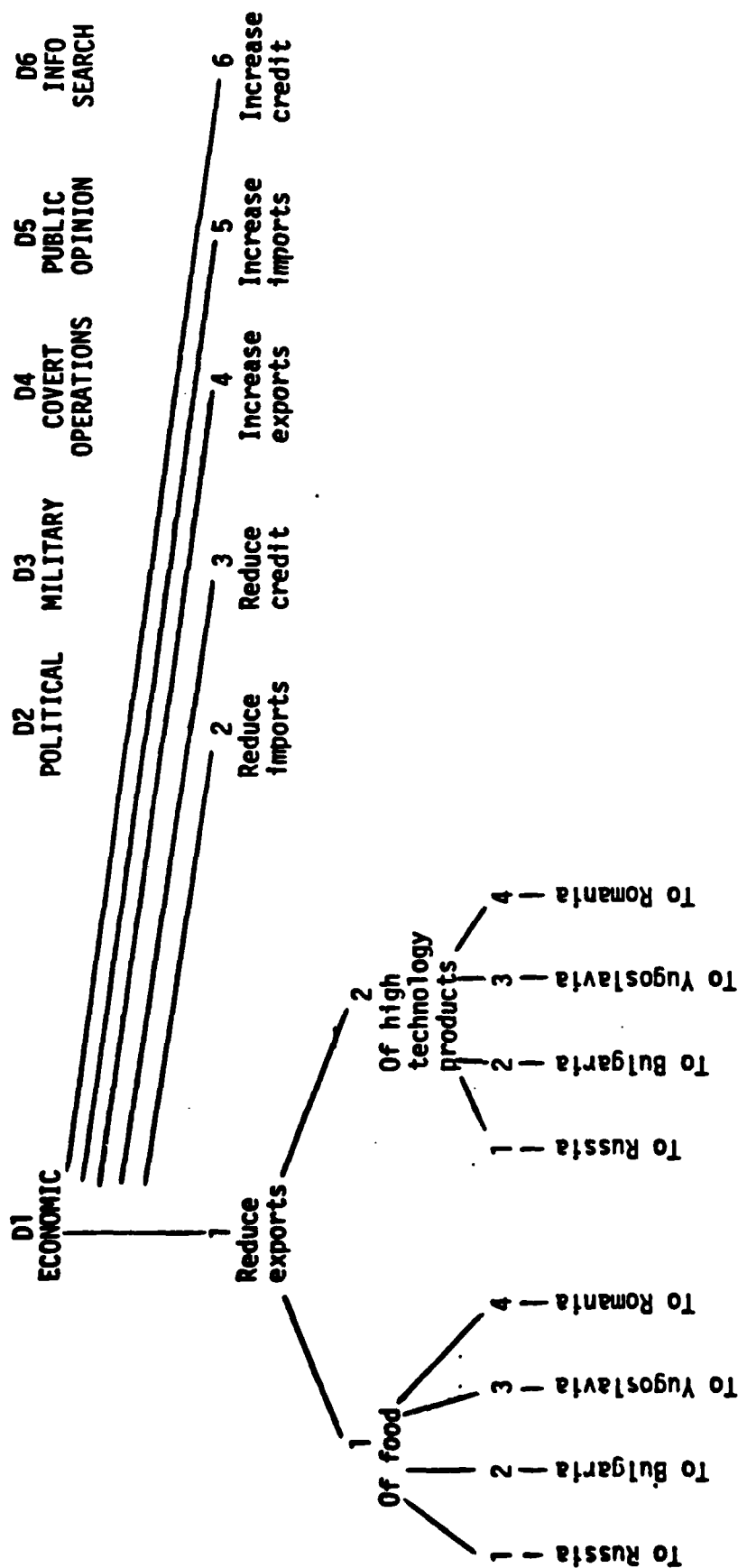


Figure 3. Decision code numbers for eight decision alternatives in the economic area.

3-MEASURE=10 (# OF DEC. CATEGORIES)	]Number of decision categories
4-MEASURE=13 86% (# OF FWD INTEGRATIONS)	]Number of forward integrations (% value is meaningless)
5-MEASURE=133 886% (MULTIPLEXITY F)	]Multiplexity F (% value is meaningless)
6-MEASURE=116 MINUTES (WEIGHT)	]Weight factor in real minutes of simulation time
7-MEASURE=0 0% (# OF BKD INTEG)	]Number of backward integrations (% value is meaningless)
8-MEASURE=2 13% (# OF UNINTEG. RES.DEC.)	]Number of unintegrated respondent decisions
9-MEASURE=562 (QIS)	]QIS (Quality of integration strategies)
10-MEASURE=2052 (WEIGHTED QIS)	]Weighted QIS
11-MEASURE=2.9 (AVE.RESPONSE SPEED)	]Average response speed in real time seconds of simulation time
12-MEASURE=4 (SERIAL CONNECTIONS)	]Number of serial connections
13-MEASURE=1 (PLANNED INTEGRATIONS)	]Number of integrations planned but not executed
14-MEASURE=4 (GENERAL UNINTEGRATED DEC.)	]Number of general unintegrated decisions

As shown in Table 2, the data used in classifying profiles come from the last section of the printout. These measures are defined below. (Predicted scores and a brief rationale for the predictions is presented in Section 4 of this chapter.) All 14 measures are discussed in greater detail with sample calculations in Appendix G.

Number of decisions (Measure 1) is the total number of decisions executed within a simulation period. To score a decision, a participant must:

- Enter the decision code
- Execute the decision (by pressing RETURN when the computer asks if the decisions should be executed)

Every decision is counted even if the same decision is executed more than once.

Number of respondent decisions (Measure 2) is the total number of decisions executed within a simulation period based on a previous message. To score a respondent decision, a participant must:

- Execute a decision
- Report that the decision was based on a previous message or messages

If one decision was based on two messages, then two respondent decisions are scored for that one decision, and so forth. Thus, the number of respondent decisions may exceed the total number of decisions.

Number of decision categories (Measure 3) is the total number of decision categories used within a simulation period. As described earlier in this section, a decision category is the first three digits of a decision code, or a decision choice sequence through the first three choice options. Decisions coded 1211 and 1213 are in the same category (121), but decisions coded 1211 and 1221 are in different categories. The decision category of each executed decision is scored only once no matter how often it is selected within a period.

Number of forward integrations (Measure 4) is the total number of forward integrations originating within a period. The integrations may be completed within the period of origination or in a later period. To score a forward integration, a participant must:

- Execute a decision
- Plan a future decision in another decision category
- Execute the planned decision (or any decision in the same category as the planned decision)
- Report that the planned decision was based on the previous decision

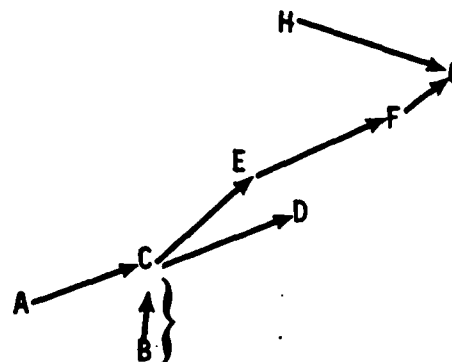
Multiplexity F (Measure 5) is the sum of the count of each forward integration scored within a period, plus all forward integrations originating and ending in the end-point of each forward integration, plus all forward integrations originating (not ending) in the endpoint of subsequent, directly connected integrations leading to the end of the simulation.

The sample below diagrams seven connected forward integrations (indicated by the → at the end of the diagonals). For example, decision C was planned at decisions A and B, and when C was executed, it was reported based on A and B.

Category

111
121
123
131
132
211
222
223

Time →



We will use this diagram to explain the calculation of Multiplexity F for integration BC.

$$BC+AC+CD+CE+EF+FG = 6$$

HG does not count because it ends, not begins, at the endpoint of the forward integration FG, which is not the integration of interest. AC counts because, for the integration of interest, DC, all integrations connected to its endpoint are connected. If all seven integrations were scored in one period, the total for the period would be the sum of the values for each integration.

Weight or integration time weight (Measure 6) is the sum of the time elapsed from initial to endpoint decision for each forward integration scored in a period. Time in this measure is real minutes of simulation time. For example, if time from original decision A to planned and executed endpoint decision C is three minutes, and from decision B to planned decision D is five minutes, the weight is eight minutes (even if AC and BD overlap in time). Backward integrations (see Measure 7) are not counted in this measure.

Number of backward integrations (Measure 7) is the total number of backward integrations originating in a period. The backward integration may or may not end in the same period. To score a backward integration, the participant must:

- Enter a decision A (endpoint decision)
- Not enter plans to execute decision B
- Execute decision B (the origin decision) in a different category from decision A

- Report that decision B was based in part on decision A

Note that backward integrations, unlike forward integrations, originate at a time later than their endpoints. Both forward and backward integrations, however, are credited to the period during which they originated.

Unintegrated respondent decisions (Measure 8) is the total number of unintegrated respondent decisions within a period. An unintegrated respondent decision occurs in response to a message, but may not originate a forward integration. An unintegrated respondent decision may, however, be part of a backward integration, or the endpoint of a forward integration, and it may lead to another decision in the same category. Unintegrated respondent decisions are a special case of respondent decisions because general respondent decisions may be any part of an integration. To score an unintegrated respondent decision, a participant must:

- Execute decision A (A may be planned or not planned)
- Report that decision A was based on a previous message

AND EITHER

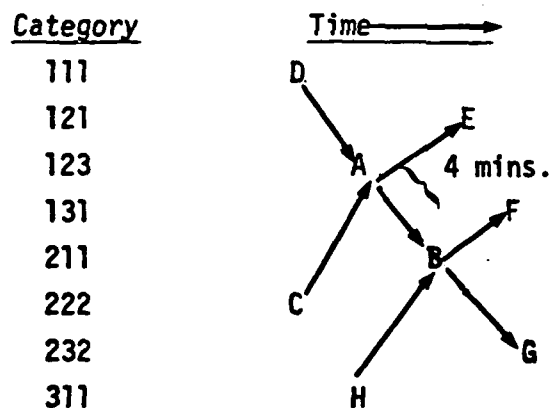
- at the time decision A is executed, not report a decision plan in a different category

OR

- report a decision plan in a different category, execute the plan, but not report it based on decision A

QIS or quality of integrated strategies (Measure 9)

is the sum of, for each forward integration scored in a period, the time weight for that integration multiplied by the sum of the number of forward integrations originating and ending at the origin and endpoint of the forward integration plus one for that forward integration. Refer to the sample below. If vector AB is a forward integration, and forward integration vectors CA and DA end at decision A in AB, and AE originates at A in AB, and forward integration vectors BF and BG originate at B in AB, and HB ends at B in AB, and the time elapsed from A to B is four minutes, the QIS score is four (the time weight) multiplied by the sum one for AB plus three for CA, DA, and AE, plus three for BF, BG, and HB, or $4(7)$ or 28.



Weighted QIS (Measure 10) is the sum of each forward integration scored in a period, plus all forward integrations originating and ending at both ends of the forward integration, plus all forward integrations originating (not ending) in the endpoint of subsequent, directly connected integrations until the end of the simulation, plus all forward integrations ending (not originating) in the origin of previous directly connected integrations until the beginning of the simulation, multiplied by the time weight. Refer to the diagram below.

Category

111

121

122

123

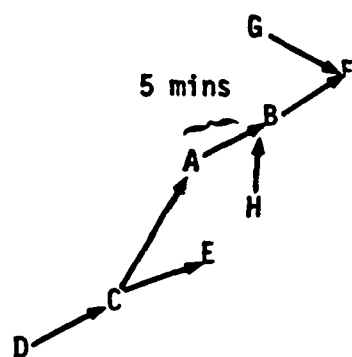
211

221

222

311

Time →



If vector AB is a forward integration, and forward integration CA connects to A in AB, and DC connects to C in CA, and CE connects to C in CA, and BF and HB connect to B in BA and GF connects to F in BF, and time elapsed from A to B is five minutes, the weighted QIS score is five multiplied by the sum of one for AB plus one each for CA and DC (not CE which originates not ends in DC and CA), plus one each for HB and BF (not GF which ends not originates in BF), or $5(5) = 25$. Weighted QIS is not QIS multiplied by the integration time weight as the name might imply. It is QIS (which already includes time weight) weighted with integrations distally connected to a target integration.

[The QIS score for the above sample would be five times (1 for AB + 1 for CA + 1 for BF + 1 for HB) = $5(4) = 20$. The Multiplexity F for the sample would be one for AB plus one for HB plus one for BF or three. Multiplexity F is essentially the forward half of WQIS minus the time weight.]

Average response speed (Measure 11) is the average time (in real minutes of simulation time) elapsed

between receipt of a message and subsequent execution of a respondent decision. (Recall that a respondent decision is one the participant reports was based on a previous message. See Measure 2.) The calculation is based on every respondent decision within a period.

Number of serial connections (Measure 12) is the number of serial connections scored in one period. A serial connection would be identical to an integration (see Measures 4 and 7) except that decisions connected serially fall in the same decision category, whereas integrated decisions fall in different decision categories.

A serial connection may be either forward or backward; this measure includes both types. To score a serial connection, the participant must:

EITHER

- Execute decision A
- Plan decision B in the same category
- Report that decision B was based on decision A

OR

- Execute decision A
- Not plan decision B
- Execute decision B in the same category as decision A
- Report that decision B was based on decision A

Planned integrations (Measure 13) is the number of forward integrations planned but not executed any time before the end of the simulation. If the integration is accomplished at any time, even in a later period than the origin decision, it is considered an executed integration. Planned but not executed integrations are credited to the period in which the origin decision was entered. The planned decision must be in a different decision category from the origin decision category. To score a planned but not executed integration, the participant must:

- Execute decision A
- Plan decision B in another category

AND EITHER

- Not execute decision B

OR

- Execute decision B (or any decision in B category) but not report that decision B was based on decision A

General unintegrated decisions (Measure 14) is the number of general unintegrated decisions within a period. A general unintegrated decision is a decision which is not part of a forward or backward integration. It may be part of a serial connection, or it may be respondent, or planned but not executed, or planned, executed, but not reported based on the previous decision, or isolated completely. Unintegrated respondent decisions and planned but not executed integrations are subsets (may be overlapping) of general unintegrated decisions.

4. Comparing Profiles

Nine measures have been selected as the basis for comparing profiles. These measures were selected because interactive complexity theory (which is the basis for the simulation) predicts that the different classifications of decision makers, described earlier, will be characterized by different scores on these measures. As shown in Table 2, these measures come from data on the printout. Other measures to be used in comparing profiles may be added later as testing on the simulation continues, but at this time, nine measures have been chosen. The measures are described below and general predictions for the different decision-making classifications are given. The measures are discussed in the order in which they appear on the sample classification graphs.

Number of general unintegrated decisions (Measure 14). These decisions are not part of forward or backward integrations. General unintegrated decisions reflect a lack of overall planning. They often represent trial and error actions. Multidimensional persons, especially integrators, would not score many unintegrated decisions in a complex, demanding situation like the Yugoslav Dilemma because most of their decisions would be integrated. An excessive number of unintegrated decisions may be expected on the Yugoslav Dilemma from unidimensional persons who generally do not plan and execute strategy.

Number of respondent decisions (Measure 2). Respondent decisions are based on messages; they may or may not be part of integrations.

Thus, some respondent decision-making is evident in the behavior of all complexity groups. However, respondent, as opposed to integrated, decisions are particularly prevalent in decision sequences generated by unidimensional persons. Persons who can neither differentiate nor integrate tend to depend on the immediate environment for cues upon which they can base their actions. Especially in situations where the immediate environment is complex, respondent decisions by unidimensional persons may be substantially increased in number and often reach or exceed 50% of their total decisions. This is because the person may react separately to each bit of information. Strategic reactions, of course, would be near zero.

Proportion of unintegrated respondent to respondent decisions (Measures 8 and 2). The proportion of unintegrated respondent to total number of respondent decisions reflects integrative strategy. As the proportion nears 1.0, less integrative strategy is implied. Thus, scores near 1.0 would be expected from unidimensional participants, and scores closer to 0 expected from multidimensional participants, with integrators scoring closer to 0 than differentiators.

Number of backward integrations (Measure 7). Backward integrations, planned only after decisions are executed, reflect less strategic planning than forward integrations, but nevertheless reflect some strategy. Thus, they occur with greater frequency for multidimensional than for unidimensional participants. A few backward integrations may be generated by unidimensional persons, but larger score values should be seen in the profiles for differentiators and the two groups of integrators.

[Differences in the use of backward integrations by differentiators, low-level integrators, and high-level integrators may become evident (with future participants) by calculating the proportion of backward integrations to all integrations. As the resulting value moves closer to 1.0, the cognitive complexity of the decision-maker would likely be lower.]

Number of forward integrations adjusted by number of planned but not executed integrations (Measures 4 and 13). Number of forward integrations is the basic and most frequently employed measure of decision integration. Very low scores would be predicted for unidimensional persons, low scores for differentiators and moderate to high scores for integrators.

Unless the measure is adjusted by number of planned but not executed integrations, however, the measure is too conservative and loses sensitivity. In order to score a forward integration, a participant must plan a decision then execute it. If the plan is not executed later, we do not know if it was due to lack of strategy or lack of time before the simulation ended ("simulation end effect"). Therefore, we should credit all or some planned but not executed integrations as forward integrations. To increase the likelihood that this adjustment is correcting for end effects and not lack of strategy, the credit should increase across periods. For example, we assume that integrators execute all plans made in period 1, but people with lack of strategy will not. Thus, no adjustment should be made for period 1. This adjustment should increase the likelihood that we identify integrators.

For the preliminary comparison sample, number of total forward integrations was calculated by adding together:

- Period 1: Number of forward integrations plus 0% planned but not executed integrations (unadjusted)
- Period 2: Number of forward integrations plus 50% planned but not executed integrations
- Period 3: Number of forward integrations plus 100% planned but not executed integrations.

Multiplexity F (Measure 5). Multiplexity F means multiple complex strategies in a forward direction. As any one course of action is approached from increasing numbers of decision points, and as that course links directly to other steps in a plan, multiplexity F scores increase. This type of planning is characteristic of multidimensional, not unidimensional, planners.

Within multidimensional planners, differentiators will score only low or moderately high on this measure. Low-level integrators score moderately high, and high-level integrators attain high scores.

The basic calculation in a multiplexity F score is number of forward integrations. Number of forward integrations has not been adjusted for planned but not executed integrations, as mentioned above. Such an adjustment may be needed in the future to increase its sensitivity to different types of integrators, but was unnecessary with the present comparison sample.

Weight (Measure 6). This measure indicates the length of time across which persons integrate. The lowest weight scores would be scored by unidimensional planners who do

not integrate. Differentiators may produce weight scores slightly higher than those for unidimensional persons, but differentiators' scores would remain near the lower end of the distribution for this measure. Low-level integrators should generate moderate weight scores and considerably greater weight scores should be generated by high-level integrators.

The weight measure may suffer from the "simulation end effect" discussed under "number of forward integrations." It is difficult to adjust the weight measure, however, because we would have to guess at what time a planned integration would occur. Should a future adjustment become desirable, we might use the obtained mean weight per integration as the constant.

Quality of integrated strategies (QIS) (Measure 9). For each forward integration, QIS adds the number of forward integrations directly connected to the beginning and endpoints of the forward integration and multiplies this sum by the time weight. Thus, QIS increases as individual integrations become woven into other integrations. QIS is low for differentiators, even lower for unidimensional persons. QIS is slightly higher for low-level integrators than for differentiators and may reach very high levels for high-level integrators. (QIS has not been adjusted for simulation end effects.)

Weighted QIS (Measure 10). For each forward integration, weighted QIS (like QIS) adds up all forward integrations connected to the beginning and endpoints of the forward integration, but unlike QIS, weighted QIS also includes all forward integrations linked to those integrations tracing them all the way to the beginning and end of the simulation. Thus, this measure increases with high levels

of strategic planning and lengthy sequences of decisions toward more distant goals. Lengthy sessions are required in order to generate high scores on this measure. The relatively short (relative to other decision-making simulations) Yugoslav Dilemma restricts scores for weighted QIS. Nonetheless, we can predict that the highest scores on this measure will be generated by high-level integrators. Scores for low-level integrators should remain moderately low, and scores achieved by all other groups should remain near zero.

Four of the 14 measures are not included in the profile comparison process:

- Number of decisions (Measure 1)
- Number of decision categories (Measure 3)
- Average response speed (Measure 11)
- Serial connections (Measure 12)

Score predictions for these measures cannot be made on the basis of complexity theory as it stands today. Presently, it is thought that these measures are influenced by specific content characteristics of a simulation, and not by structural aspects of a participant's decision-making.

In order to compare a participant's style to the preliminary comparison sample, the researcher must follow the steps listed below:

- Calculate the proportion of unintegrated respondent to total respondent decisions for each period.
- Adjust forward integrations for each period using the adjustment described above.

- For each of the nine measures used, calculate a per-period average by totalling the scores and dividing by the number of periods.
- Plot the nine averages on each of the three (unidimensional, multidimensional differentiative, multidimensional integrative) tentative comparison graphs (Figures 4, 5, and 6).
- Determine best fit.

Figures 4, 5, and 6 are the preliminary comparison graphs for unidimensional, multidimensional differentiative, and multidimensional integrative style, respectively. These graphs were based on a very small sample of participants, have NOT been validated, and, thus, may be considered as tentative. The interested reader may refer to Swezey, Streufert, Criswell, Unger, and van Rijn (1984) for more information on the derivation of these comparison figures.

Scores should fit within the window on one of the comparison graphs. If several scores fall above or below a window, this would suggest that the person's performance reflects a different decision-making style than is represented on that comparison graph. The best fit within the window area of a graph indicates the group to which that person would be tentatively assigned.

Let us use the sample for participant "Complex Test" in Appendix F in an example of how to use the comparison graphs. Table 3 shows how the per-period means for the nine measures are calculated.

Next, the means are plotted. Figures 7, 8, and 9 show how these values fit against each of the three graphs. The values fit best with multidimensional integrators.

GENERAL UNINTEGRATED DECISIONS	RESPONDENT DECISIONS	PROPORTION OF UNINTEGRATED RESPONDENT DECISIONS TO RESPONDENT DECISIONS	BACKWARD INTEGRATIONS	FORWARD INTEGRATIONS (ADJUSTED WITH PLANNED BUT NOT EXECUTED INTEGRATIONS)	MULTIPLICITY F	WEIGHT	QIS	WEIGHTED QIS
			20+	7+	20+	20+	20+	20+
			19			19	19	
			18	6	10	18	18	10
			17			17	17	
		.7-	16			16	16	
	0		15	5	7	15	15	5
	10	.75	14			14	14	
	20		13	4	6	13	13	4
			12			12	12	
		.8	11		5	11	11	
2	30		10			10	10	3
4	40	.85	9	3	4	9	9	
6	50		8			8	8	
8	60	.9	7	2	3	7	7	2
10	70		6			6	6	
12	80+	.95	5		2	5	5	1
14			4	1	1	4	4	
16+		1.0	3			3	3	
			2			2	2	
			1	0	0	1	1	0
			0			0	0	

Range

Figure 4. Performance score ranges in the Yugoslav Dilemma simulation expected for unidimensional persons.

GENERAL UNINTEGRATED DECISIONS	RESPONDENT DECISIONS	PROPORTION UNINTEGRATED RESPONDENT DECISIONS TO RESPONDENT DECISIONS	BACKWARD INTEGRATIONS	FORWARD INTEGRATIONS (ADJUSTED WITH PLANNED BUT NOT EXECUTED INTEGRATIONS)	MULTIPLICITY F	WEIGHT	QIS	WEIGHTED QIS
		.4-	18+	8+	60+	30+	200+	300+
			17				150	
		.5	16	7	40	25	100	200
			15				80	
			14	6			70	
			13				64	100
		.6	12	5	20	20	48	
0	5		11				44	75
	10		10				40	
2	15	.7	9	4	16	15	36	
	20		8				32	
4	25	.8	7		14		28	50
	30		6		12		24	
6	35	.9	5	3	10	10	20	
	40		4		8		16	
8	45	1.0	3		6		12	25
	50		2	2	4	5	10	
10	55		1		2		8	
	60		0	1			6	
12	70						4	5
	80						2	
14	100+						1	2
16								
20								
24								
28+								

Range

Figure 5. Performance score ranges in the Yugoslav Dilemma simulation expected for multidimensional differentiators.

GENERAL UNINTEGRATED DECISIONS	RESPONDENT DECISIONS	PROPORTION OF UNINTEGRATED RESPONDENT DECISIONS TO RESPONDENT DECISIONS	BACKWARD INTEGRATIONS	FORWARD INTEGRATIONS (ADJUSTED WITH PLANNED BUT NOT EXECUTED INTEGRATIONS)	MULTIPLICITY F	WEIGHT	QIS	WEIGHTED QIS
						VERY HIGH LEVEL INTEGRATORS	1000+	2000+
							750	1000
							500	900
							475	800
							450	700
							425	600
							400	500
							375	500
						HIGH LEVEL INTEGRATORS		
						300+		
						250		
						150+		
						100		
						30+		
						28		
0	0		12+		60	100	325	450
1	5		10		50	85	300	350
2	10	0			40	70	250	
3	15	.1	8		30	60	200	250
4	20	.2			20	50	150	
5	25	.3	6		10	40	125	150
6	30	.4			7	35		
7	35	.5	4		30	30	100	50
8	40	.6			25	25	90	40
9	45	.7	2		20	20	80	20
10+	50	.8	1		15	15	75	0
	55	.9	0		10	10	70	
	60	1.0			5	5	60	
	65				4	4		
	70				3	3		
	75				2	2		
	80+				1	1		
					0	0		

Figure 6. Performance score ranges in the Yugoslav Dilemma simulation expected for multidimensional integrators.

TABLE 3

CALCULATION OF SAMPLE PARTICIPANT'S SCORES FOR PROFILE COMPARISON

	GENERAL UNINTEGRATED DECISIONS	RESPONDENT DECISIONS	UNINTEGRATED RESPONDENT TO RESPONDENT DECISIONS	BACKWARD INTEGRATIONS	FORWARD INTEGRATIONS ADJUSTED WITH PLANNED BUT NOT EXECUTED INTEGRATIONS	MULTIPLICITY F	WEIGHT	QIS	WEIGHTED QIS
Period 1	4	5	$2/5 = .40$	0	$13 + (0 \times 1) = 13$	133	116	562	2052
Period 2	2	3	$3/3 = 1.00$	2	$12 + (.50 \times 0) = 12$	96	184	1312	3874
Period 3	2	2	$1/2 = .50$	0	$4 + (1.00 \times 3) = 7$	6	22	134	612
Total	8	10	1.90	2	32	235	322	2008	6538
MEAN	2.7	3.3	.63	.7	10.7	78.3	107.3	669.3	2179.3

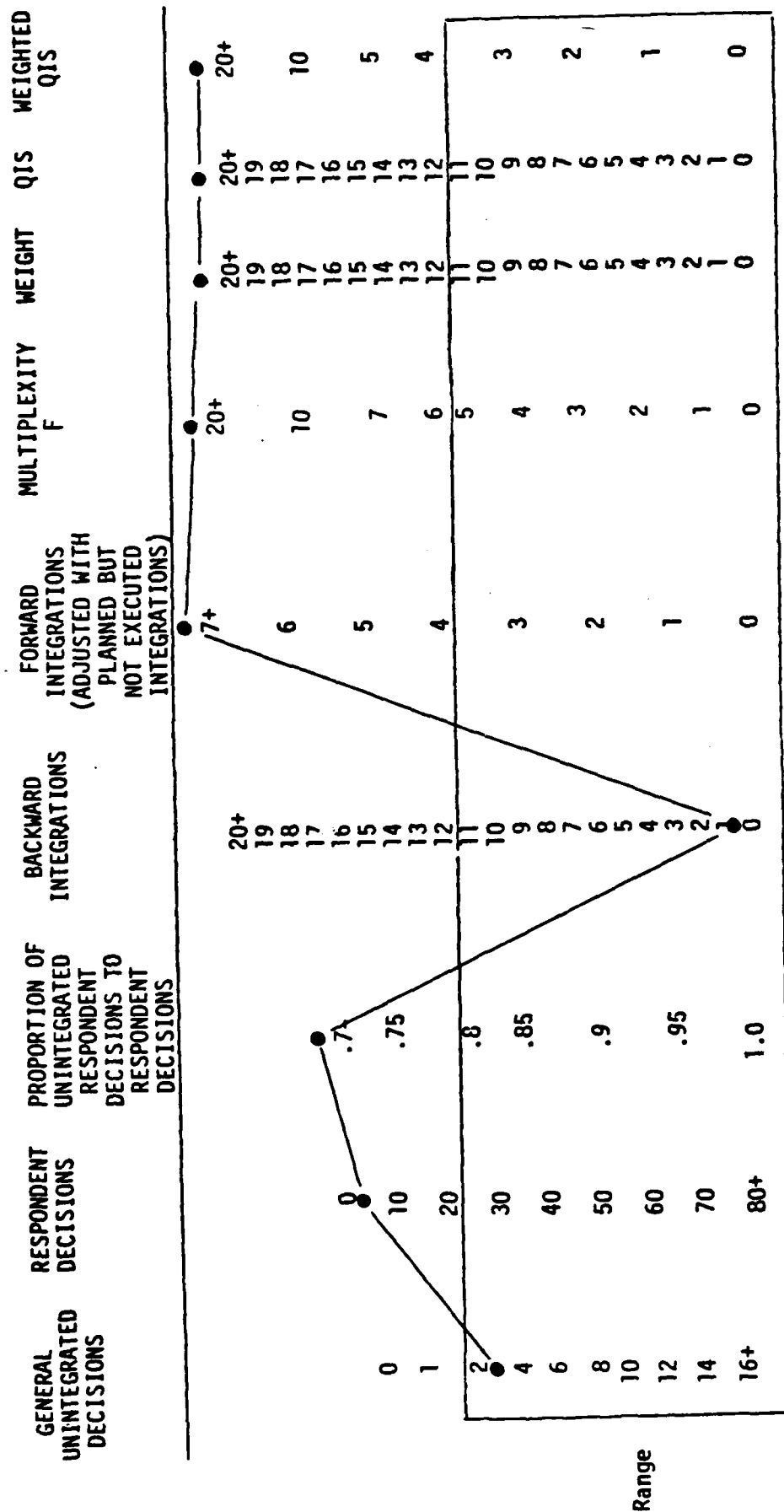


Figure 7. Scores for sample participant "Complex Test" compared to unidimensional range.

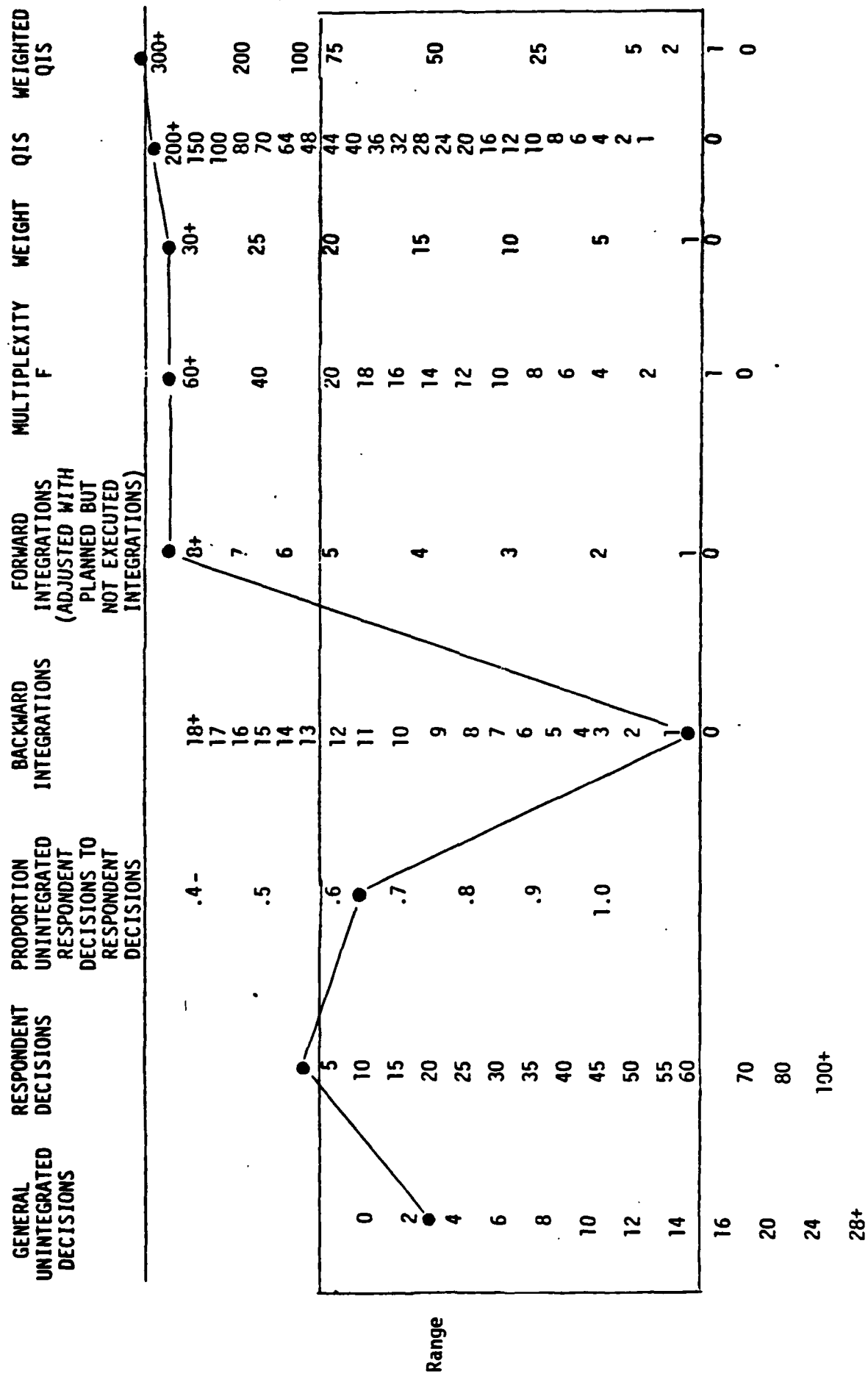


Figure 8. Scores for sample participant "Complex Test" compared to multidimensional differentiator range.

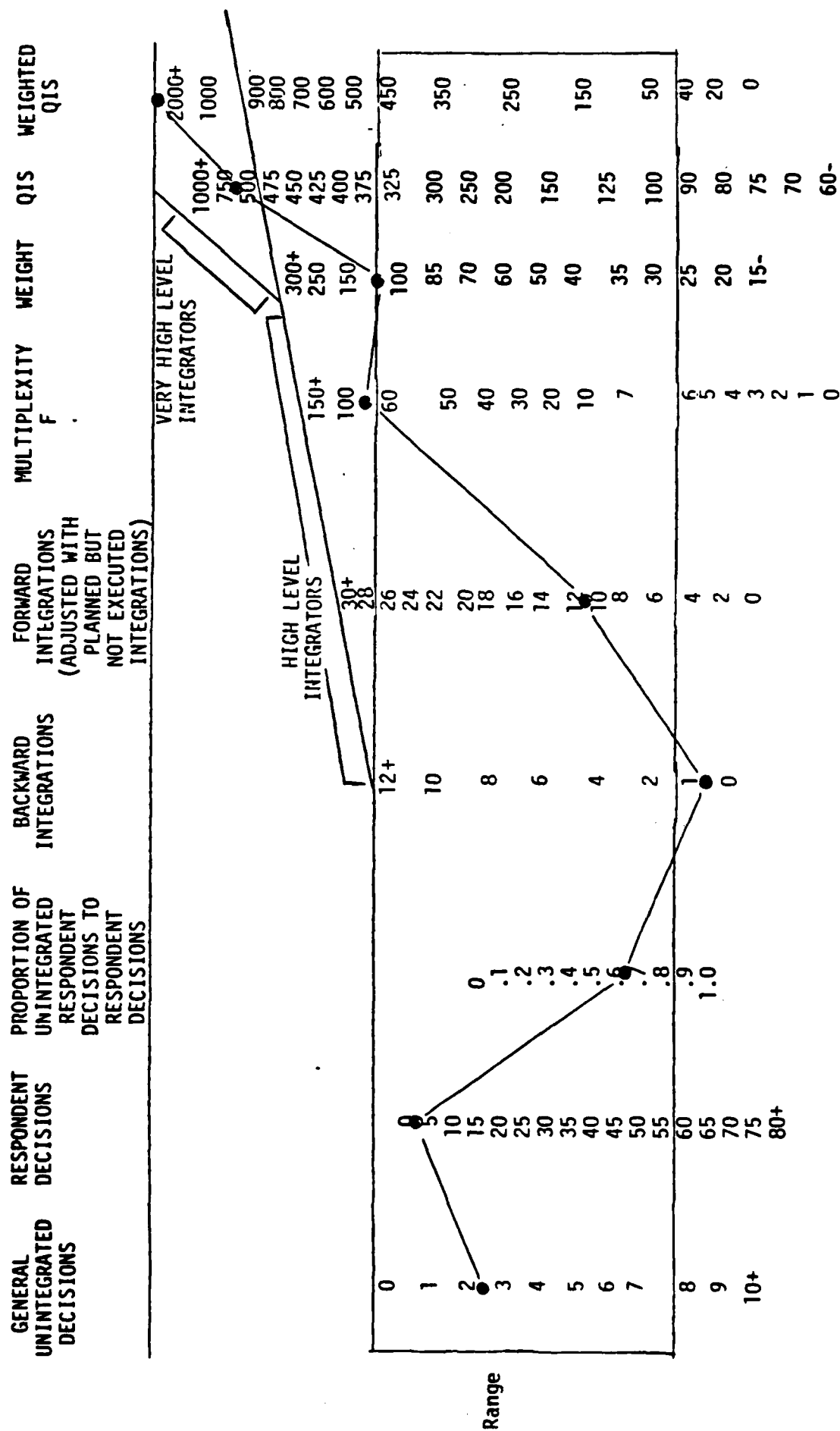


Figure 9. Scores for sample participant "Complex Test" compared to multidimensional integrator range.

5. Expert Strategies

As emphasized earlier in this manual, complexity theory and the Yugoslav Dilemma are concerned with the structure and process of decision making, not with the quality of the decision. Thus, can we say that a person who demonstrates more strategic forward integrations between decisions is a better decision maker than one who fails to generate these connections? For any given task, however, whether or not a particular decision-making style is optimal depends on the task, the environment, and the limitations of content that are acceptable in that environment.

To illustrate, consider how two different tasks and environments call for two different decision-making structures. First consider a task environment which is simple, where only two choices are available, neither has important long-term implications, one of the two choices has immediate desirable outcomes, and the other has immediate undesirable outcomes. An example might be whether to put gas in the car when it is nearly empty or drive the car until it runs out of gas. In cases of that kind, there is no need to use a complex decision-making strategy. A good versus a bad decision is easy to judge in the very simple case.

Second, consider a case where task and environment are complex, where decisions must be made under conditions of uncertainty, where the long-range, sequential effects of current decisions need to be considered and where the opponent is likely to employ specific strategy. An example of complex task and environment might be the Yugoslav Dilemma, or its real world counterpart. Clearly, quick, simple decisions would be maladaptive. Without referring at all to the content of the crisis, we may say

that careful consideration of information from many sources, planned information collection, and flexible responding as the situation changes are desirable characteristics of executive-level decision making. Perhaps the best executive-level decision maker is one who has a variety of simple and complex strategies available in his or her repertoire to apply as the situation requires. Optimal strategies are situation dependent.

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APPENDIX A
DECISION ALTERNATIVES FOR STORM SCENARIO

STORM SCENARIO DECISION ALTERNATIVES

Evacuation Action You Can Take

1111	Alert the administrators of Jackson High School	
1112	of Kennedy High School	
1121	Alert the teachers of Jackson High School	
1122	of Kennedy High School	
12111	Move the administrators of Jackson High School	to Marsh Park
12112		to Tyson's Corner
12113		to quadrant
12121	Move the administrators of Kennedy High School	to Marsh Park
12122		to Tyson's Corner
12123		to quadrant
12211	Move the students of Jackson High School	to Marsh Park
12212		to Tyson's Corner
12213		to quadrant
12221	Move the students of Kennedy High School	to Marsh Park
12222		to Tyson's Corner
12223		to quadrant
12311	Move the teachers of Jackson High School	to Marsh Park
12312		to Tyson's Corner
12313		to quadrant
12321	Move the teachers of Kennedy High School	to Marsh Park
12322		to Tyson's Corner
12323		to quadrant

Information Search You Can Request

2111	Determine threat to administrators of Jackson High School	
2112	of Kennedy High School	
2121	Determine threat to teachers of Jackson High School	
2122	of Kennedy High School	
2131	Determine threat to students of Jackson High School	
2132	of Kennedy High School	
2211	Assess damage to roads in the city	
2212	in the suburbs	
2221	Assess damage to communications facilities in the city	
2222	in the suburbs	

APPENDIX B
DECISION ALTERNATIVES FOR YUGOSLAV DILEMMA

ECONOMIC ACTION YOU CAN TAKE

Reduce exports of food

1111 to Russia
1112 to Bulgaria
1113 to Yugoslavia
1114 to Romania

Reduce exports of high technology products

1121 to Russia
1122 to Bulgaria
1123 to Yugoslavia
1124 to Romania

Reduce imports of raw materials

1211 to Russia
1212 to Bulgaria
1213 to Yugoslavia
1214 to Romania

Reduce imports of manufactured goods

1221 to Russia
1222 to Bulgaria
1223 to Yugoslavia
1224 to Romania

Reduce credit by 1 million dollars

1311 to Russia
1312 to Bulgaria
1313 to Yugoslavia
1314 to Romania

Reduce credit by 5 million dollars

1321 to Russia
1322 to Bulgaria
1323 to Yugoslavia
1324 to Romania

Reduce credit by 10 million dollars

1331 to Russia
1332 to Bulgaria
1333 to Yugoslavia
1334 to Romania

Reduce credit by 50 million dollars

1341 to Russia
1342 to Bulgaria
1343 to Yugoslavia
1344 to Romania

Increase exports of food

1411 to Russia
1412 to Bulgaria
1413 to Yugoslavia
1414 to Romania

Increase exports of high technology products

1421 to Russia
1422 to Bulgaria
1423 to Yugoslavia
1424 to Romania

Increase imports of raw materials

1511 to Russia
1512 to Bulgaria
1513 to Yugoslavia
1514 to Romania

Increase imports of manufactured goods

1521 to Russia
1522 to Bulgaria
1523 to Yugoslavia
1524 to Romania

Increase credit by 1 million dollars

1611 to Russia
1612 to Bulgaria
1613 to Yugoslavia
1614 to Romania

Increase credit by 5 million dollars

1621 to Russia
1622 to Bulgaria
1623 to Yugoslavia
1624 to Romania

Increase credit by 10 million dollars

1631 to Russia
1632 to Bulgaria
1633 to Yugoslavia
1634 to Romania

Increase credit by 50 million dollars

1641 to Russia
1642 to Bulgaria
1643 to Yugoslavia
1644 to Romania

POLITICAL ACTION YOU CAN TAKE

Send messages concerning the potential imposition of economic sanctions

21111 to the Russian Ambassador
21112 Foreign Minister
21113 President
21121 to the Bulgarian Ambassador
21122 Foreign Minister
21123 President
21131 to the Yugoslavian Ambassador
21132 Foreign Minister
21133 President
21141 to the Romanian Ambassador
21142 Foreign Minister
21143 President

Send messages concerning the potential resumption of normal trade

21211 to the Russian Ambassador
21212 Foreign Minister
21213 President
21221 to the Bulgarian Ambassador
21222 Foreign Minister
21223 President
21231 to the Yugoslavian Ambassador
21232 Foreign Minister
21233 President
21241 to the Romanian Ambassador
21242 Foreign Minister
21243 President

Send messages concerning the potential involvement of U.S. forces in Yugoslavia

21311 to the Russian Ambassador
21312 Foreign Minister
21313 President
21321 to the Bulgarian Ambassador
21322 Foreign Minister
21323 President
21331 to the Yugoslavian Ambassador
21332 Foreign Minister
21333 President
21341 to the Romanian Ambassador
21342 Foreign Minister
21343 President

Send messages concerning U.S. interests in a non-aligned Yugoslavia

21411 to the Russian Ambassador
21412 Foreign Minister
21413 President
21421 to the Bulgarian Ambassador
21422 Foreign Minister
21423 President
21431 to the Yugoslavian Ambassador
21432 Foreign Minister
21433 President
21441 to the Romanian Ambassador
21442 Foreign Minister
21443 President

Send diplomats to discuss potential imposition of economic sanctions

22111 to the Russian Ambassador
22112 Foreign Minister
22113 President
22121 to the Bulgarian Ambassador
22122 Foreign Minister
22123 President
22131 to the Yugoslavian Ambassador
22132 Foreign Minister
22133 President
22141 to the Romanian Ambassador
22142 Foreign Minister
22143 President

Send diplomats to discuss potential resumption of normal trade

22211 with the Russian Ambassador
22212 Foreign Minister
22213 President
22221 with the Bulgarian Ambassador
22222 Foreign Minister
22223 President
22231 with the Yugoslavian Ambassador
22232 Foreign Minister
22233 President
22241 with the Romanian Ambassador
22242 Foreign Minister
22243 President

Send diplomats to discuss potential involvement of U.S. forces in Yugoslavia

22311 with the Russian Ambassador
22312 Foreign Minister
22313 President
22321 with the Bulgarian Ambassador
22322 Foreign Minister
22323 President
22331 with the Yugoslavian Ambassador
22332 Foreign Minister
22333 President
22341 with the Romanian Ambassador
22342 Foreign Minister
22343 President

Send diplomats to discuss U.S. interests in a non-aligned Yugoslavia

22411 with the Russian Ambassador
22412 Foreign Minister
22413 President
22421 with the Bulgarian Ambassador
22422 Foreign Minister
22423 President
22431 with the Yugoslavian Ambassador
22432 Foreign Minister
22433 President
22441 with the Romanian Ambassador
22442 Foreign Minister
22443 President

Arrange a conference with cabinet members
2311 to assess previous political actions
2312 military actions
2313 economic actions
2314 covert operations
2315 public opinion actions

Arrange a conference with cabinet members
2321 to plan future political actions
2322 military actions
2323 economic actions
2324 covert operations
2325 public opinion actions

MILITARY ACTION YOU CAN TAKE

Alert U.S. 6th fleet
3111 to prepare to move
3112 to prepare for combat

Alert U.S. Air Force
3121 to prepare to move
3122 to prepare for combat

Alert U.S. Army Europe
3131 to prepare to move
3132 to prepare for combat

Alert U.S. Rapid Deployment Force
3141 to prepare to move
3142 to prepare for combat

Move U.S. 6th fleet
32111 Task Force A to the Adriatic Sea
32112 to the Aegean Sea
32113 to the Ionian Sea
32114 to quadrant
32121 Task Force B to the Adriatic Sea
32122 to the Aegean Sea
32123 to the Ionian Sea
32124 to quadrant

Move U.S. Air Force interceptor squadrons (W. Germany)
32211 to airfields in Britain
32212 in W. Germany
32213 in Greece
32214 in quadrant

Move U.S. Air Force ground attack fighter squadrons (W. Germany)
32221 to airfields in Britain
32222 in W. Germany
32223 in Greece
32224 in quadrant

Move U.S. Air Force reconnaissance squadrons (England)
32231 to airfields in Britain
32232 in W. Germany
32233 in Greece
32234 in quadrant

Move U.S. Air Force transport squadrons (U.S.)
32241 to airfields in Britain
32242 in W. Germany
32243 in Greece
32244 in quadrant

Move U.S. Air Force bomber squadrons (England)
32251 to airfields in Britain
32252 in W. Germany
32253 in Greece
32254 in quadrant

Move U.S. Army Europe Division A (armored)

32311 to bases in Britain
32312 in W. Germany
32313 in Italy
32314 in Greece
32315 in quadrant

Move U.S. Army Europe Division B (infantry)

32321 to bases in Britain
32322 in W. Germany
32323 in Italy
32324 in Greece
32325 in quadrant

Move U.S. Army Europe Division C (mechanized)

32331 to bases in Britain
32332 in W. Germany
32333 in Italy
32334 in Greece
32335 in quadrant

Move U.S. Army Europe Division D (airmobile)

32341 to bases in Britain
32342 in W. Germany
32343 in Italy
32344 in Greece
32345 in quadrant

Move U.S. Rapid Deployment Force Division A (mechanized)

32411 to bases in Britain
32412 in W. Germany
32413 in Italy
32414 in Greece
32415 in quadrant

Move U.S. Rapid Deployment Force Division B (airborne)

32421 to bases in Britain
32422 in W. Germany
32423 in Italy
32424 in Greece
32425 in quadrant

Move U.S. Rapid Deployment Force Division C (air assault)

32431 to bases in Britain
32432 in W. Germany
32433 in Italy
32434 in Greece
32435 in quadrant

Move U.S. Rapid Deployment Force Special Forces Units

32441 to bases in Britain
32442 in W. Germany
32443 in Italy
32444 in Greece
32445 in quadrant

Conduct reconnaissance missions

3311 in Russia with satellites
3312 - - with SR-71 aircraft
3313 - - with foot patrols
3321 in Bulgaria with satellites
3322 with SR-71 aircraft
3323 with foot patrols
3331 in Yugoslavia with satellites
3332 with SR-71 aircraft
3333 with foot patrols
3341 in Romania with satellites
3342 with SR-71 aircraft
3343 with foot patrols

COVERT OPERATIONS ACTIONS YOU CAN TAKE.

Transmit false information

4111 about planned U.S. military actions in Russia
4112 in Bulgaria
4113 in Yugoslavia
4114 in Romania
4121 about planned U.S. political actions in Russia
4122 in Bulgaria
4123 in Yugoslavia
4124 in Romania
4131 about planned U.S. economic actions in Russia
4132 in Bulgaria
4133 in Yugoslavia
4134 in Romania
4141 about planned U.S. covert operations in Russia
4142 in Bulgaria
4143 in Yugoslavia
4144 in Romania

Send additional agents

4211 to penetrate military organizations in Russia
4212 in Bulgaria
4213 in Yugoslavia
4214 in Romania
4221 to penetrate political organizations in Russia
4222 in Bulgaria
4223 in Yugoslavia
4224 in Romania
4231 to penetrate intelligence organizations in Russia
4232 in Bulgaria
4233 in Yugoslavia
4234 in Romania

Sabotage

4311 power plants in Russia
4312 in Bulgaria
4313 in Yugoslavia
4314 in Romania
4321 rail lines in Russia
4322 in Bulgaria
4323 in Yugoslavia
4324 in Romania
4331 communication facilities in Russia
4332 in Bulgaria
4333 in Yugoslavia
4334 in Romania
4341 air fields in Russia
4342 in Bulgaria
4343 in Yugoslavia
4344 in Romania
4351 fuel dumps in Russia
4352 in Bulgaria
4353 in Yugoslavia
4354 in Romania
4361 navy yards in Russia
4362 in Bulgaria
4363 in Yugoslavia
4364 in Romania
4371 bridges in Russia
4372 in Bulgaria
4373 in Yugoslavia
4374 in Romania
4381 industrial plants in Russia
4382 in Bulgaria
4383 in Yugoslavia
4384 in Romania
4391 army bases in Russia
4392 in Bulgaria
4393 in Yugoslavia
4394 in Romania

Influence attitudes

4411 of military leaders in Russia
4412 in Bulgaria
4413 in Yugoslavia
4414 in Romania
4421 political leaders in Russia
4422 in Bulgaria
4423 in Yugoslavia
4424 in Romania
4431 of the general population in Russia
4432 in Bulgaria
4433 in Yugoslavia
4434 in Romania

Remove key officials

4511 by kidnapping in Russia
4512 in Bulgaria
4513 in Yugoslavia
4514 in Romania
4521 by assassination in Russia
4522 in Bulgaria
4523 in Yugoslavia
4524 in Romania
4531 by encouraging defection in Russia
4532 in Bulgaria
4533 in Yugoslavia
4534 in Romania

PUBLIC OPINION ACTIONS YOU CAN TAKE

Collect information

5111 from U.S. public concerning support for U.S. actions
5112 for Soviet actions
5121 from pro-Western nations concerning support for U.S. actions
5122 for Soviet actions

Disseminate information

5211 to U.S. public concerning current U.S. actions
5212 Soviet actions
5221 to pro-Western nations concerning current U.S. actions
5222 Soviet actions

INFORMATION SEARCH YOU CAN MAKE

Economic

6111 Describe the importance of U.S. imports from Russia
6112 from Bulgaria
6113 from Yugoslavia
6114 from Romania
6121 Describe the importance of U.S. exports to Russia
6122 to Bulgaria
6123 to Yugoslavia
6124 to Romania
6131 Estimate the current line of credit (millions of dollars) to Russia
6132 to Bulgaria
6133 to Yugoslavia
6134 to Romania

Political

6211 Describe the foreign policy of Russia
6212 of Bulgaria
6213 of Yugoslavia
6214 of Romania
6221 Describe the relations between the U.S. and Russia
6222 and Bulgaria
6223 and Yugoslavia
6224 and Romania

6231 Describe the results of the latest diplomatic mission to Russia
 6232 to Bulgaria
 6233 to Yugoslavia
 6234 to Romania

Who is responsible for the latest
 62411 Yugoslavian economic actions?
 62412 political actions?
 62413 military actions?
 62414 covert operations?
 62421 Bulgarian economic actions?
 62422 political actions?
 62423 military actions?
 62424 covert operations?

Military

6311 What is the location of the U.S. 6th Fleet Task Force A?
 6312 Task Force B?
 6321 What is the location of the U.S. Air Force interceptor squadrons?
 6322 ground attack fighter squadrons?
 6323 reconnaissance squadrons?
 6324 transport squadrons?
 6325 bomber squadrons?
 6331 What is the location of U.S. Army Europe Division A?
 6332 Division B?
 6333 Division C?
 6334 Division D?

Covert Operations

Provide information gathered by U.S. agents
 6411 in military organizations in Russia
 6412 in Bulgaria
 6413 in Yugoslavia
 6414 in Romania
 6421 in political organizations in Russia
 6422 in Bulgaria
 6423 in Yugoslavia
 6424 in Romania
 6431 in intelligence organizations in Russia
 6432 in Bulgaria
 6433 in Yugoslavia
 6434 in Romania

Public Opinion

Describe the results of the latest opinion poll concerning
 6511 support for U.S. actions
 6512 Soviet actions

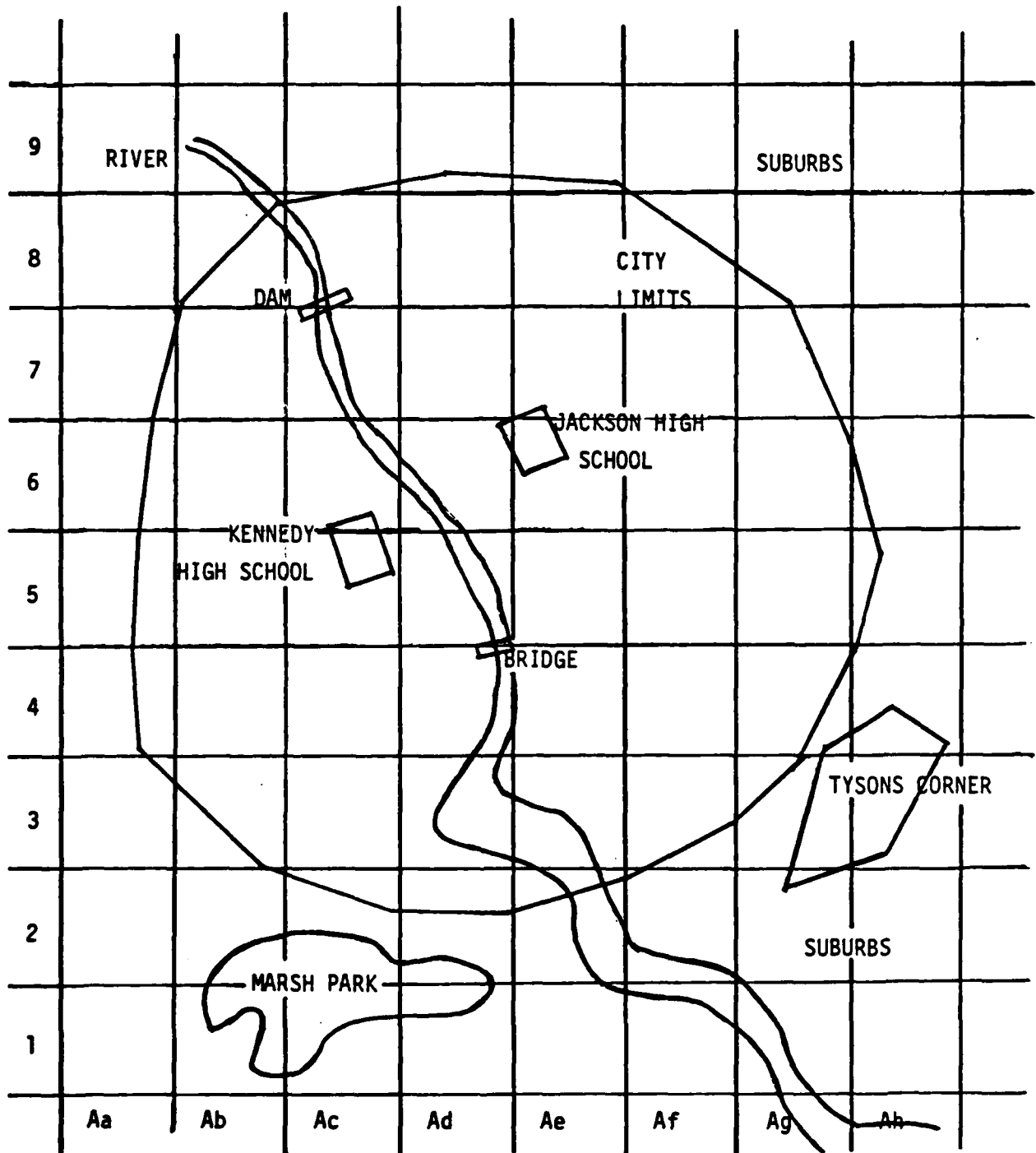
APPENDIX C
NOTE-TAKING FORM

STORM SCENARIO/YUGOSLAV DILEMMA - PARTICIPANT'S NOTES

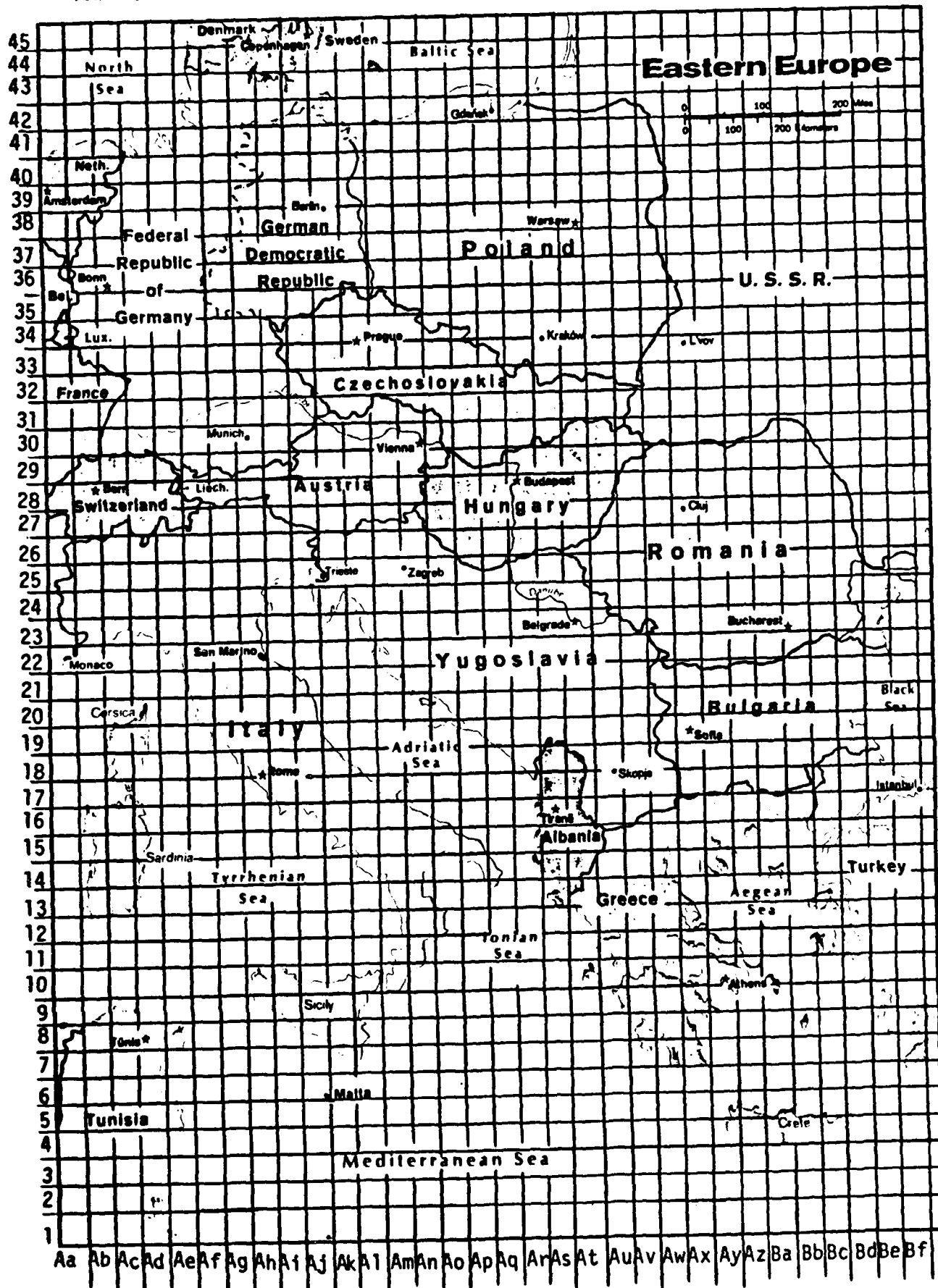
MESSAGES RECEIVED		DECISIONS I MADE			MY FUTURE DECISION PLANS	DECISIONS WHICH LED TO THIS DECISION	MESSAGES WHICH LED TO THIS DECISION
#	TIME/TEXT	#	CODE/TIME/TEXT	RESULTS	CODE	#	#

APPENDIX D
REQUIRED MAPS

MAP FOR STORM SCENARIO



MAP FOR YUGOSLAV DILEMMA



APPENDIX E
LONG AND SHORT FORM INSTRUCTIONS

Appendix E - Long and Short Form Instructions

Long Form Instructions

- A) You have just entered a decision. If you plan to make related decisions in the future, please enter these plans now. Note that these planned decisions must also be entered at a later time (when you actually wish to execute them).
- Are you planning any future related decisions?

- B) The decision you recently made may have been planned when you made earlier decisions. If this decision was previously planned, enter the numbers of all previous decisions that you made as you planned the current action.
- If you do not remember the number of those previous decisions, please check the print-out or your notes. Please enter these related decisions by their number. Separate numbers by a semi-colon (;). Hit the return key when all numbers have been entered.
- If this decision was not planned in the past, enter zero (0).

- C) If your decision was made entirely or partly in response to recently received messages, enter the number(s) of those messages. Separate message numbers with a semi-colon (;). If none, enter zero (0). Press return after all numbers have been entered.

Short Form Instructions

- A) Are you currently planning any future related decisions?

- B) If you previously planned this decision, please enter the decision numbers of all previous decisions that you made as you planned the current action. Separate decision numbers with a semi-colon (;). If none, enter zero (0). Press return after all numbers have been entered.

- C) If your decision was made entirely or partly in response to recently received messages, enter the number(s) of those messages. Separate message numbers with a semi-colon (;). If none, enter zero (0). Press return after all numbers have been entered.

APPENDIX F
SAMPLE PARTICIPANT PROFILE

PROGRAM MEASURE
ENTER PARTICIPANT CODE: COMPLEX TEST

DATA LIST? (Y/N): Y

NUMBER OF MINUTES IN SIMULATION: 74

NUMBER OF MESSAGES: 24

NUMBER OF DECISIONS: 38

NUMBER OF PERIODS: 3

R1/COMPLEX TEST

YOUR DECISION TO REDUCE CREDIT TO YUGOSLAVIA BY 1 MILLION DOLLARS @1-28>250

TIME=32.5

PERIOD=2 MESSAGES=12

DECISION NUMBER=17 TIME=06/18 21153:38

(ID1331.1)

FUTURE DECISIONS: (ID1211.1)

BASED ON DECISIONS: 9/10

BASED ON MESSAGES: 0

R2/COMPLEX TEST

YOUR DECISION TO SEND MESSAGES CONCERNING THE POTENTIAL IMPOSITION OF ECONOMIC SANCTIONS TO THE RUSSIAN AMBASSADOR

TIME=34.5

PERIOD=2 MESSAGES=12

DECISION NUMBER=18 TIME=06/18 21155:52

(ID2111.1 ID2112.1)

BASED ON DECISIONS: 0

BASED ON MESSAGES: 0

R4/COMPLEX TEST

YOUR DECISION TO REDUCE EXPORTS OF HIGH TECHNOLOGY PRODUCTS TO RUSSIA

TIME=36.5

PERIOD=2 MESSAGES=12

DECISION NUMBER=19 TIME=06/18 21157:45

(ID1121.1)

FUTURE DECISIONS: (ID1211.1)

BASED ON DECISIONS: 0

BASED ON MESSAGES: 0

R5/COMPLEX TEST

YOUR DECISION TO SEND MESSAGES CONCERNING THE POTENTIAL INVOLVEMENT OF U.S. FORCE IN YUGOSLAVIA TO THE RUSSIAN AMBASSADOR

TIME=38.5

PERIOD=2 MESSAGES=13

DECISION NUMBER=20 TIME=06/18 21159:53

(ID131.1 ID2132.1)

FUTURE DECISIONS: (ID1321.1)

BASED ON DECISIONS: 0

BASED ON MESSAGES: 0

R7/COMPLEX TEST

YOUR DECISION TO SEND DIPLOMATS TO DISCUSS POTENTIAL IMPOSITION OF ECONOMIC SANCTIONS WITH THE RUSSIAN AMBASSADOR @179>750

TIME=40.5

PERIOD=2 MESSAGES=13

DECISION NUMBER=21 TIME=06/18 22102:28

(ID2211.1 ID2212.1)

FUTURE DECISIONS: (ID1321.1)

BASED ON DECISIONS: 0

BASED ON MESSAGES: 0

R8/COMPLEX TEST
 YOUR DECISION TO SEND DIPLOMATS TO DISCUSS POTENTIAL RESUMPTION OF NORMAL TRADE WITH THE RUSSIAN AMBASSADOR @1=79>750
 TIME=42.5
 PERIOD=2 MESSAGES=13
 DECISION NUMBER=22 TIME=06/18 22:04:50
 (D2221.1;D2222.1)
 FUTURE DECISIONS:(D1321.1)
 BASED ON DECISIONS:0
 BASED ON MESSAGES:0

R9/COMPLEX TEST
 YOUR DECISION TO REDUCE EXPORTS OF FOOD TO RUSSIA HAS BEEN SUCCESSFULLY COMPLETED.
 TIME=.5
 PERIOD=1 MESSAGES=1
 DECISION NUMBER=1 TIME=06/18 19:40:38
 (D1111.1)
 FUTURE DECISIONS:(D1121.1)
 BASED ON DECISIONS:N
 BASED ON MESSAGES:1

R10/COMPLEX TEST
 YOUR DECISION TO REDUCE IMPORTS OF MANUFACTURED GOODS FROM RUSSIA
 TIME=44.5
 PERIOD=2 MESSAGES=13
 DECISION NUMBER=23 TIME=06/18 22:07:12
 (D1221.1)
 BASED ON DECISIONS:15:18
 BASED ON MESSAGES:13

R11/COMPLEX TEST
 YOUR DECISION TO ARRANGE A CONFERENCE WITH CABINET MEMBERS TO ASSESS PREVIOUS POLITICAL ACTIONS @1=B3>850
 TIME=46.5
 PERIOD=2 MESSAGES=14
 DECISION NUMBER=24 TIME=06/18 22:10:51
 (D2311.1)
 BASED ON DECISIONS:0
 BASED ON MESSAGES:14

R13/COMPLEX TEST
 YOUR DECISION TO SEND MESSAGES CONCERNING THE POTENTIAL IMPOSITION OF ECONOMIC SANCTIONS TO THE RUSSIAN AMBASSADOR
 TIME=48.5
 PERIOD=2 MESSAGES=14
 DECISION NUMBER=25 TIME=06/18 22:12:53
 (D2111.1;D2112.1)
 BASED ON DECISIONS:0
 BASED ON MESSAGES:14

R14/COMPLEX TEST
 YOUR DECISION TO ALERT U.S. SIXTH FLEET TO PREPARE TO MOVE
 TIME=50.5
 PERIOD=2 MESSAGES=14
 DECISION NUMBER=26 TIME=06/18 22:14:50
 (D3111.1)
 FUTURE DECISIONS:(D3221.1;D3222.1)
 BASED ON DECISIONS:14
 BASED ON MESSAGES:0

R15/COMPLEX TEST
 YOUR DECISION TO REDUCE EXPORTS OF HIGH TECHNOLOGY PRODUCTS TO RUSSIA HAS BEEN SUCCESSFULLY COMPLETED.
 TIME=2.5
 PERIOD=1 MESSAGES=1
 DECISION NUMBER=2 TIME=06/18 19:42:43
 (D1121.1)
 FUTURE DECISIONS:(D3211.1;D3212.1)
 BASED ON DECISIONS:1
 BASED ON MESSAGES:1

R16/COMPLEX TEST
 YOUR DECISION TO REDUCE IMPORTS OF RAW MATERIALS FROM RUSSIA
 TIME=52.5
 PERIOD=2 MESSAGES=15
 DECISION NUMBER=27 TIME=06/18 22:17:16
 (D1211.1)
 FUTURE DECISIONS:(D3221.1;D3222.1)
 BASED ON DECISIONS:16:17:19
 BASED ON MESSAGES:0

R17/COMPLEX TEST
 YOUR DECISION TO REDUCE EXPORTS OF FOOD TO RUSSIA
 TIME=54.5
 PERIOD=2 MESSAGES=15
 DECISION NUMBER=28 TIME=06/18 22:19:44
 (D1111.1)
 FUTURE DECISIONS:(D3221.1;D3222.1)
 BASED ON DECISIONS:0
 BASED ON MESSAGES:0

R18/COMPLEX TEST
 YOUR DECISION TO MOVE U.S. SIXTH FLEET TASK FORCE A TO THE ADRIATIC SEA HAS BEEN SUCCESSFULLY ACCOMPLISHED.@1=2>200
 TIME=4.5
 PERIOD=1 MESSAGES=2
 DECISION NUMBER=3 TIME=06/18 19:45:03

(#D3211.1#D3212.1)
FUTURE DECISIONS:(#D1211.1)(#D3221.1#D3222.1)
BASED ON DECISIONS:2
BASED ON MESSAGES:0

R19/COMPLEX TEST
YOUR DECISION TO REDUCE CREDIT TO BULGARIA BY 1 MILLION DOLLARS @1-28>240
TIME=56.5
PERIOD=2 MESSAGES=15
DECISION NUMBER=29 TIME=06/18 22:22:04
(#D321.1)
FUTURE DECISIONS:(#D3221.1#D3222.1)
BASED ON DECISIONS:20#21#22
BASED ON MESSAGES:0

R20/COMPLEX TEST
YOUR DECISION TO ARRANGE A CONFERENCE WITH CABINET MEMBERS TO PLAN FUTURE POLITI
CAL ACTIONS @1-84>860
TIME=58.5
PERIOD=2 MESSAGES=15
DECISION NUMBER=30 TIME=06/18 22:24:40
(#D321.1)
FUTURE DECISIONS:(#D3221.1#D3222.1)
BASED ON DECISIONS:14
BASED ON MESSAGES:0

R21/COMPLEX TEST
YOUR DECISION TO REDUCE IMPORTS OF RAW MATERIALS FROM RUSSIA HAS BEEN SUCCESSFUL
LY COMPLETED.
TIME=6.5
PERIOD=1 MESSAGES=3
DECISION NUMBER=4 TIME=06/18 19:48:08
(#D1211.1)
FUTURE DECISIONS:(#D3221.1#D3222.1)
BASED ON DECISIONS:3
BASED ON MESSAGES:0

R22/COMPLEX TEST
YOUR DECISION TO REDUCE EXPORTS OF FOOD TO RUSSIA
TIME=60.5
PERIOD=2 MESSAGES=16
DECISION NUMBER=31 TIME=06/18 22:27:06
(#D1111.1)
FUTURE DECISIONS:(#D3221.1#D3222.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:0

R23/COMPLEX TEST
YOUR DECISION TO SEND MESSAGES CONCERNING THE POTENTIAL IMPOSITION OF ECONOMIC SA
CTIONS TO THE RUSSIAN AMBASSADOR
TIME=62.5
PERIOD=3 MESSAGES=18
DECISION NUMBER=32 TIME=06/19 00:01:50
(#D2111.1#D2112.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:18

R24/COMPLEX TEST
YOUR DECISION TO TRANSMIT FALSE INFORMATION ABOUT PLANNED US MILITARY ACTIONS IN
RUSSIA
TIME=64.5
PERIOD=3 MESSAGES=19
DECISION NUMBER=33 TIME=06/19 00:03:51
(#D4111.1)
FUTURE DECISIONS:(#D2231.1#D2232.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:19

R26/COMPLEX TEST
YOUR DECISION TO REDUCE EXPORTS OF HIGH TECHNOLOGY PRODUCTS TO RUSSIA
TIME=66.5
PERIOD=3 MESSAGES=20
DECISION NUMBER=34 TIME=06/19 00:06:26
(#D1121.1)
FUTURE DECISIONS:(#D1221.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:0

R27/COMPLEX TEST
YOUR DECISION TO MOVE U.S. AIR FORCE INTERCEPTOR SQUADRONS (W. GERM) TO AIRFIELD

S IN BRITAIN @!=51>460
 TIME=08.5
 PERIOD=3 MESSAGES=21
 DECISION NUMBER=35 TIME=06/19 00:11:38
 (D13221.1D13222.1)
 FUTURE DECISIONS:(D1211.1X D1331.1X D2231.1D2232.1)
 BASED ON DECISIONS:26:27:28:29:30:31
 BASED ON MESSAGES:0

R29/COMPLEX TEST
 YOUR DECISION TO REDUCE IMPORTS OF RAW MATERIALS FROM RUSSIA
 TIME=70.5
 PERIOD=3 MESSAGES=22
 DECISION NUMBER=36 TIME=06/19 00:15:21
 (D1211.1)
 FUTURE DECISIONS:(D1111.1)
 BASED ON DECISIONS:35
 BASED ON MESSAGES:0

R31/COMPLEX TEST
 YOUR DECISION TO REDUCE IMPORTS OF MANUFACTURED GOODS FROM RUSSIA WAS NOT SUCCESSFUL.
 TIME=8.5
 PERIOD=1 MESSAGES=3
 DECISION NUMBER=5 TIME=06/18 19:50:48
 (D1221.1)
 FUTURE DECISIONS:(D13221.1D13222.1)
 BASED ON DECISIONS:0
 BASED ON MESSAGES:0

R32/COMPLEX TEST
 YOUR DECISION TO REDUCE CREDIT TO YUGOSLAVIA BY 1 MILLION DOLLARS @!=28>250
 TIME=72.5
 PERIOD=3 MESSAGES=23
 DECISION NUMBER=37 TIME=06/19 00:17:25
 (D1331.1)
 FUTURE DECISIONS:(D1111.1)
 BASED ON DECISIONS:35
 BASED ON MESSAGES:0

R33/COMPLEX TEST
 YOUR DECISION TO SEND DIPLOMATS TO DISCUSS POTENTIAL INVOLVEMENT OF U.S. FORCES IN YUGOSLAVIA WITH THE RUSSIAN AMBASSADOR @!=79>750

TIME=74.5
 PERIOD=3 MESSAGES=24
 DECISION NUMBER=38 TIME=06/19 00:19:39
 (D12231.1D12232.1)
 BASED ON DECISIONS:33:35
 BASED ON MESSAGES:0

R38/COMPLEX TEST
 YOUR DECISION TO REDUCE EXPORTS OF HIGH TECHNOLOGY PRODUCTS TO RUSSIA HAS BEEN SUCCESSFULLY COMPLETED.
 TIME=10.5
 PERIOD=1 MESSAGES=4
 DECISION NUMBER=6 TIME=06/18 19:53:25
 (D1121.1)
 BASED ON DECISIONS:0
 BASED ON MESSAGES:0

R59/COMPLEX TEST
 YOUR DECISION TO MOVE U.S. AIR FORCE INTERCEPTOR SQUADRONS (W. GERM) TO AIRFIELD S IN BRITAIN HAS BEEN SUCCESSFULLY ACCOMPLISHED.@!

=51>460
 TIME=12.5
 PERIOD=1 MESSAGES=5
 DECISION NUMBER=7 TIME=06/18 19:55:17
 (D13221.1D13222.1)
 FUTURE DECISIONS:(D13211.1D13212.1X D13221.1D13222.1X D1311.1X D2121.1D2122.1)
 BASED ON DECISIONS:31:415
 BASED ON MESSAGES:0

R52/COMPLEX TEST
 YOUR DECISION TO MOVE U.S. AIR FORCE INTERCEPTOR SQUADRONS (W. GERM) TO AIRFIELD S IN BRITAIN HAS BEEN SUCCESSFULLY ACCOMPLISHED.@!
 =51>460
 TIME=14.5
 PERIOD=1 MESSAGES=5

DECISION NUMBER=8 TIME=06/18 19:59:59
(#D3221.1)(#D3222.1)
FUTURE DECISIONS:(#D3221.1)(#D3222.1)
BASED ON DECISIONS:7
BASED ON MESSAGES:5

R66/COMPLEX TEST
YOUR DECISION TO REDUCE CREDIT TO RUSSIA BY 1 MILLION DOLLARS WAS NOT SUCCESSFUL

TIME=16.5
PERIOD=1 MESSAGES=6
DECISION NUMBER=9 TIME=06/18 20:04:05
(#D1311.1)
FUTURE DECISIONS:(#D1311.1)(#D1331.1)
BASED ON DECISIONS:7
BASED ON MESSAGES:5

R68/COMPLEX TEST
YOUR DECISION TO SEND MESSAGES CONCERNING THE POTENTIAL RESUMPTION OF NORMAL TRADE TO THE RUSSIAN AMBASSADOR WAS NOT SUCCESSFUL.

TIME=18.5
PERIOD=1 MESSAGES=7
DECISION NUMBER=10 TIME=06/18 20:06:55
(#D2121.1)(#D2122.1)
FUTURE DECISIONS:(#D1331.1)(#D2211.1)(#D2212.1)
BASED ON DECISIONS:7
BASED ON MESSAGES:0

R70/COMPLEX TEST
YOUR DECISION TO MOVE U.S. AIR FORCE INTERCEPTOR SQUADRONS (W. GERM) TO AIRFIELD 5 IN BRITAIN HAS BEEN SUCCESSFULLY ACCOMPLISHED.6!

TIME=20.5
PERIOD=1 MESSAGES=7
DECISION NUMBER=11 TIME=06/18 20:09:53
(#D3221.1)(#D3222.1)
FUTURE DECISIONS:(#D3211.1)(#D3212.1)
BASED ON DECISIONS:8
BASED ON MESSAGES:0

R76/COMPLEX TEST
YOUR DECISION TO REDUCE CREDIT TO RUSSIA BY 1 MILLION DOLLARS WAS NOT SUCCESSFUL

TIME=22.5
PERIOD=1 MESSAGES=8
DECISION NUMBER=12 TIME=06/18 20:12:29
(#D1311.1)
BASED ON DECISIONS:9
BASED ON MESSAGES:0

R78/COMPLEX TEST
YOUR DECISION TO REDUCE CREDIT TO BULGARIA BY 1 MILLION DOLLARS HAS BEEN SUCCESSFULLY COMPLETED.0!-28>240

TIME=24.5
PERIOD=1 MESSAGES=9
DECISION NUMBER=13 TIME=06/18 20:14:25
(#D1321.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:0

R84/COMPLEX TEST
YOUR DECISION TO ARRANGE A CONFERENCE WITH CABINET MEMBERS TO PLAN FUTURE POLITICAL ACTIONS WAS NOT SUCCESSFUL.

TIME=26.5
PERIOD=1 MESSAGES=9
DECISION NUMBER=14 TIME=06/18 20:16:51
(#D2321.1)
FUTURE DECISIONS:(#D2321.1)(#D3111.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:0

R86/COMPLEX TEST
YOUR DECISION TO REDUCE EXPORTS OF FOOD TO RUSSIA HAS BEEN SUCCESSFULLY COMPLETED.

TIME=28.5
PERIOD=1 MESSAGES=10
DECISION NUMBER=15 TIME=06/18 20:19:50
(#D1111.1)
BASED ON DECISIONS:0
BASED ON MESSAGES:9

R06/COMPLEX TEST
 YOUR DECISION TO MOVE U.S. SIXTH FLEET TASK FORCE A TO THE ADRIATIC SEA HAS BEEN
 SUCCESSFULLY ACCOMPLISHED.01=200
 TIME=30.5
 PERIOD=2 MESSAGES=11
 DECISION NUMBER=16 TIME=06/18 21:50:59
 (103211.1;103212.1)
 FUTURE DECISIONS:(101211.1)
 BASED ON DECISIONS:7;11
 BASED ON MESSAGES:0

NUMBER OF CATEGORIES= 19

111
 112
 113
 121
 122
 123
 131
 132
 133
 211
 212
 213
 221
 222
 223
 231
 232
 233
 311
 312
 313
 321
 322
 323
 331
 332
 333
 411

PERIOD 1
 1-MEASURE=15 (# OF DECISIONS)
 2-MEASURE=5 33% (# OF RESPONDENT DEC.)
 3-MEASURE=10 (# OF DEC. CATEGORIES)
 4-MEASURE=13 86% (# OF FWD INTEGRATIONS)
 5-MEASURE=133 88% (MULTIPLEXITY F)
 6-MEASURE=116 MINUTES (WEIGHT)
 7-MEASURE=0 0% (# OF BKD INTEG)
 8-MEASURE=2 13% (# OF UNINTEG.RES.DEC.)
 9-MEASURE=562 (QIS)
 10-MEASURE=2052 (WEIGHTED QIS)
 11-MEASURE=2.9 (AVE.RESPONSE SPEED)
 12-MEASURE=4 (SERIAL CONNECTIONS)
 13-MEASURE=1 (PLANNED INTEGRATIONS)
 14-MEASURE=4 (GENERAL UNINTEGRATED DEC.)

PERIOD 2
 1-MEASURE=16 (# OF DECISIONS)
 2-MEASURE=3 18% (# OF RESPONDENT DEC.)
 3-MEASURE=14 (# OF DEC. CATEGORIES)
 4-MEASURE=12 75% (# OF FWD INTEGRATIONS)
 5-MEASURE=96 600% (MULTIPLEXITY F)
 6-MEASURE=184 MINUTES (WEIGHT)

7-MEASURE=2 12% (# OF BKD INTEG)
 8-MEASURE=3 18% (# OF UNINTEG.RES.DEC.)
 9-MEASURE=1312 (QIS)
 10-MEASURE=3874 (WEIGHTED QIS)
 11-MEASURE=3.83333333 (AVE.RESPONSE SPEED)
 12-MEASURE=0 (SERIAL CONNECTIONS)
 13-MEASURE=0 (PLANNED INTEGRATIONS)
 14-MEASURE=2 (GENERAL UNINTEGRATED DEC.)
 PERIOD 3
 1-MEASURE=7 (# OF DECISIONS)
 2-MEASURE=2 28% (# OF RESPONDENT DEC.)
 3-MEASURE=7 (# OF DEC. CATEGORIES)
 4-MEASURE=4 57% (# OF FWD INTEGRATIONS)
 5-MEASURE=6 85% (MULTIPLEXITY F)
 6-MEASURE=22 MINUTES (WEIGHT)
 7-MEASURE=0 0% (# OF BKD INTEG)
 8-MEASURE=1 14% (# OF UNINTEG.RES.DEC.)
 9-MEASURE=134 (QIS)
 10-MEASURE=412 (WEIGHTED QIS)
 11-MEASURE=.5 (AVE.RESPONSE SPEED)
 12-MEASURE=0 (SERIAL CONNECTIONS)
 13-MEASURE=3 (PLANNED INTEGRATIONS)
 14-MEASURE=2 (GENERAL UNINTEGRATED DEC.)

APPENDIX G
DETAILED EXPLANATIONS
OF THE 14 MEASURES
OF DECISION MAKING

The purpose of this appendix is to provide complete definitions of the 14 measures of decision-making strategy calculated by the computer for each simulation period. This appendix provides more detail than that given in the body of the report; it explains the calculation of measures on the "Complex Test" sample participant. That profile is presented in Appendix F.

The 14 measures are calculated by the computer using the data stored for each decision. These data are printed out if the data list option is selected. The majority of the Complex Test printout in Appendix F is the data list section. Pertinent data from the data list section appear in Table A.

Using the data in Table A, a diagram called a time-event matrix was constructed and is presented in Figure A. This matrix contains a point for each decision and clearly shows decision connections. The horizontal axis is time, the vertical axis is decision category. Forward integrations are noted by diagonal lines with a forward arrow ➡, backward integrations are diagonals with a backward arrow ⇐, serial connections are horizontal lines with a forward arrow ➡. The sample calculations in this appendix will refer to Table A and Figure A.

Number of decisions (Measure 1) is the total number of decisions executed within a simulation period. To score a decision, a participant must:

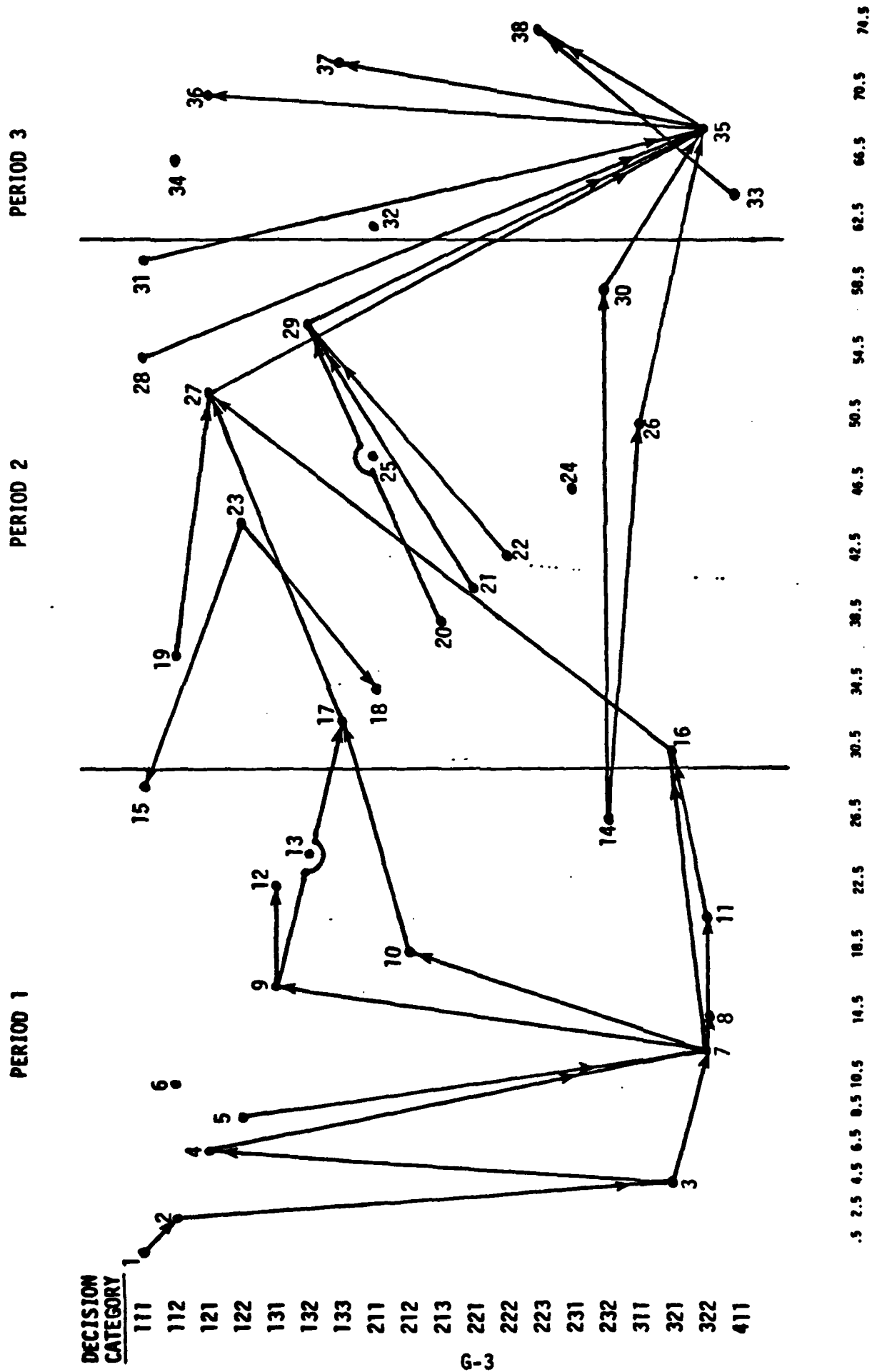
- Enter the decision code.
- Execute the decision (by pressing RETURN when the computer asks if the decision should be executed)

Every decision is counted even if the same decision is executed more than once.

As shown in Table A and Figure A, 15 decisions were executed during period 1, 16 in period 2, and 7 in period 3. The category numbers of the decisions are also available in Table A and Figure A.

TABLE A
DATA FOR SAMPLE PARTICIPANT "COMPLEX TEST"
(Adapted from Unger and Swezey, 1983)

DECISION #	DECISION CATEGORY	BASED ON MESSAGE	PLANNED DECISIONS	BASED ON DECISION #	TIME DECISION EXECUTED
PERIOD 1:					
1	111	1	1121	-	.5
2	112	1	3211, 3212	1	2.5
3	321	-	1211, 3221, 3222	2	4.5
4	121	-	3221, 3222	3	6.5
5	122	-	3221, 3222	-	8.5
6	112	-	-	-	10.5
7	322	-	3211, 3212, 3221, 3222, 1311, 2121, 2122	3, 4, 5	12.5
8	322	5	3221, 3222	7	14.5
9	131	5	1311, 1331	7	16.5
10	212	-	1331, 2211, 2212	7	18.5
11	322	-	3211, 3212	8	20.5
12	131	-	-	9	22.5
13	132	-	-	-	24.5
14	232	-	2321, 3111	-	26.5
15	111	9	-	-	28.5
PERIOD 2:					
16	321	-	1211	7, 11	30.5
17	133	-	1211	9, 10	32.5
18	211	-	-	-	34.5
19	112	-	1211	-	36.5
20	213	-	1321	-	38.5
21	221	-	1321	-	40.5
22	222	-	1321	-	42.5
23	122	13	-	15, 18	44.5
24	231	14	-	-	46.5
25	211	14	-	-	48.5
26	311	-	3221, 3222	14	50.5
27	121	-	3221, 3222	16, 17, 19	52.5
28	111	-	3221, 3222	-	54.5
29	132	-	3221, 3222	20, 21, 22	56.5
30	232	-	3221, 3222	14	58.5
31	111	-	3221, 3222	-	60.5
PERIOD 3:					
32	211	18	-	-	62.5
33	411	19	2231, 2232	-	64.5
34	112	-	1221	-	66.5
35	322	-	1211, 1331, 2231, 2232	26, 27, 28, 29, 30, 31	68.5
36	121	-	1111	35	70.5
37	133	-	1111	35	72.5
38	223	-	-	33, 35	74.5



TIME (in real minutes of simulation time)

Figure A. Time-event matrix for sample participant "Complex Test" (adapted from Unger and Swezey, 1983).

Number of respondent decisions (Measure 2) is the total number of decisions executed within a simulation period based on a previous message. To score a respondent decision, a participant must:

- Execute a decision
- Report that the decision was based on a previous message or messages

If one decision was based on two messages, then two respondent decisions are scored for that one decision, and so forth. Thus, the number of respondent decisions may exceed the total number of decisions.

From Table A, we see that five respondent decisions were executed in period 1 (with category numbers 111, 112, 322, 131, and 111). We calculate this by counting the number of decisions reported to be based on a message, counting each decision once for as many messages on which it is based. Table A shows three respondent decisions in period 2, and two in period 3.

Also for Measure 2, the printout gives the proportion of respondent to total decisions; in this case, 5/15 or 33% for period 1, 3/16 or 18% for period 2, and 2/7 or 28% for period 3.

Number of decision categories (Measure 3) is the total number of decision categories used within a simulation period. As described thoroughly in the body of the report, a decision category is the first three digits of a decision code, or a decision choice sequence through the first three choice options. Decisions coded 1211 and 1213 are in the same category (121), but decisions coded 1211 and 1221 are in different categories. The decision category of each executed decision is scored only once no matter how often it is selected within a period.

From Table A, we see the decision categories selected in order in period 1 are: 111, 112, 321, 121, 122, 112 (already selected), 322, 322 (already selected), 131, 212, 322 (already selected), 131 (already selected), 132, 232, and 111 (already selected) for a total of 10 categories used in period 1.

The 14 categories in period 2 are scored for each decision except decision numbers 25 and 31 whose categories were already scored.

Each decision in period 3 fell in a different category for a total of seven.

Number of forward integrations (Measure 4) is the total number of forward integrations originating within a period. The integrations may be completed within the period of origination or in a later period. To score a forward integration, a participant must:

- Execute a decision
- Plan a future decision in another decision category
- Execute the planned decision (or any decision in the same category as the planned decision)
- Report that the planned decision was based on the previous decision

To calculate number of forward integrations from Table A, we start at decision 1, code 111. At the time of execution, decision 112 (in a different category from 111) was planned. Later, at decision 2, 112 was executed, and the participant reported that decision 112 was based on previous decision 1 (which is decision 111). Thus, the forward integration is complete.

From Table A, we count the following forward integrations: decision 1 to 2, 2 to 3, 3 to 4, 3 to 7, 4 to 7, 5 to 7 (7 to 8 does not count because both are in the same category), 7 to 9, 7 to 10, 7 to 16, (8 to 11 does not count because they are in the same category; 9 to 12 is also within a category), 9 to 17, 10 to 17, 11 to 16, and 14 to 26 (14 to 30 is within a category).

It is easy to count forward integrations from Figure A. Simply count the diagonals with a forward arrow. (Horizontal lines do not count because they connect within category decisions). Using Figure A, the 12 forward integrations in period 2 are 17 to 27, 16 to 27, 19 to 27, 20 to 29,

21 to 29, 22 to 29, 26 to 35, 30 to 35, 27 to 35, 29 to 35, 28 to 35, and 31 to 35. In period 3, the four forward integrations are 35 to 36, 35 to 37, 35 to 38, and 33 to 38.

Also for this measure, the printout includes the proportion of forward integrations to total decisions. For period 1, this ratio is 13/15 or 86%; for period 2, 12/16 or 75%; for period 3, 4/7 or 57%.

Multiplexity F (Measure 5) is the sum of the count of each forward integration scored within a period, plus all forward integrations originating and ending in the endpoint of each forward integration, plus all forward integrations originating (not ending) in the endpoint of subsequent, directly connected integrations leading to the end of the simulation.

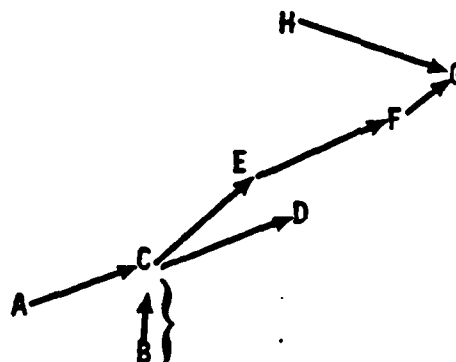
Multiplexity F reflects future planning. As any one integration leads to other integrations, multiplexity increases. Three sample calculations follow.

The sample below appeared in the body of the report and is repeated here for reader convenience. The sample below diagrams seven connected forward integrations (indicated by the arrow at the end of the diagonals). For example, decision C was planned at decisions A and B, and when C was executed, it was reported based on A and B.

Category

111
121
123
131
132
211
222
223

Time →



We will use this diagram to explain the calculation of Multiplexity F for integration BC.

$$BC+AC+CD+CE+EF+FG = 6$$

HG does not count because it ends, not begins, at the endpoint of the forward integration FG, which is not the integration of interest. AC counts because, for the integration of interest, BC, all integrations connected to its endpoint are connected. If all seven integrations were scored in one period, the total for the period would be the sum of the values for each integration.

To calculate Multiplexity F for period 3 in the sample, refer to the time event matrix (Figure A) and to Table B.

Period 2 of the sample provides a more complex example. See Table C.

Weight or integration time weight (Measure 6) is the sum of the time elapsed from initial to endpoint decision for each forward integration scored in a period. Time in this measure is real minutes of simulation time. For example, if time from original decision A to planned and executed endpoint decision C is three minutes, and from decision B to planned decision D is five minutes, the weight is eight minutes (even if AC and BD overlap in time). Backward integrations (see Measure 7) are not counted in this measure.

Weight may be easily calculated using the data in Table A. For period 1, weight for the 13 forward integrations credited to period 1 is calculated in Table D.

Number of backward integrations (Measure 7) is the total number of backward integrations originating in a period. The backward integration may or may not end in the same period. To score a backward integration, the participant must:

- Enter a decision A (endpoint decision)
- Not enter plans to execute decision B

TABLE B
MULTIPLEXITY F CALCULATION FOR PERIOD 3
FOR SAMPLE PARTICIPANT "COMPLEX TEST"

FORWARD INTEGRATIONS SCORED IN PERIOD 3	ALL FORWARD INTEGRATIONS DIRECTLY CONNECTED TO THE ENDPOINT	FORWARD INTEGRATIONS ORIGINATING AT THE ENDPOINT OF SUBSEQUENT CONNECTED INTEGRATIONS	CALCULATIONS
35-36	-	-	1
35-37	-	-	1
35-38	33-38	-	2
33-38	35-38	-	2
			TOTAL = $\overline{6}$

TABLE C
MULTIPLEXITY F CALCULATION FOR PERIOD 2
FOR SAMPLE PARTICIPANT "COMPLEX TEST"

FORWARD INTEGRATIONS SCORED IN PERIOD 2	ALL FORWARD INTEGRATIONS DIRECTLY CONNECTED TO THE ENDPOINT			FORWARD INTEGRATIONS ORIGINATING AT THE ENDPOINT OF SUBSEQUENT CONNECTED INTEGRATIONS			CALCULATIONS
17-27	16-27	19-27	27-35	35-36	35-37	35-38	7
16-27	17-27	19-27	27-35	35-36	35-37	35-38	7
19-27	16-27	17-27	27-35	35-36	35-37	35-38	7
20-29	21-29	22-29	29-35	35-36	35-37	35-38	7
21-29	20-39	22-29	29-35	35-36	35-37	35-38	7
22-29	20-29	21-29	29-35	35-36	35-37	35-38	7
26-35	30-35	27-35	29-35		-		
	28-35	31-35	35-36				
	35-37	35-38					9
30-35	26-35	27-35	29-35		-		
	28-35	31-35	35-36				
	35-37	35-38					9
27-35	26-35	30-35	29-35		-		
	28-35	31-35	35-36				
	35-37	35-38					9
29-35	26-35	30-35	27-35		-		
	28-35	31-35	35-36				
	35-37	35-38					9
28-35	26-35	30-35	27-35		-		
	29-35	31-35	35-36				
	35-37	35-38					9
31-35	26-35	30-35	27-35		-		
	29-35	28-35	35-36				
	35-37	35-38					
TOTAL = $\frac{9}{96}$							

TABLE D
INTEGRATION TIME WEIGHT CALCULATIONS
FOR PERIOD 1 FOR SAMPLE
PARTICIPANT "COMPLEX TEST"

FORWARD INTEGRATIONS IN PERIOD 1		TIME OF EXECUTION*		TIME ELAPSED IN REAL MINUTES OF SIMULATION TIME
<u>Origin Decision</u>	<u>Endpoint Decision</u>	<u>Origin Decision</u>	<u>Endpoint Decision</u>	
1	2	.5	2.5	2
2	3	2.5	4.5	2
3	4	4.5	6.5	2
3	7	4.5	12.5	8
4	7	6.5	12.5	6
5	7	8.5	12.5	4
7	9	12.5	16.5	4
7	10	12.5	18.5	6
7	16	12.5	30.5	18
11	16	20.5	30.5	10
9	17	16.5	32.5	16
10	17	18.5	32.5	14
14	26	26.5	50.5	24
				$\Sigma = 116$

*All execution times in this sample happen to fall on even minutes and at half minutes; however, the computer registers execution times at any tenth of any minute. (From Unger and Swezey, 1983)

- Execute decision B (the origin decision) in a different category from decision A
- Report that decision B was based in part on decision A

Note that backward integrations, unlike forward integrations, originate at a time later than their endpoints. Both forward and backward integrations, however, are credited to the period during which they originated.

It is easier to calculate backward integrations from the time-event matrix in Figure A than from Table A. On the matrix, a backward integration is a diagonal with a backward arrow pointing to the endpoint. There are no backward integrations in periods 1 and 3 of the sample. Period 2 has two backward integrations, 23 to 15 and 23 to 18.

Unintegrated respondent decisions (Measure 8) is the total number of unintegrated respondent decisions within a period. An unintegrated respondent decision occurs in response to a message, but may not originate a forward integration. An unintegrated respondent decision may, however, be part of a backward integration, or the endpoint of a forward integration, and it may lead to another decision in the same category. Unintegrated respondent decisions are a special case of respondent decisions because general respondent decisions may be any part of an integration. To score an unintegrated respondent decision, a participant must:

- Execute decision A (A may be planned or not planned)
- Report that decision A was based on a previous message

AND EITHER

- At the time decision A is executed, not report a decision plan in a different category

OR

- Report a decision plan in a different category, execute the plan, but not report it based on decision A

In order to calculate number of unintegrated respondent decisions we need more information than is shown on the time-event matrix, so we use Table A. We will first find all the respondent decisions, then test to see if they originate forward integrations which will exclude them from being "unintegrated."

For period 1, the respondent decisions are 1, 2, 8, 9, and 15. Decisions 1 and 2 originate forward integrations so they are not unintegrated. Decision 8 leads only to a decision in its own category so it is unintegrated. Decision 9 originates a forward integration. Decision 15 does not originate a forward integration and is unintegrated. Thus, Decisions 8 and 15 are the only two unintegrated respondent decisions in period 1.

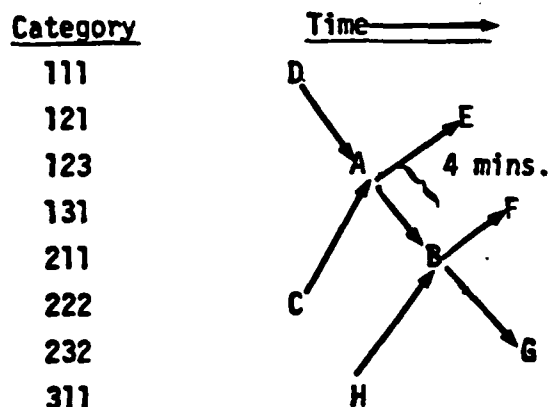
For period 2, the respondent decisions are numbers 23, 24, and 25. None of them originates a forward integration and are all unintegrated according to the use of the word unintegrated in this measure. Decision 23 originates two backward integrations, but still counts as unintegrated.

For period 3, the respondent decisions are 32 and 33. Decision 33 originates a forward integration; 32 is an unintegrated respondent decision.

QIS or quality of integrated strategies (Measure 9) is the sum of, for each forward integration scored in a period, the time weight for that integration multiplied by the sum of the number of forward integrations originating and ending at the origin and endpoint of the forward integration plus one for that forward integration.

QIS may be thought of as reflecting the complexity of plans at any point. Where plans are connected in a strategy, QIS is high. The QIS score is low where integrations are not connected. QIS also increases with the time interval from origin to endpoint of integration. Two samples of QIS calculations follow.

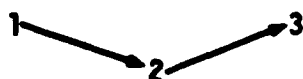
The sample below was used in the body of the report. If vector AB is a forward integration, and forward integration vectors CA and DA end at decision A in AB, and AE originates at A in AB, and forward integration vectors BF and BG originate at B in AB, and HB ends at B in AB, and the time elapsed from A to B is four minutes, the QIS score is four (the time weight) multiplied by the sum one for AB plus three for CA, DA, and AE, plus three for BF, BG, and HB, or 4(7) or 28.



Period 3 of the sample provides a more complex example of the QIS calculation. To calculate QIS for period 3 in the sample, refer to the time-event matrix and Table E.

Weighted QIS (Measure 10) is the sum of each forward integration scored in a period, plus all forward integrations originating and ending at both ends of the forward integration, plus all forward integrations originating (not ending) in the endpoint of subsequent, directly connected integrations until the end of the simulation, plus all forward integrations ending (not originating) in the origin of previous directly connected integrations until the beginning of the simulation, multiplied by the time weight.

Weighted QIS and QIS are equal when the strategy employed links only three or two decisions together; that is, one forward integration linked to one other forward integration, or just one forward integration not connected to any other integration.



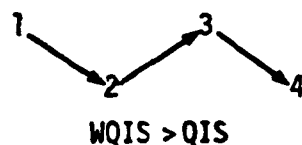
QIS = WQIS

TABLE E

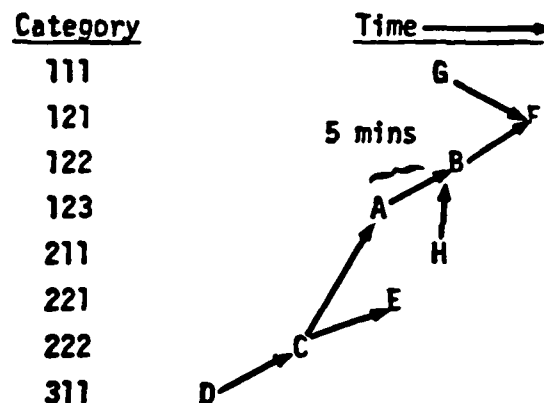
CALCULATION OF QIS FOR PERIOD 3
USING SAMPLE PARTICIPANT "COMPLEX TEST"

FORWARD INTEGRATIONS SCORED IN PERIOD 3		FORWARD INTEGRATIONS CONNECTING TO AND FROM ORIGIN DECISION	FORWARD INTEGRATIONS CONNECTING TO AND FROM ENDPOINT DECISION	TIME WEIGHT	CALCULATION Weight(1 + integrations around origin + integrations around endpoint)
Origin Decision	Endpoint Decision				
33	- 38	-	35-38	10	$10(1 + 0 + 1) = 20$
35	- 36	26-35 30-35 27-35 29-35 28-35 31-35 35-37 35-38	-	2	$2(1 + 8 + 0) = 18$
35	- 37	26-35 30-35 27-35 29-35 28-35 31-35 35-36 35-38	-	4	$4(1 + 8 + 0) = 36$
35	- 38	26-35 30-35 27-35 29-35 28-35 31-35 35-36 35-37	33-38	6	$6(1 + 8 + 1) = 60$ <u>134</u>

However, if four decisions or three forward integrations are linked, weighted QIS increases over QIS because weighted QIS considers all forward integrations linked from beginning to end of simulation, and QIS considers only those directly adjoined to any one forward integration:



Two sample calculations follow. The first example was used in the body of the report. Refer to the diagram below.



If vector AB is a forward integration, and forward integration CA connects to A in AB, and DC connects to C in CA, and CE connects to C in CA, and BF and HB connect to B in BA, and GF connects to F in BF, and time elapsed from A to B is five minutes, the weighted QIS score is five multiplied by the sum of one for AB plus one each for CA and DC (not CE which originates not ends in DC and CA), plus one each for HB and BF (not GF which ends not originates in BF), or $5(5) = 25$. Weighted QIS is not QIS multiplied by the integration time weight as the name might imply. It is QIS (which already includes time weight) weighted with integrations distally connected to a target integration.

[The QIS score for the above sample would be five times (1 for AB + 1 for CA + 1 for BF + 1 for HB) = $5(4) = 20$. The Multiplexity F for the sample would be one for AB plus one for HB plus one for BF or three. Multiplexity F is essentially the forward half of WQIS minus the time weight.]

WQIS for period 3 of the sample provides a more complex example. Refer to the time-event matrix in Figure A and Table F.

Average response speed (Measure 11) is the average time (in real minutes of simulation time) elapsed between receipt of a message and subsequent execution of a respondent decision. (Recall that a respondent decision is one the participant reports was based on a previous message. See Measure 2.) The calculation is based on every respondent decision within a period.

To calculate average response speed for period 1 in the sample, refer to Table A and Table G.

Number of serial connections (Measure 12) is the number of serial connections scored in one period. A serial connection would be identical to an integration (see Measures 4 and 7) except that decisions connected serially fall in the same decision category, whereas integrated decisions fall in different decision categories.

A serial connection may be either forward or backward; this measure includes both types. To score a serial connection, the participant must:

- Execute decision A
- Plan decision B in the same category
- Report that decision B was based on decision A

OR

- Execute decision A

TABLE F
CALCULATION OF MQIS FOR PERIOD 3 OF SAMPLE PARTICIPANT "COMPLEX TEST"

FORWARD INTEGRATIONS SCORED IN PERIOD 3	ALL FORWARD INTEGRATIONS DIRECTLY CONNECTED TO BOTH ENDS OF THE FORWARD INTEGRATION OF INTEREST	CONNECTED FORWARD INTEGRATIONS LEADING TO THE END OF THE SIMULATION	CONNECTED FORWARD INTEGRATIONS LEADING TO THE BEGINNING OF THE SIMULATION	TIME WEIGHT (SUM OF EACH OF THE FOUR COLUMNS)	CALCULATION
33-38	35-38	-	31-35 28-35 29-35 27-35 30-35 26-35 * 14-26 ** 22-29 21-29 20-29 19-27 17-27 16-27 9-17 10-17 7-9 7-10 *** 11-16 7-16 **** 5-7 4-7 3-4 3-7 2-3 1-2		10(1+1+0+25) = 270
35-36	35-38 35-37 31-35 28-35 29-35 27-35 30-35 26-35	-	14-26 ** 22-29 21-29 20-29 19-27 17-27 16-27 9-17 10-17 7-9 7-10 *** 11-16 7-16 **** 5-7 4-7 3-4 3-7 2-3 1-2		2(1+8+0+19) = 56
35-37	35-38 35-36 31-35 28-35 29-35 27-35 30-35 26-35	-	14-26 ** 22-29 21-29 20-29 19-27 17-27 16-27 9-17 10-17 7-9 7-10 *** 11-16 7-16 **** 5-7 4-7 3-4 3-7 2-3 1-2		4(1+8+0+19) = 112
35-38	33-38 35-37 35-36 31-35 28-35 29-35 27-35 30-35 26-35	-	14-26 ** 22-29 21-29 20-29 19-27 17-27 16-27 9-17 10-17 7-9 7-10 *** 11-16 7-16 **** 5-7 4-7 3-4 3-7 2-3 1-2		6(1+9+0+19) = 174 TOTAL = 612

*35-36 and 35-37 do not count because they connect origin to origin
 **14-30 is a serial connection, not an integration
 ***9-12 does not count because (a) it is an origin-origin connection and (b) it is serial
 ****7-8 and 8-11 are serial connections

TABLE G
AVERAGE RESPONSE SPEED CALCULATION
FOR PERIOD 1 FOR SAMPLE
PARTICIPANT "COMPLEX TEST"
(from Unger and Swezey, 1983)

<u>RESPONDENT DECISION</u>	<u>TIME MESSAGE DELIVERED*</u>	<u>TIME RESPONDENT DECISION EXECUTED</u>	<u>RESPONSE SPEED</u>
1	0	.5	.5
2	0	2.5	2.5
8	12	14.5	2.5
9	12	16.5	4.5
15	24	28.5	4.5
			Σ 14.5
			$\bar{x} = 2.9$

*Messages in period 1 appeared every three real minutes of simulation time.

- Not plan decision B
- Execute decision B in the same category as decision A
- Report that decision B was based on decision A

A serial connection in a forward direction is credited to the period of the origin decision even if the endpoint occurs in a different period. A serial connection in a backward direction is also credited to the period of the origin decision, but in this type of connection, the origin decision occurs after the endpoint decision because the endpoint is designated only retrospectively.

We can count serial connections in period 1 of the sample by counting the horizontal (not diagonal) lines with forward or backward arrows in the time-event matrix (Figure A). The serial connections are decisions 7 to 8, 8 to 11, 9 to 12, and 14 to 30. There are no serial connections in periods 2 and 3.

Planned integrations (Measure 13) is the number of forward integrations planned but not executed any time before the end of the simulation. If the integration is accomplished at any time, even in a later period than the origin decision, it is considered an executed integration. Planned but not executed integrations are credited to the period in which the origin decision was entered. The planned decision must be in a different decision category from the origin decision category. To score a planned but not executed integration, the participant must:

- Execute decision A
- Plan decision B in another category

AND EITHER

- Not execute decision B

OR

- Execute decision B (or any decision in B category) but not report that decision B was based on decision A

To calculate planned but not executed integrations, refer to Table A. In period 1, when decision 1 was executed, decision 1121 was planned, in a different category from origin decision 1111. Decision 1121 was executed (decision 2) and it was reported based on decision 1. Thus, the integration was executed and does not count in this measure. We check each planned decision in this way to see if it was executed. At decision 10 (212), we see that decisions 1331, 2211, and 2212 were planned. Decision 1331 was executed in period 2 (decision 17), reported based on decision 10 and, thus, the integration was accomplished. Decision 2211 (planned at decision 212 and in a different category) was executed in period 2 (decision 21) but was not reported based on decision 10; therefore, one planned but not executed integration is scored. Planned decision 2212 was never executed, but is not scored as such because it is in the same category as planned but not executed decision 2211 mentioned above.

Period 2 contains no planned but not executed integrations. Decision 1211 was planned three times, executed at decision 27, and reported based on the appropriate decisions, so three integrations scored. Decision 1321 was planned but also executed three times. The 12 plans at decisions 26 through 31 are all in the same 322 category, and when decision 3221 (decision 35) was executed it was reported based on decisions 26, 27, 28, 29, 30, and 31. Thus, six more integrations scored in period 2 (easy to see on the time-event matrix).

Period 3 contains three planned but not executed integrations: 1221, 1111, and 1111.

General unintegrated decisions (Measure 14) is the number of general unintegrated decisions within a period. A general unintegrated decision is a decision which is not part of a forward or backward integration. It may be part of a serial connection, or it may be respondent, or planned but not executed, or planned, executed, but not reported based on the previous decision, or isolated completely. Unintegrated respondent decisions and planned but not executed integrations are subsets (may be overlapping) of general unintegrated decisions.

General unintegrated decisions are easy to spot on the time-event matrix. In period 1, decisions 6 and 13 stand alone; 8 and 12 are part of serial connections not integrations. Every other decision in period 1 is part of an integration. In periods 2 and 3, decisions 24, 25, 32, and 34 stand alone. Every other decision is part of an integration.