ARMY RESEARCH LABORATORY

Cognitive Uncertainty and Work Shifts in a Real-World Multi-task Environment

by Keryl A. Cosenzo, Linda T. Fatkin, and Teresa A. Branscome

ARL-TR-3515 May 2005

Approved for public release; distribution is unlimited.

NOTICES

Disclaimers

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

DESTRUCTION NOTICE—Destroy this report when it is no longer needed. Do not return it to the originator.

Army Research Laboratory
Aberdeen Proving Ground, MD 21005-5425

ARL-TR-3515 **May 2005**

Cognitive Uncertainty and Work Shifts in a Real-World Multi-task Environment

Keryl A. Cosenzo, Linda T. Fatkin, and Teresa A. Branscome
Human Research and Engineering Directorate, ARL

Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED (From - To)
May 2005		

4. TITLE AND SUBTITLE

Cognitive Uncertainty and Work Shifts in a Real-World Multi-task Environment

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Keryl A. Cosenzo, Linda T. Fatkin, and Teresa A. Branscome (all of ARL)

5d. PROJECT NUMBER
62716AH70

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Army Research Laboratory
Human Research and Engineering Directorate
Aberdeen Proving Ground, MD 21005-5425

8. PERFORMING ORGANIZATION REPORT NUMBER

ARL-TR-3515

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The U.S. Army Future Force will require Soldiers to have multiple responsibilities in an information-rich environment. In these environments, Soldiers must attain a state of cognitive readiness that will enable them to perform all tasks with equal success. The ability to make rapid and effective decisions is difficult to do, but this difficulty is increased by the fact that the environment is fraught with uncertainty. It is important to develop tools that assess the cognitive capabilities of the Soldier to perform effectively in uncertain situations so that capabilities of the Soldier meet the performance requirements of the Future Force. Traditionally, uncertainty has been examined at the data or situation level. The authors propose that a new approach be used when one is examining the effects of uncertainty on decision making by focusing on understanding how individuals assess situations and make decisions in addition to understanding the impact of situational elements.

Various metrics were identified that assessed the cognitive processes used by individuals to make decisions. One objective of this study was to assess the utility of those metrics for predicting performance in a multi-task environment. The second objective was to examine the effect of work shifts and cognitive uncertainty on performance in the same environment.

Data were collected at an emergency operations center (EOC) because it is a realistic multi-task environment and the flow of information in an EOC is similar to that in a tactical operations center. Nineteen EOC operators completed a battery of stress and uncertainty questionnaires. The performance measure was the time required for the operator to complete an emergency call. Results showed that individual differences in coping with uncertainty were related to call time. Information gathered from this study will be used in subsequent research endeavors aimed at understanding of the determinants of cognitive processes during conditions of uncertainty.

15. SUBJECT TERMS

cognitive uncertainty; decision making; multi-task

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Keryl A. Cosenzo
Unclassified	Unclassified	Unclassified	SAR	75	19b. TELEPHONE NUMBER (*Include area code*) 410-278-2946

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

Contents

List of Figures v

List of Tables v

1. Introduction 1

1.1 Background 1

1.2 Response to Uncertainty....1

1.3 Work Shift and Performance....4

1.4 Hypotheses 5

1.4.1 Hypothesis I....5

1.4.2 Hypothesis II 6

1.4.3 Hypothesis III....6

2. Methodology 6

2.1 Participants....6

2.2 Instrumentation....6

2.2.1 Demographics Measure....6

2.2.2 Psychological Trait Measures 7

2.2.3 Psychological State Measures 8

2.3 Procedure....9

2.4 Experimental Design 9

3. Results 10

3.1 Performance - Time to Complete a Call....10

3.1.1 NCS and AACS....11

3.1.2 URS: EU, DC, and CU....13

3.2 Personality Trait Measures....15

3.2.1 Impulsivity-Sensation Seeking....15

3.2.2 Neuroticism-Anxiety....16

3.2.3 Sociability....16

3.2.4 Uncertainty Characteristics 16

3.3 Sleepiness and SSE 16

3.4 Stress Perceptions and SSE....16

3.4.1 Situational Self-Efficacy 17

3.4.2 MAACL-R State....18
3.4.3 MAACL-R State, Positive Affect Comparative Data....19
4. Discussion 20
4.1 Performance - Time to Complete a Call....20
4.2 Personality Traits and Measures of Uncertainty....22
4.3 Situational Self-Efficacy....23
4.4 General Conclusions....23
4.5 Limitations and Future Directions....24
5. References 25
Appendix A. Demographics Questionnaire 29
Appendix B. Multiple Affect Adjective Checklist - Revised 31
Appendix C. Zuckerman-Kuhlman Personality Questionnaire 33
Appendix D. The Need for Cognitive Structure Scale 39
Appendix E. The Ability to Achieve Cognitive Structure Scale 43
Appendix F. The Uncertainty Response Scale 47
Appendix G. Daily Log 55
Appendix H. Volunteer Agreement Affidavit 57
Appendix I. Categorization Questionnaire 61
Appendix J. Call Categories 63
Appendix K. Table of Means and Standard Error of the Mean 65
Distribution List 67

List of Figures

Figure 1. Mean call times (seconds) of emergency (victim related) calls for NCS and AACS groups. 11
Figure 2. Mean call times (seconds) of police calls for NCS and AACS groups. 12
Figure 3. Mean call times (seconds) of fire calls for NCS and AACS groups. 12
Figure 4. Mean call times (seconds) of emergency (victim related) calls for groups from the URS subscales. 13
Figure 5. Mean call times (seconds) of police calls for groups from the URS subscales. 14
Figure 6. Mean call times (seconds) of fire calls for groups from the URS subscales. 14
Figure 7. Mean SSE levels for NCS and AACS groups. 17
Figure 8. Mean SSE levels for groups from the uncertainty response subscales. 18
Figure 9. Mean MAACL-R positive affect scores for NCS and AACS groups. 18
Figure 10. Mean MAACL-R positive affect scores for groups from the uncertainty response subscales 19
Figure 11. Comparative data chart of MAACL-R positive affect levels (means) of EOC personnel with the following groups: (1) spouses of patients undergoing oncology surgery; (2) medical students taking a critical exam; (3) Soldiers participating in a marksmanship competition; (4) military personnel participating in chemical decontamination training; (5) soldiers performing during a 52-hour sustained operations field exercise; (6) inexperienced military fire fighters; (7) Army recruiters; and (8) an independent control group of males during a routine day. 20

List of Tables

Table 1. Characteristics of the combinations of NCS and AACS levels 3
Table 2. Definitions of NCS and AACS constructs. 11
Table 3. Definitions of URS constructs. 13
Table 4. Correlations between cognitive uncertainty and ZKPQ personality traits. 15
Table 5. Correlations between cognitive uncertainty and MAACL-R personality traits. 15

INTENTIONALLY LEFT BLANK

1. Introduction

1.1 Background

The U.S. Army Future Force requires Soldiers to have multiple responsibilities in an information-rich environment. In these environments, Soldiers must attain a state of cognitive readiness that will enable them to perform all tasks with equal success. Cognitive readiness is defined as the optimization and enhancement of human cognitive performance (Foster, 2001). It is an enhanced state of mental acuity, that is, the ability of the Soldier to meet the expected cognitive demands of a situation.

In support of the Command and Control (C2) in Complex and Urban Terrain Army Technology Objective, the cognitive readiness team is identifying various metrics that may be used to predict combat effectiveness in uncertain situations. We are also examining stress resiliency factors that may be necessary for Soldiers to adapt to changing and uncertain circumstances. A related effort in team decision making is being conducted within the U.S. Army Research Laboratory's (ARL's) Advanced Decision Architecture Collaborative Technology Alliance (ADA-CTA). One goal of the ADA-CTA (technical area 2) is to develop tools to aid in collaborative decision making within all types of military operations. Part of the work required to develop these tools is to first understand how individuals and teams make decisions and assess situations. It is important to develop tools that assess the Soldier's cognitive capabilities to perform effectively in uncertain situations so that his/her capabilities meet the performance requirements of the Future Force.

1.2 Response to Uncertainty

Uncertainty in decision making may be attributable to insufficient information regarding the choices or consequences of each choice (Bar-Tal, 1994). Uncertainty is an inevitable component of any military operation. At any given time, most of what is known is only partially understood (John, Callan, Proctor, & Holste, 2000).

> While we try to reduce theses unknowns by gathering information, we must realize that we cannot eliminate them. The very nature of war makes absolute certainty impossible; all actions in war will be based on incomplete, inaccurate, or even contradictory information (United States Marine Corps, 1997).

Even though uncertainty cannot be eliminated from military operations, researchers can examine the effects of uncertainty on decision making and how these effects can be minimized (John et al., 2000). Research by Bar-Tal and colleagues (e.g., Bar-Tal, 1994; Bar-Tal & Spitzer, 1999) has shown that there are individual differences in how decisions are made in conditions of uncertainty. In uncertain situations, some individuals may rely on the first-derived solution or on past experiences. Others may go through a process of hypothesis generation and validation.

According to Bar-Tal (1994), there are two factors that determine how an individual will cope with uncertainty and conflictual decision making: the Need for Cognitive Structure (NCS) and the Ability to Achieve Cognitive Structure (AACS). Cognitive structuring is defined as the creation and use of abstract mental representations, such as schemas, scripts, and stereotypes, which are simplified generalizations of previous experiences (Neuberg & Newson, 1993). The NCS is defined as the desire for clear and firm knowledge regarding a topic, as opposed to ambiguity; it is the extent to which individuals prefer to use cognitive structuring (Bar-Tal, 1994). The AACS is the ability to apply the information processes that are consistent with an individual's level of NCS; it is the extent to which an individual is able to avoid information that does not match his/her existing knowledge structures. The process of cognitive structuring facilitates certainty by eliminating inconsistent or irrelevant information (Fiske & Linville, 1980).

Levels of NCS and AACS affect how an individual perceives a situation and how much time is spent making the decision. For example, Bar-Tal (1994) showed that individuals with high NCS and low AACS preferred to use cognitive structuring but were least able to achieve certainty. As a result, they took the longest time to make the decision. Individuals with high NCS and high AACS preferred to use cognitive structuring, were able to achieve it, and as a result, spent the least amount of time making the decision. High NCS individuals prefer to reduce uncertainty by using effortless, category-based processes (Bar-Tal & Spitzer, 1999). Low NCS individuals prefer to reduce uncertainty by using effortful, systematic evaluative processes. In this evaluative process, a cognitive structure has to be created for each situation. It is calibrated on the basis of available information, and the adequacy of the structure is then examined against the information available (Bar-Tal, Kishon-Rabin, & Tabak, 1997). The process of hypothesis validation and alternative hypothesis generation is time consuming and results in longer decision times during conditions of uncertainty.

Hancock and Mortimer (2002) suggest that in stressful conditions, individuals are more likely than in non-stressful conditions to make decisions based on past experiences and to ignore contrary information, which can lead to disastrous consequences. Bar-Tal, Raviv, and Spitzer (1999) suggest that NCS and AACS may moderate the effects of stress on decision making. Table 1 shows characteristics of the combinations of levels of NCS and AACS on stress and decision making. For example, Bar-Tal and colleagues (1999) showed that stress in the form of increased task difficulty and cognitive load decreased the difficultly of making a decision for individuals with high NCS and high AACS. However, stress increased the difficulty of making a decision for individuals with high NCS and low AACS. As stress increased, high NCS and high AACS individuals increased their use of cognitive structuring. In contrast, as stress increased, high NCS and low AACS individuals decreased their use of cognitive structuring and used more effortful information processing to make decisions. In general, under stress, individuals tend to use information-processing strategies that are in accordance with their level of NCS and AACS.

If stress is too high, the individuals' response may be maladaptive and, in turn, may prevent the use of preferred strategies.

Table 1. Characteristics of the combinations of NCS and AACS levels

	NCS	
AACS	**Low**	**High**
Low	Low Piecemeal Processing Effortless Processing High Certainty Low Stress Dysfunctional Impulsivity	Low Cognitive Structuring Effortful Processing High Uncertainty Very High Stress Vigilance
High	High Piecemeal Processing Effortful Processing Low Certainty High Stress Hypervigilance	High Cognitive Structuring Effortless Processing High Certainty Low Stress Functional Impulsivity

Adapted from Bar-Tal, Kishon-Rabin, and Tabak (1997)

Greco and Roger (2001) suggest that tolerance of uncertainty has both a cognitive and an emotional component. These authors developed the Uncertainty Response scale (URS) to assess styles of coping with uncertainty. This scale focuses on individual differences in the perceived stressfulness of uncertainty. The URS assesses coping on three levels: Emotional Uncertainty (EU), Desire for Control (DC), and Cognitive Uncertainty (CU). The CU subscale of the URS is similar to the NCS and AACS scales developed by Bar-Tal (1994). CU is the degree to which an individual prefers order, planning, and structure in an uncertain environment. The URS (Greco & Roger, 2001) has an emotional dimension of coping not addressed by Bar-Tal and colleagues' measures. EU is the degree to which an individual responds to uncertainty with anxiety and sadness (i.e., maladaptive behaviors). DC is the degree to which an individual enjoys novelty, uncertainty, and change. Greco and Roger (2003) showed that the EU predicted stress responses (i.e., increased blood pressure). According to Greco and Roger, personality factors moderate an individual's response to uncertainty. Preliminary studies have shown that the scores on the URS are highly correlated with individual personality differences. For example, EU was correlated with neuroticism and anxiety (Greco & Roger, 2001, 2003). DC was correlated with extra-version and impulsivity. CU was negatively correlated with tolerance of ambiguity. No other studies have been published to date that have used the URS.

In summary, previous literature has shown that there are individual differences in how people cope with uncertainty, which in turn impacts performance (i.e., decision making). According to Bar-Tal and others (e.g., Bar-Tal, 1994; Bar-Tal & Spitzer 1999), NCS and AACS are two factors that determine how individuals cope with uncertainty and conflictual decision making. Greco and Roger (2001) expand this cognitive based coping structure by including EU and DC.

The first objective of this study was to assess the utility of Bar-Tal's and Greco and Roger's metrics for predicting performance in a multi-task environment.

The Harford County Emergency Operations Center (EOC) provided researchers with a realistic multi-task environment in which to assess these new metrics. The flow of information in an EOC is similar to that in a tactical operations center (TOC). In a typical TOC, Soldiers are required to perform many complex and often stressful duties. They must be able to handle incoming calls, transfer information from one source to another, coordinate multiple units or staff members, comply with information requests, and process reports (Wojciechowski, Kilduff, & Plott, 2001). Message traffic and information flow in a TOC mirror that of an EOC. An incoming message is received and acknowledged. Once that message has been acknowledged, it is then compared to information that is currently known. Depending on the type of information received, a decision must be made regarding the appropriate course of action, and the action is then executed.

Dispatchers in an EOC perform duties that closely resemble those of a Soldier working in a TOC. The role of a dispatcher is to handle incoming calls, transfer the call, and coordinate units (Burke, 1995). Individuals working in an EOC and a TOC often experience stressors unique to their positions, including high workload, divided attention, and a high level of responsibility.

Decision making in both environments lends itself to high degrees of uncertainty (Joslyn & Hunt, 1998). Very rarely are split-second decisions made on the basis of all available information and with all the alternatives considered. Usually, a situation is classified by alternatives based on a set of rules or memories of past situations. Consequently, the decision maker is often forced to revisit a situation and second guess an interpretation or course of action. Decision makers are also responsible for allocating their own limited cognitive resources and material resources. Often in these environments, there is more information available than can be processed at one time. In addition, time is a critical factor. The longer it takes an individual to make a decision, the more the benefit derived from that decision decreases.

1.3 Work Shift and Performance

In addition to the stress from uncertainty, decision making under pressure, and high workload, individuals in the EOC also work various shifts. The second objective of this study was to examine the moderating role of individual personality differences, such as coping with uncertainty, on performance during various shifts. Performance is defined as how long it takes an individual to complete a call (i.e., make a decision and enact that decision). Eighteen percent of full time U.S. workers are involved in shift work (Della Rocco, 1999). Further, the United States military completes many military operations during night-time hours. Night-time work requires wakefulness during a period when the physiological systems dictate sleep. As a result, night-time work is associated with increased errors and accidents. For example, Della Rocco, Cruz, and Clemens (1995) showed that air traffic controllers who worked the midnight shift, when air traffic levels were low, reported a decrease in alertness and made more computer entry

and flight progress maintenance errors relative to those on the day shifts, when air traffic levels were high. Reports of fatigue are not limited to late shifts. Gregory, Oyung, and Rosekind (1999) reported that two-thirds of the fatigue occurred during day shifts. This increase in reported fatigue for day shifts relative to late shifts may be attributable to higher workloads during the day.

Performance may also change within a shift. Schellekens, Sijtsma, Vegter, and Meijman (2000) examined the after-effects of long-lasting mental demand (such as that experienced in an EOC environment) on secondary task performance. Results showed that individuals who completed a demanding information-processing task all afternoon made more errors, had slower reaction times, and decreased effort on a secondary task than to those who completed an easy information-processing task. Individuals in the demanding condition also shifted toward a more risky and inaccurate strategy during the course of the afternoon. Thus, when examining the effects of shifts on performance, the researcher must examine the time of the shift and the amount of workload experienced during each shift.

The effects of work shift on performance may also be influenced by individual differences. The ability to effectively predict performance may also come from understanding personality characteristics (Salas, Driskell, & Hughes, 1996). Research has suggested that performance rarely deteriorates as a result of sustained work or sleep deprivation if the individual is willing to expend more effort to compensate for the fatigue, even after 32 to 56 hours of sleep deprivation (Schellekens et al., 2000). Mullins and Fatkin (1999) showed significant differences in cognitive performance for individuals scoring high on the Impulsive-Sensation Seeking subscale of the Zuckerman-Kulhman Personality scale (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). For example, differences in an impulsive dimension might be a factor when one is favoring speed over accuracy for dynamic tasks. Likewise, individuals who tend to perceive the multi-tasking scenario as a challenge may perform better than individuals who experience the multiple tasks as threatening or highly frustrating distractions. Further, Szalma (2002) showed that level of pessimism and optimism was related to level of stress and coping strategy. An analysis of research conducted by ARL's Cognitive Sciences Branch has shown that differences in impulsivity, energy, and neuroticism impact multi-task performance (Branscome, Swoboda & Fatkin, in process). The present study assessed personality traits and stress perceptions of the participants to gain a more complete understanding of multi-task performance differences.

1.4 Hypotheses

Because of the exploratory nature of this study, the hypotheses were non-directional.

1.4.1 Hypothesis I

Individual differences in coping with uncertainty will be related to how long it takes the dispatcher to complete the call.

1.4.2 Hypothesis II

Personality traits and stress perceptions may be related to how long it takes the dispatcher to complete the call.

1.4.3 Hypothesis III

Differences in dispatcher performance (time to answer the call and time to complete the call) will be related to the work shift.

---

2. Methodology

2.1 Participants

Nineteen dispatchers (five male, fourteen female) from the Harford County EOC participated in this study. The mean age was 33.8 (range 19 to 49). Eleven participants were married, five were single, and two were divorced (data were not available for one dispatcher). No monetary incentive was offered for their being in the study, and participants had the option of withdrawing from the study at any time. The voluntary, fully informed consent of the persons used in this research was obtained as required by 32 Code of Federal Regulations 219 and Army Regulation (AR) 70-25. The investigators have adhered to the policies for the protection of human subjects as prescribed in AR 70-25.

2.2 Instrumentation

Participants completed seven measures at the beginning of the study: the demographics questionnaire, the Multiple Affect Adjective Checklist-Revised (MAACL-R), general form (Zuckerman & Lubin, 1985), the Zuckerman-Kuhlman Personality Questionnaire, Form III (ZKPQIII) (Zuckerman et al., 1993), the Polychronicity scale (Bluedorn, Kalliath, Strube, & Martin, 1999), the Need for Cognitive Structure (NCS) scale (Bar-Tal, 1994), the Ability to Achieve Cognitive Structure (AACS) scale (Bar-Tal, 1994), and the Uncertainty Response scale (URS) (Greco & Roger, 2001). During the course of the study, participants completed four additional measures: the MAACL-R today form (Zuckerman & Lubin, 1985), the Situational Self-Efficacy (SSE) scale (Bandura, 1977), the Stanford Sleepiness scale (Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973), and the daily log.

2.2.1 Demographics Measure

The demographics questionnaire (see appendix A) is a comprehensive questionnaire that requests information about age, family status, public safety service, and computer experience.

2.2.2 Psychological Trait Measures

The trait measures were used to assess personality characteristics. This trait battery included the six assessment measures described here.

2.2.2.1 Multiple Affect Adjective Checklist - Revised

The general form of the MAACL-R in appendix B (Zuckerman & Lubin, 1985) consists of five primary subscales (anxiety, depression, hostility, positive affect, and sensation seeking) derived from a one-page list of 132 adjectives. An overall distress score, dysphoria or negative affect, is a composite of the anxiety, depression, and hostility scores. The respondents were instructed to check all the words that describe how they "generally" feel.

2.2.2.2 Zuckerman-Kuhlman Personality Questionnaire

The ZKPQIII in appendix C (Zuckerman et al., 1993) identifies five components of personality in five subscales: activity, aggression-hostility, sociability, neuroticism-anxiety, and impulsive risk taking. This five-factor model is recommended for research involving personality correlates because it provides maximal specificity at no loss in reproducibility across gender and populations.

2.2.2.3 Cognitive Uncertainty Measures

The data for the cognitive uncertainty metrics were transformed into dichotomous variables of high and low in this study. The designers of these measures traditionally dichotomize the data before analysis. Therefore, we adopted this methodology in order to compare the results of this study to the literature.

1. The Need for Cognitive Structure scale

The NCS scale in appendix D (Bar-Tal, 1994) is a 20-item scale that assesses the extent of an individual's preference for using cognitive structuring to achieve certainty. A median split was conducted on the NCS scale to create high and low NCS groups. High and low NCS groups consisted of participants whose scores on the NCS scale were above 3.0 and or below 3.00, respectively.

2. The Ability to Achieve Cognitive Structure scale

The AACS scale in appendix E (Bar-Tal, 1994) is a 24-item scale that assesses the extent to which individuals are able to apply information processes that are consistent with their need for cognitive structure. A median split was conducted on the AACS scale to create high and low AACS groups. High and low AACS groups consisted of participants whose score on the AACS scale were above 3.20 or below 3.00, respectively.

3. Uncertainty Response Scale

The URS in appendix F (Greco & Roger, 2001) is a 48-item scale that was designed to predict individual differences in coping with uncertainty. The URS consists of three factors: emotional uncertainty (EU), desire for change (DC), and cognitive uncertainty (CU). EU is the degree to which an individual responds to uncertainty with anxiety and sadness (i.e., maladaptive behaviors). DC is the degree to which an individual enjoys novelty, uncertainty, and change. CU is the degree to which an individual prefers order, planning, and structure in an uncertain environment.

A median split was conducted on each of the subscales of URS to create high and low groups. High and low emotional uncertainty groups consisted of participants whose score on the EU scale was above 32.50 or below 32.50, respectively. High and low DC groups consisted of participants whose score on the DC scale was above 52.50 or below 52.50, respectively. High and low CU groups consisted of participants whose score on the CU scale was above 55.50 or below 55.50, respectively.

2.2.3 Psychological State Measures

The following stress perception measures were included.

2.2.3.1 Multiple Affect Adjective Checklist - Revised

The MAACL-R today form in appendix B (Zuckerman & Lubin, 1985) was administered at the end of each shift. Because of the improved discriminant validity and the control of the checking response set, the MAACL-R today form has been found to be particularly suitable for investigations that postulate changes in specific affects in response to stressful situations. This is identical to the general form, except participants were instructed to answer according to how they "feel right now" or "have felt" since they last completed these questionnaires.

2.2.3.2 Situational Self-Efficacy Scale

The SSE scale in appendix G (daily log) (Bandura, 1977) was developed for investigating the predictive power of efficacy expectations about behavior or task performance. Participants were asked to rate (from 1 to 10) their level of confidence in their ability to do well. There is extensive evidence that self-efficacy is associated with higher levels of motivation and performance for both civilian and military populations (Fatkin & Hudgens, 1994; Potosky, 2002).

2.2.3.3 Stanford Sleepiness Scale

The Stanford Sleepiness scale in appendix G (daily log) (Hoddes et al., 1973) was used to assess the participants' sleepiness at the beginning of their shift. The scale ranges from 1 to 7, and each value is anchored by a description of the sleepiness level.

2.2.3.4 Daily Log

The daily log (appendix G) is a comprehensive questionnaire that was completed by each participant during his or her shift. The daily log requests information about work shift, sleep, work breaks, and food intake. The SSE scale (Bandura, 1977) and the Stanford sleepiness scale (Hoddes et al., 1973) were also included in the daily log.

2.3 Procedure

This experiment was conducted for three months. The experimenter briefed the dispatchers at the EOC before the study to allow them to ask questions about the study and to determine if they would like to participate. During this briefing, participants were told the study's purpose and general procedures. The participants were also told that participation was *strictly voluntary* and that they could withdraw from the experiment at anytime.

On day 1 of the experiment, the participants were briefed about the purpose and procedures of the study and were read the volunteer agreement affidavit (appendix H). They were given the required briefing about confidentiality, as indicated on Department of the Army (DA) form 5303-R.

The participants who agreed to take part in the study signed the volunteer agreement affidavit. They completed the demographics questionnaire, the MACCL-R (Zuckerman & Lubin, 1985), the ZKPQIII (Zuckerman et al., 1993), the Polychronicity scale (Bluedorn et al., 1999), the NCS scale (Bar-Tal, 1994), the AACS scale (Bar-Tal, 1994), and the URS (Greco & Roger, 2001). After they completed the questionnaires, the participants were given a blank daily log. The experimenter explained to the participants when and how to complete the log. The daily log and the MAACL-R were placed in a blank envelope. On each day of their shift, the participants completed the daily log and the today form of the MAACL-R.

2.4 Experimental Design

This was a field study in which the experimenter was unable to actively manipulate variables. However, key factors were assessed. The between-subjects factors were NCS (two levels, high and low), AACS (two levels, high and low), EU (two levels, high and low), DC (two levels, high and low), CU (two levels, high and low), SSE, state affect, (MAACL-R), sleepiness, and personality traits. The within-subjects factors were day in shift and study week. There were five days in a shift and performance was assessed for three weeks. The dependent measures were time to complete a call, stress response as measured by the MAACL-R, and SSE. Self-efficacy and sleepiness were also used as independent variables in certain analyses.

The data for time to complete a call were provided by the Harford County EOC. The variable time to complete a call is defined as the average amount of time the dispatchers take to complete an action (e.g., dispatch an ambulance to an emergency):

Time to complete a call = Time action were completed – Time call was received.

The data for time to complete a call were initially grouped into 11 categories. These 11 categories were then condensed into three categories for analyses: emergency (victim related), fire, and police calls. Three categories were used because the amount of time it takes to complete a call depends in part on the type of call it is. For example, dispatching a police officer to a stalled car on the highway should take less time than dispatching an ambulance to a medical emergency. Furthermore, taking a medical emergency call may be more stressful than a traffic call. Call-type categories were verified by the dispatchers at the Harford County EOC. Five dispatchers at the EOC completed a Categorization Questionnaire (appendix I). The questionnaire asked the dispatcher if the groupings chosen were a logical representation of the call types and if not, how they would have grouped the calls. Four of the five dispatchers reported that the call types were grouped correctly. The dispatchers were then asked to rate the three categories according to the perceived stress level associated with the calls. In order to obtain quick and reliable ratings, participants were provided with the Specific Rating of Events (SRE) scale (Fatkin, King, & Hudgens, 1990). The SRE allows participants to rate (on a scale of 0 to 100) the stressfulness of specific events and has been validated with other subjective stress ratings and physiological measures of stress (Fatkin et al., 1990). Appendix J contains a list of the call types within each category.

3. Results

Repeated measures analyses of variance (ANOVAs) of the data (i.e., performance and subjective stress) did not show a significant effect of day in shift or study week on the dependent measures of interest. These variables were not included as independent variables in the analyses. However, the factors were included in the models to account for the fact that multiple measurements were taken.

3.1 Performance - Time to Complete a Call

To assess the effect of the psychological trait measures on performance (i.e., call time), mixed linear model analyses were conducted. Those analyses were chosen because they are able to handle correlated data, unequal cell sizes, and unequal variances (McCulloh & Searle, 2001).

The analyses were run with the participants entered as subject factors and week and day in shift entered as repeated factors. The psychological trait variables were entered as fixed factors. A diagonal covariance structure was used for the analyses. This structure was used because the covariance structure of the data had heterogeneous variances and zero correlations between the elements. Separate analyses were run for emergency (victim related), police, and fire calls.

3.1.1 NCS and AACS

Table 2 shows the levels of NCS and AACS constructs and their corresponding definitions to aid the reader in following the logic of results.

Table 2. Definitions of NCS and AACS constructs.

Low NCS	Preference for using piece-meal processes
High NCS	Preference for using cognitive structuring
Low AACS	Unable to use preferred information processing strategy.
High AACS	Able to use preferred information processing strategy

Figures 1, 2, and 3 show mean call times for low and high NCS and AACS groups during emergency (victim related), police, and fire calls.

Analysis of the data for emergency calls revealed a significant NCS x AACS Group on Performance interaction, F (1, 55.9) = 10.45, p = .00; NCS group, F (1, 70.29) = 17.22, p = .00; AACS group F (1, 64.55) = 9.81, p = .00. To explain this interaction, linear contrasts were conducted. Significant comparisons were

Low NCS-low AACS calls were slower than low-NCS-high AACS, p = .04

Low NCS-low AACS calls were slower than high-NCS-low AACS, p = .00

Low NCS-high AACS calls were slower than high-NCS-low AACS, p = .01

High NCS-low AACS calls were faster than high-NCS-high AACS, p = .01

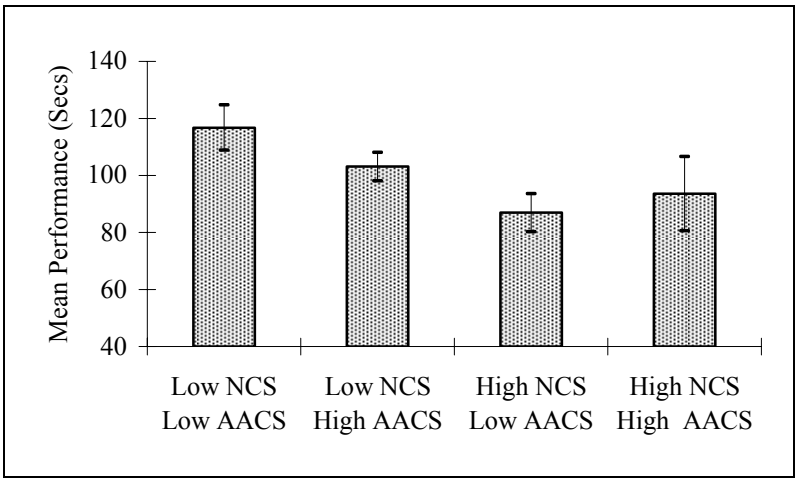


Figure 1. Mean call times (seconds) of emergency (victim related) calls for NCS and AACS groups.

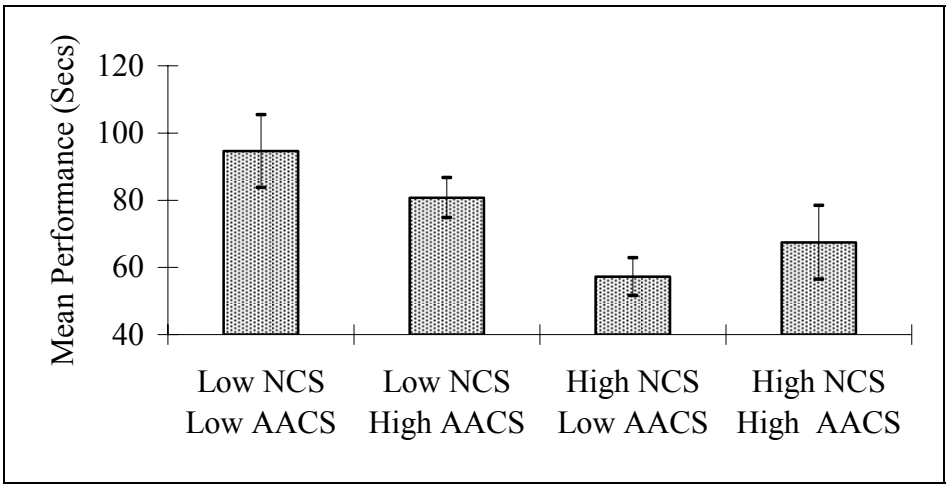


Figure 2. Mean call times (seconds) of police calls for NCS and AACS groups.

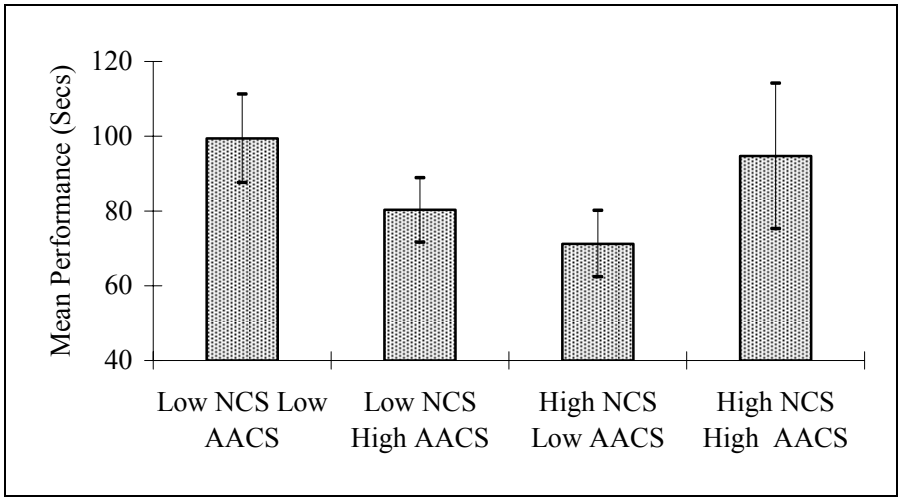


Figure 3. Mean call times (seconds) of fire calls for NCS and AACS groups.

Analysis of the data for police calls revealed significant main effects of NCS group and AACS group on performance, F (1,118.93) = 8.41, p = .00 and F (1,116.59) = 4.15, p = .04, respectively. Police calls were completed significantly faster in the high NCS group (M = 84.5) than the low NCS group (M = 60.3); the low AACS group (M = 71.9) was faster than the high AACS group (M = 78.0). The NCS x AACS interaction was not significant, F (1,114.93) = 3.15, p = .08. Figure 2 shows that the pattern of performance for the NCS and AACS groups for police calls was similar to that for emergency (victim related) calls.

Analysis of the data for fire calls revealed a significant NCS x AACS Group on Performance interaction, F (1,5.03) = 16.43, p = .01; NCS group, F (1,7.88) = 16.71, p = .00; AACS group, F (1,8.87) = 8.51, p = .01. To explain this interaction, linear contrasts were conducted. Significant comparisons were

Low NCS-low AACS calls were slower than low NCS-high AACS, $p = .05$

Low NCS-low AACS calls were slower than high NCS-low AACS, $p = .00$

Low NCS-high AACS calls were slower than high NCS-low AACS, $p = .05$

High NCS-low AACS calls were faster than high NCS-high AACS, $p = .01$

3.1.2 URS: EU, DC, and CU

Table 3 shows the levels of URS constructs and their corresponding definitions to aid the reader in following the logic of results.

Table 3. Definitions of URS constructs.

EU	The degree to which an individual responds to uncertainty maladaptively.
DC	The degree to which an individual enjoys novelty, uncertainty, and change.
CU	The degree to which an individual enjoys order and structure.

Figures 4, 5, and 6 are graphs of mean call times for low and high groups on the URS subscales during emergency (victim related), police, and fire calls.

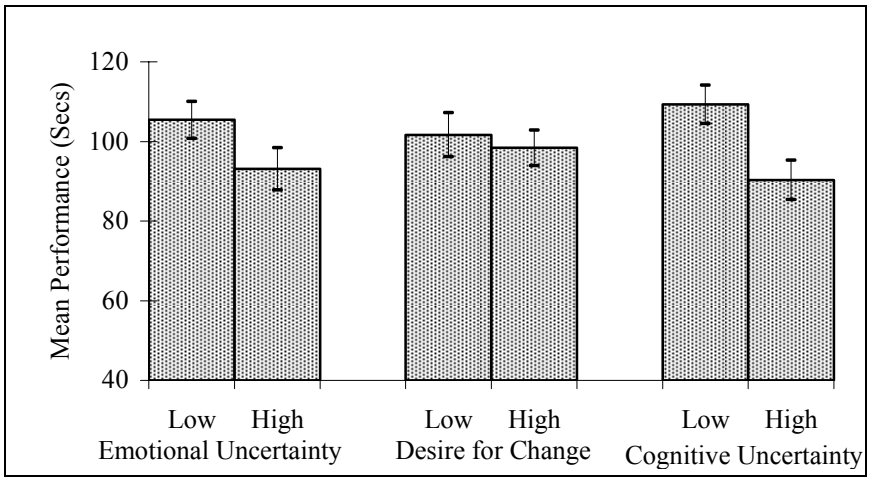


Figure 4. Mean call times (seconds) of emergency (victim related) calls for groups from the URS subscales.

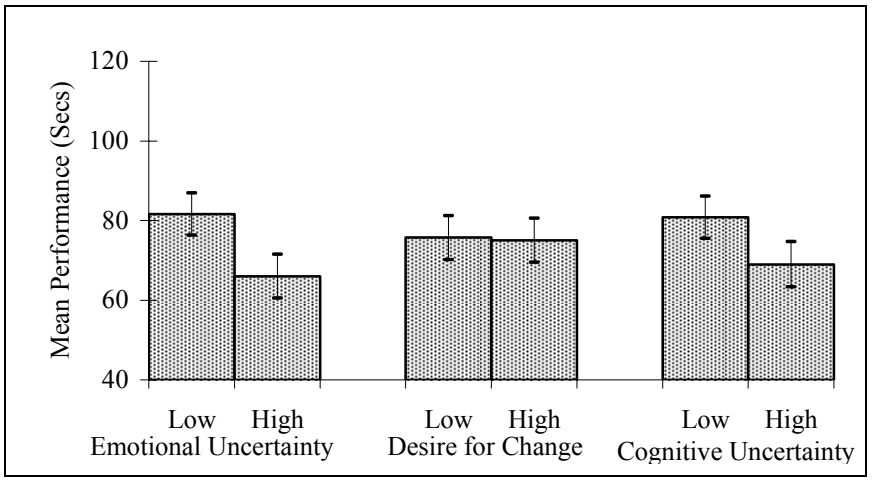


Figure 5. Mean call times (seconds) of police calls for groups from the URS subscales.

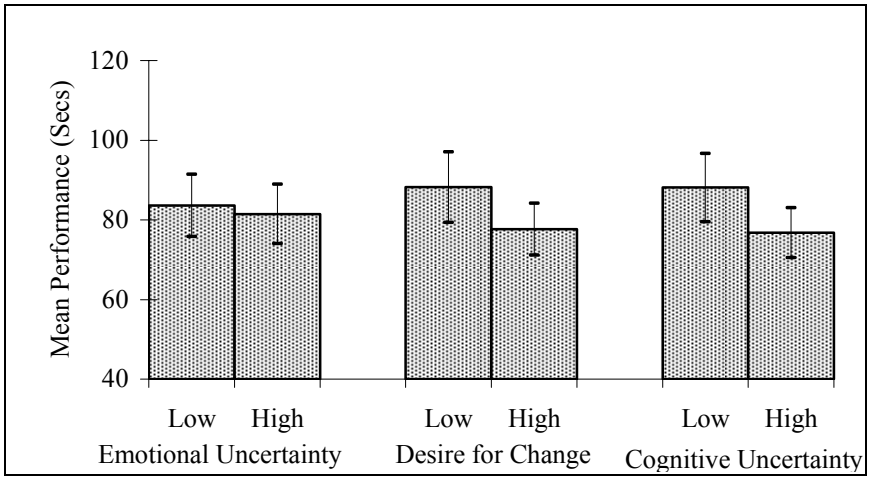


Figure 6. Mean call times (seconds) of fire calls for groups from the URS subscales.

Analyses of the data for emergency calls revealed significant main effects of DC and CU group on performance, F (1,68.97) = 4.98, p = .02 and F (1,75.13) = 14.98, p = .00, respectively. Results showed that emergency calls were completed significantly faster in the high DC group (M = 98.4) than in the low DC group (M = 101.6), as well as faster in the high CU group (M = 90.3) than in the low CU group (M = 109.2). EU was not significant, $F < 1.0$.

Analyses of the data for police calls revealed significant main effects of EU and CU group on performance, F (1,105.1) = 3.85, p = .06 (marginal) and F (1,103.1) = 5.07, p = .02, respectively. Results showed that police calls were completed significantly faster in the high EU group (M = 81.4) than the low EU group (M = 83.6); the high CU group (M = 76.7) was faster than the low CU group (M = 88.1). DC was not significant, $F < 1.0$.

Analyses of the data for fire calls showed no significant difference between the low and high groups for the subscales of the URS on performance, *F's*< 1.

3.2 Personality Trait Measures

Correlations were conducted between the psychological trait measures and the uncertainty measures and are presented in tables 4 and 5. The significant correlations between these variables suggest that personality may contribute to the emotional and behavioral reactions of individuals performing in uncertain circumstances. The results for specific personality traits are discussed in more detail in the remaining subsections (3.2.1 through 3.2.4).

Table 4. Correlations between cognitive uncertainty and ZKPQ personality traits.

Measure	NCS	AACS	EU	DC	CU	Impulsivity	Neuroticism	Aggressiveness	Energy	Sociability
Cognitive Uncertainty										
NCS	--	-.394	.660**	-.200	.644**	-.096	.345	.206	-.173	-.361
AACS		--	-.702**	.355	-.036	.158	-.715*	.058	.252	.530*
EU			--	-.320	.503*	-.315	.810**	.147	-.405	-.520*
DC				--	.034	.628**	-.337	-.040	.471	.430
CU					--	-.181	.141	-.108	-.098	-.120
ZKPQ										
Impulsivity						--	-.377	.261	.311	.464
Neuroticism							--	.355	-.256	-.421
Aggressive-ness								--	-.114	.033
Energy									--	.527*
Sociability										--

p <.05*, *p* <.01**

Table 5. Correlations between cognitive uncertainty and MAACL-R personality traits.

Measure	NCS	AACS	EU	DC	CU	Sens-Seek	Anxiety	Depression	Hostility	Pos Affect
Cognitive Uncertainty										
NCS	--	-.394	.660**	-.200	.644**	-.295	.272	-.027	.177	-.136
AACS		--	-.702**	.355	-.036	.218	-.426	-.263	-.136	.145
EU			--	-.320	.503*	-.486*	.491*	.201	.415	-.270
DC				--	.034	.570*	-.198	-.313	-.305	.111
CU					--	-.219	.214	-.116	.199	-.240
MAACL-R										
Sens-Seek						--	-.254	-.074	-.220	.218
Anxiety							--	.413	.518*	-.482*
Depression								--	.322	-.483*
Hostility									--	-.625**
PosAffect										--

p<.05*, *p*<.01**
Sens-Seek – Sensation Seeking, PosAffect – Positive Affect.

3.2.1 Impulsivity-Sensation Seeking

Scores from both the ZKPQ Impulsivity-Sensation Seeking scale and the MAACL-R Sensation Seeking scale were significantly and positively correlated with the scores from the DC subscale

of the URS. Individuals who typically act impulsively tend to enjoy the novelty and change associated with uncertain circumstances. They are often willing to take risks for the sake of excitement or novel experiences.

3.2.2 Neuroticism-Anxiety

Scores from both the ZKPQ Neuroticism-Anxiety scale and the MAACL-R trait Anxiety scale were significantly and positively correlated with the scores from the EU subscale of the URS. This finding indicated that dispatchers who lack self-confidence, are sensitive to criticism, are indecisive, or experience tension and worry, tended to lack the ability to cope well with uncertainty.

There was a significant negative correlation between scores from the ZKPQ Neuroticism-Anxiety scale and scores from the AACS. Individuals who become upset easily and who frequently become obsessed with indecision were not able to filter inconsistent or irrelevant information. These individuals had difficulty avoiding and processing information in a manner that is congruent with their level of NCS.

3.2.3 Sociability

Significant correlations were found between participants who scored high on the ZKPQ Sociability scale and participants who scored low on the EU subscale of the URS. Dispatchers who described themselves as outgoing and having a preference for being with others also tended to use adaptive coping strategies in uncertain circumstances.

There was a significant positive correlation between scores from the ZKPQ Sociability scale and scores from the AACS. Individuals who expressed a preference for external interactions were adept at avoiding information that might be inconsistent or irrelevant to a task.

3.2.4 Uncertainty Characteristics

Scores from the AACS measure were significantly and negatively correlated with scores from the EU subscale of the URS. This indicates that individuals who had the ability to use their preferred cognitive strategies tended to use adaptive coping strategies in uncertain situations.

3.3 Sleepiness and SSE

Mixed model analyses were conducted to assess the impact of SSE, amount of sleep (in past 24 hours) and subjective sleepiness on performance. There were no significant effects on dispatcher performance, p's > .10.

3.4 Stress Perceptions and SSE

Mixed model analyses were conducted to examine the effects of level of NCS, AACS, and URS on subjective stress, as measured by the MAACL-R stress perception measure and SSE. The analyses were run with the participants entered as subject factors and week and day entered as

repeated factors. A compound symmetry-heterogeneous covariance structure was used for the analyses. This structure was used because the covariance structure of the data had heterogeneous variances and constant correlations between the elements.

3.4.1 Situational Self-Efficacy

Figure 7 shows mean reported SSE for low and high NCS and AACS groups. Analyses showed there was a significant main effect of NCS and AACS group for SSE, F (1,20.3) = 4.22, p = .05 and F (1,20.3) = 6.30, p = .02. Dispatchers in the low NCS group (M = 8.91) reported higher levels of confidence in their ability to do well, compared to those in the high NCS group (M = 7.93); the high AACS group (M = 9.0) reported greater confidence than the low AACS group (M = 7.87). The NCS x AACS interaction was not significant, p's > .10.

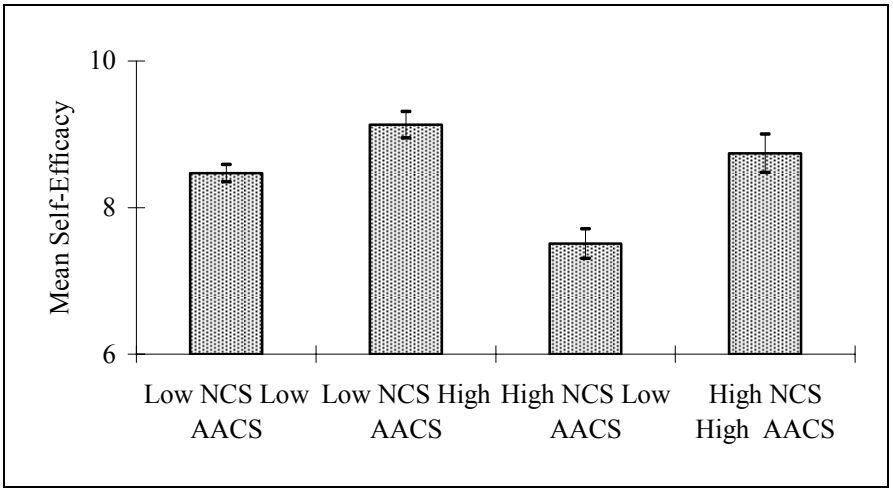


Figure 7. Mean SSE levels for NCS and AACS groups.

Figure 8 is a graph of mean reported SSE for low and high groups on the URS subscales. Analyses showed that there were significant main effects of EU and CU group on SSE, F (1,10.79) = 6.83, p = .02 and F (1,9.43) = 6.23, p = .03. Dispatchers in the low EU (M =9.05) group reported a greater confidence in their ability to do well than the high EU group (M = 7.90); the high CU group (M = 8.55) reported greater confidence than the low CU group (M = 8.40). The main effect of DC was not significant, F (1,9.5) = 4.29, p = .06. However, the high DC reported a greater confidence in their ability to do well (M = 9.00) than did the low DC group (M = 7.97).

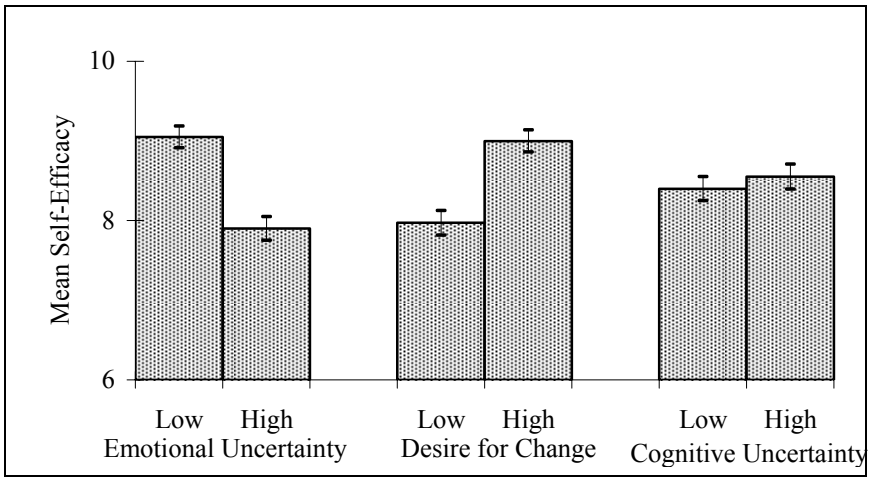


Figure 8. Mean SSE levels for groups from the uncertainty response subscales.

3.4.2 MAACL-R State

Figure 9 shows mean reported positive affect for low and high NCS and AACS groups. Analyses showed that there was a significant NCS x AACS interaction for self-reported positive affect, F (1,9.28) = 13.53, p = .00. The main effect for NCS and AACS were not significant, F (1,9.28) = 3.60, p = .08 and F (1,9.28) = .458, p = .52, respectively. To explain this interaction, a mixed model analysis was applied to the data of high and low AACS groups separately. Results for the low AACS group showed that more positive affect was reported by the low NCS group than the high NCS group, F (1,27.1) = 37.04, p = .00. There was no significant difference for the high AACS group, p > .10. The NCS x AACS interaction was not significant for any other components of the MAACL-R state (e.g., anxiety, depression), p's > .10.

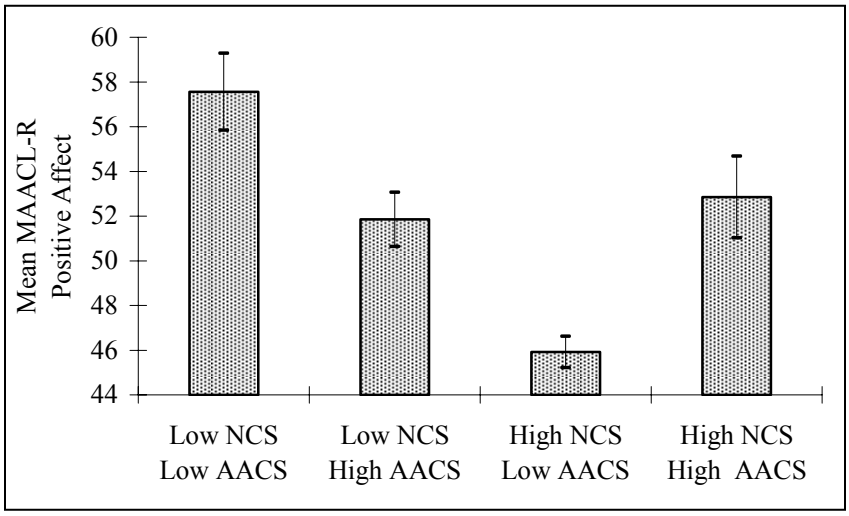


Figure 9. Mean MAACL-R positive affect scores for NCS and AACS groups.

Figure 10 shows mean reported positive affect for low and high EU, DC, and CU groups from the URS. Analyses showed that there were significant main effects of EU and DC group on self-

reported positive affect, F (1,10.12) = 7.71, p = .01, and F (1,9.72) = 7.31, p = .02, respectively. More positive affect was reported by the low EU (M = 52.6) group than the high EU group (M = 49.89); the low DC group (M = 53.4) reported more positive affect than the high DC group (M = 48.88). The main effects of the URS subscales were not significant for any other component of the MAACL-R, p's > .10

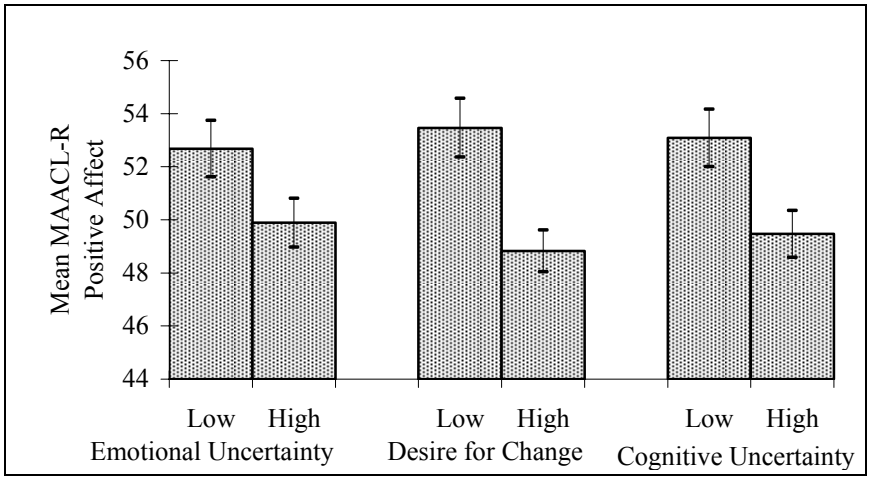


Figure 10. Mean MAACL-R positive affect scores for groups from the uncertainty response subscales.

3.4.3 MAACL-R State, Positive Affect Comparative Data

The assessment of the level and intensity of emotional reactions was accomplished by a comparison of the results from the current study with data from other studies with identical psychological measures. These comparisons provide a method for estimating the relative stress experienced in a given situation and for studying the links between stress responses and performance in a variety of settings (Fatkin, 2003; Fatkin & Hudgens, 1994; Fatkin, King, & Hudgens, 1990; Fatkin, Mullins, & Patton, 1999). For example, an independent control was included as comparison data, representing a condition ranging from no stress to low stress. These data provide a metric with which to compare participants from the present study (see figure 11).

As illustrated in figure 11, individuals who have a high need for cognitive structure, combined with a relatively low ability to achieve that structure, have positive affect levels significantly lower than the independent control group, t (27)= 3.023, p =.005. Their levels were comparable to the low levels reported by spouses of patients undergoing oncology surgery, Soldiers participating in marksmanship competition, Soldiers performing during a 52-hour sustained operations field exercise, inexperienced military fire fighters, and overworked Army recruiters. Dispatchers who had high levels of AACS reported positive affect levels similar to medical students taking a critical examination and military personnel participating in chemical decontamination training.

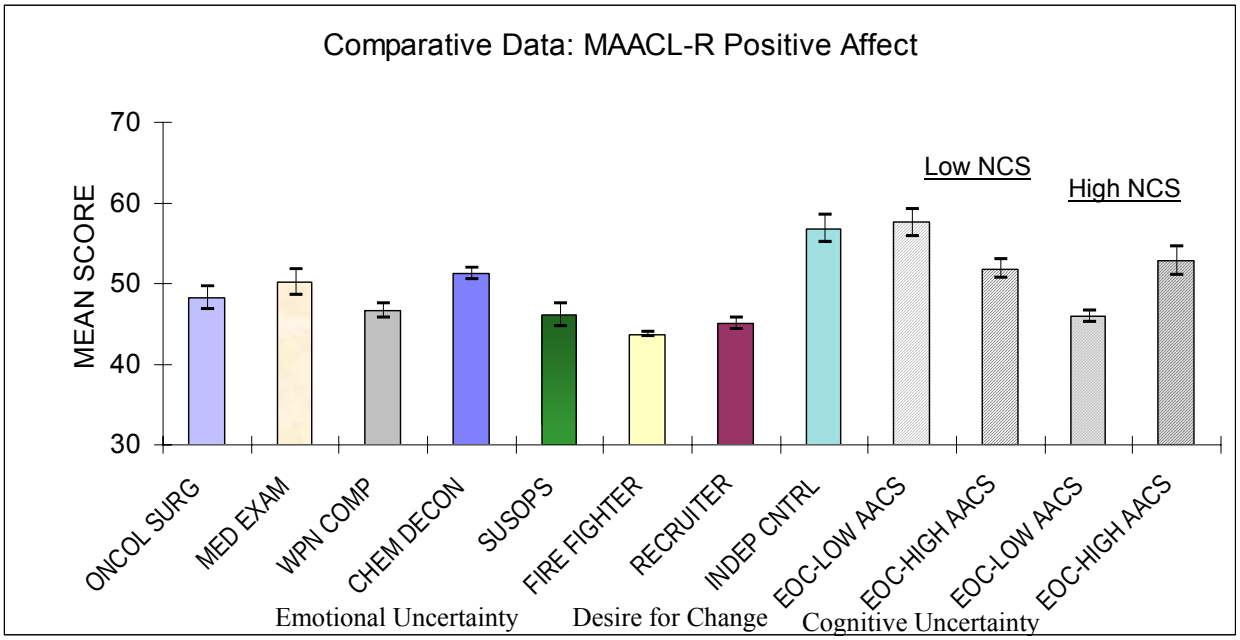


Figure 11. Comparative data chart of MAACL-R positive affect levels (means) of EOC personnel with the following groups: (1) spouses of patients undergoing oncology surgery; (2) medical students taking a critical exam; (3) Soldiers participating in a marksmanship competition; (4) military personnel participating in chemical decontamination training; (5) soldiers performing during a 52-hour sustained operations field exercise; (6) inexperienced military fire fighters; (7) Army recruiters; and (8) an independent control group of males during a routine day.

4. Discussion

The results suggest that there are individual differences in the information processing and emotional coping strategies that people prefer and are able to use to make decisions in uncertain situations. These individual differences significantly impacted performance, subjective stress, and situational self-efficacy. Implications for these findings and future directions are discussed.

4.1 Performance - Time to Complete a Call

Results showed that the level of NCS and AACS significantly impacted the time it took a dispatcher to complete an EOC call. The interaction of these two variables differed between high and low stress events. Event stress was determined by self-report. Dispatchers were asked to rate, using the SRE scale, the amount of stress they typically experience when taking various types of calls. The dispatchers reported that they experience higher levels of stress during fire and emergency (victim related) calls ($M = 63.3$) than during police calls ($M = 28.0$). Results showed that there was a significant interaction of NCS and AACS levels during high stress events (i.e., emergency [victim related] and fire calls) but not during low stress events (i.e., police calls). Individuals who had a high NCS and a low AACS completed calls faster than

those with a low NCS. Further comparison also showed that this group was significantly faster than those with a low NCS and high AACS.

NCS represents a continuum from the tendency to use piece-meal processes, that is an active and systematic evaluation of relevant information (low NCS), to the use of cognitive structuring (high NCS) in order to achieve certainty (Bar-Tal, Raviv, & Spitzer, 1999). Even when an individual uses piece-meal processes, s/he has to use cognitive structuring, but it occurs later in the decision-making process. AACS is the ability to apply the information processes that are consistent with an individual's level of NCS; the information processes can be piece-meal or cognitive structuring. Bar-Tal et al. suggested that stress increases the use of cognitive structuring, and the levels of NCS and AACS may moderate this effect (Bar-Tal et al., 1999; Hancock & Mortimer, 2002).

Bar-Tal et al. (1999) proposed that high NCS-low AACS individuals use a disorganized and non-systematic search for information, which in turn, can lead to greater uncertainty and less structured data. These types of individuals do not discriminate well between different types of information (i.e., relevant versus irrelevant) and are hypervigilant. In contrast, it is suggested that low NCS-high AACS individuals attend to all the information available (relevant or irrelevant) to make a decision; they are characterized as vigilant. Bar-Tal et al. showed that low NCS-high AACS individuals report a greater difficulty in making decisions under stress but were also more vigilant. They attended to relevant information and used less cognitive structuring under cognitive load. In the current study, this decrease in the use of cognitive structuring may be reflected in the increased time to complete a call for the low NCS-high AACS group relative to the high NCS-low AACS.

Individuals with a low NCS-low AACS also completed calls more slowly than those with a high NCS-low AACS. According to Bar-Tal (1994), this group uses cruder categorization and more cognitive structuring. It is unclear why the low NCS-low AACS group was slower than the high NCS-low AACS-low group. Bar-Tal and colleagues (Bar-Tal et al. 1999) suggested that AACS may not only be a trait-like characteristic but that it could also be determined by situational factors. For example, training and experience may increase or decrease the difficulty of using cognitive structuring. There were not enough participants to capture the role of experience and training in the NCS x AACS interaction in this study.

Results also showed that the hypothetical constructs measured by the subscales of the URS (Greco & Roger, 2001) significantly impacted the time it took a dispatcher to complete an EOC call. This is the first study to examine the effects of individual differences on the URS on performance. Individuals with a high DC and CU completed calls faster, regardless of call type, than those with low scores on these subscales. The URS assesses how individuals appraise and cope with uncertainty. The stress experienced during uncertainty is a function of the appraisal and coping process. More specifically, DC is a measure of an individual's level of enjoyment for uncertainty, novelty, and change. CU is a measure of an individual's need to plan ahead, gather

information, and seek clarification in order to avoid uncertainty. The EOC is an environment that is fraught with uncertainty and change. The data suggest that individuals who prefer environments characterized by uncertainty (e.g., high DC) perform better in these circumstances.

Individuals with high EU completed police calls faster than those with low EU. EU is a measure of the tendency to use a maladaptive coping style, that is, respond to uncertainty with anxiety and sadness (Greco & Roger, 2001, 2003). Greco and Roger reported a significant positive correlation between EU and neuroticism (i.e., hypochondriasis, social sensitivity, and rumination) and a negative correlation between EU and detachment. In this study, there was a significant positive correlation between EU and neuroticism and also with CU. The components of this relationship were significant contributors to ways in which the EU subscale significantly impacted call time for police calls but not for emergency (victim related) or fire calls. The police side of the EOC has less ambiguity and stress. High EU individuals reported that they preferred order and structure in their environment. The match between the situational environment and the level of cognitive uncertainty for the high EU individuals may be reflected in the faster call times.

4.2 Personality Traits and Measures of Uncertainty

The significant correlations found between personality traits and uncertainty measures suggest that personality may contribute to the emotional and behavioral reactions of individuals performing in uncertain circumstances. Scores from both the ZKPQ Impulsivity-Sensation Seeking scale and the MAACL-R Sensation Seeking scale were significantly and positively correlated with the URS-DC factor. Individuals who typically act impulsively tend to enjoy the novelty and change associated with uncertain circumstances. They are often willing to take risks for the sake of excitement or novel experiences.

Additionally, scores from both the ZKPQ Neuroticism-Anxiety scale and the MAACL-R trait Anxiety scale were significantly and positively correlated with the scores from the URS-EU factor. Dispatchers who generally approach their day-to-day events with an accompanying sense of tenseness and worry, tend to experience difficulty in making decisions. They also admit to a lack of self-confidence and sensitivity to criticism. It is understandable that dispatchers with this personality trait were more likely to experience higher levels of anxiety and sadness, in the midst of uncertain situations, than those who possessed more adaptive coping skills.

The significant correlations found between the time it took a dispatcher to complete an EOC call and coping styles imply that dispatchers could learn to adapt the coping strategies they use to perform well. We recommend the implementation of performance-enhancing techniques, such as the optimal use of information displays and functions, and explicit training for building resiliency in order to use and maintain efficacious training strategies.

The effects of individual differences in temperament have been investigated in other types of multi-tasking jobs as well. One such occupation is the high pressure, intensely demanding job of the air traffic controller. In a review of research conducted by the Civil Aeromedical Institute of

the Federal Aviation Administration, longitudinal predictions of the effectiveness of air traffic controllers were made on the basis of scores from personality measures (King, Retzlaff, Detwiler, Schroeder, & Broach, 2003). As in the current study, neuroticism-anxiety and impulsivity-sensation seeking were consistent correlates of effective coping strategies. These were significant contributors to the efficacy of successful training performance. The researchers reported that successful air traffic controller students exhibited lower levels of neuroticism and higher scores of impulsive-sensation seeking than those who were not as successful.

4.3 Situational Self-Efficacy

The SSE measure provided a valid and reliable assessment of the individual's ability to master new situations or adapt to changing circumstances. This ability is considered to be a composite of past successful and failed experiences which influences the individual's perception of how s/he might perform other tasks (Sherer, Maddux, Mercandante, Prentice-Dunn, Jacobs, & Roger, 1982). Dispatchers who scored relatively high on self-efficacy reported being less anxious about their ability to perform and therefore experienced lower levels of emotional uncertainty. Dispatchers who reported high levels of confidence also had a preference for organization, planning, and structure. These dispatchers chose to cope with uncertainty by following specific methods in a series of steps for determining outcomes, and tended to complete calls faster than those who did not cope as effectively. These findings are also supported by a meta-analysis conducted by Barrick and Mount (1991). Individuals with high achievement levels were also confident, experienced success from past undertakings, and expected to succeed in the future.

Bandura (1977, 1982, 1986) contends that individuals are constantly assessing their range of capabilities and that these assessments significantly guide and influence behavior. When individuals perceive a circumstance or task as exceeding their ability, they tend to minimize their efforts, perform less effectively, or avoid these situations altogether. On the other hand, when individuals believe the tasks or adjustments are within their range of capabilities, they invest more effort and tend to persevere even in the face of obstacles or adverse circumstances.

4.4 General Conclusions

The first goal of this research was to assess the validity of the uncertainty metrics. The NCS and URS-CU subscale seem to be measuring similar constructs, as evidenced by the significant positive correlation ($r = .644$, $p = .00$). Further, NCS and URS-CU impacted similarly on the time it took a dispatcher to complete an EOC call. The relationship between these two scales needs to be investigated further, as this is the first study that has examined both measures in the same context. The data suggest that cognitive uncertainty, as measured by NCS, AACS, and the URS, impacts performance and is related to personality characteristics. In summary, there are individual differences in cognitive preferences and these differences affect how individuals perceive situations and how they make decisions.

The second goal of this study was to examine the effects of work shifts on performance. Results showed that the shift that an individual worked did not differentially impact performance. It is important to note that the dispatchers in this study typically worked the same shift each week (i.e., day, evening, or night shift). In the shift work literature, individuals usually rotate between shifts. It seems that consistency in the shift worked allows an individual to accommodate to the environment (e.g., regular sleep-wake cycles) and as such, his or her performance is optimized. As a result of this accommodation, sleepiness did not impact performance either.

4.5 Limitations and Future Directions

Information gathered from this study can be used in subsequent research endeavors to understand the effects of information processing strategies (e.g., cognitive structuring) on decision making in military environments. In this study, the experimenters were unable to actively manipulate the independent variables or control for any confounds. Further, for our dependent measure (time to complete a call), we were unable to determine the "goodness of the decision." Future research will examine if cognitive uncertainty predicts decision making in a controlled military-like environment, and measures of time and operational effectiveness will be obtained. The instruments (NCS scale, AACS scale, and URS) are new in military applications and are generally untested by this scientific community. Research is also needed to refine the tools used to measure NCS, AACS, and URS to reflect behaviors that are characteristic of a military environment.

It is possible that cognitive uncertainty measures can be used to guide researchers who design decision aids and C2 displays. Consideration of cognitive style differences may be useful in determining how and what type of information to present. By presenting information in a way that matches an individual's cognitive preferences this may enhance Soldier effectiveness and overall mission performance.

5. References

Bandura, A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, **1977**, *84*, 191–215.

Bandura, A. Self-efficacy mechanisms in human agency. *American Psychologist*, **1982**, *27*, 122–147.

Bandura, A. Social foundations of thought and action: A social cognitive theory. NJ: Prentice-Hall 1986.

Barrick, M.R.; Mount, M.K. The big five personality dimensions and job performance: A meta-analysis. *Personnel Psychology*, **1991**, *44*, 1–26.

Bar-Tal, Y. The effect on mundane decision-making of the need and ability to achieve cognitive structure. *European Journal of Personality*, **1994**, *8*, 45–53.

Bar-Tal, Y.; Kishon-Rabin; Tabak, N. The effect of the need and ability to achieve cognitive structuring on cognitive structuring. *Journal of Personality and Social Psychology*, **1997**, *73*, 1158–1176.

Bar-Tal, Y.; Raviv, A.; Spitzer, A. The need and ability to achieve cognitive structuring: Individual differences that moderate the effect of stress on information processing. *Journal of Personality and Social Psychology*, **1999**, *77*, 33–51.

Bar-Tal, Y.; Spitzer, A. The effect of coping on monitoring, blunting, and the ability to achieve cognitive structure. *The Journal of Psychology*, **1999**, *133*, 395–412.

Bluedorn, A.C.; Kalliath, T.J.; Strube, M.J.; Martin, G.D. Polychronicity: A fundamental dimension of organizational culture. *Journal of Managerial Psychology*, **1999**, 3, 205–230.

Branscome, T.A.; Swoboda, J. C.; Fatkin, L.T. (research in process). *An Initial Investigation of Factors Affecting Multi-task Performance*. U.S. Army Research Laboratory: Aberdeen Proving Ground, MD,

Burke, T. Dispatcher stress. *FBI Law Enforcement Bulletin*, **1995**, *64*, 1–6.

Della Rocco, P. *The Role of Shift Work and Fatigue In Air Traffic Control Operational Errors and Incidents* (DOT-FAA-AM-99-2). FAA Office of Aviation Medicine Reports Special Issue: The role of shift work and fatigue in air traffic control operational errors and incidents, 1999.

Della Rocco, P.; Cruz, C.; Clemens, J. A. (1995). *Operational errors /deviations and shift work in air traffic control* (DOT-FAA-AM-95-32); FAA Office of Aviation Medicine Reports, 1995

Fatkin. L.T. Identifying the delayed effects of terrorism. *Proceedings of the International Critical Incident Stress Foundation, 7th World Congress on Stress, Trauma, & Coping,* Baltimore, MD, 2003; 279–290.

Fatkin, L.T.; Hudgens, G.A. *Stress perceptions of soldiers participating in training at the Chemical Defense Training Facility: The mediating effects of motivation, experience, and confidence level;* ARL-TR-365; U.S. Army Research Laboratory: Aberdeen Proving Ground, MD, 1994.

Fatkin, L.T., King, J.M., & Hudgens, G.A. *Evaluation of stress experienced by Yellowstone Army fire fighters* (Tech. Mem. No. 9-90). U.S. Army Research Laboratory: Aberdeen Proving Ground, MD, August 1990.

Fatkin, L.T.; Mullins, L.L.; Patton, D.J. (1999). Stress, overload and performance: High standards or high stakes? *Proceedings of the APA National Institute of Occupational Safety and Health Conference on Work, Stress and Health '99*, American Psychological Association Washington, DC, 1980, 211.

Fiske, S. T. & Linville, P.W. (1980). What does the schema concept buy us? *Personality and Social Psychology Bulletin, 6*, **1980**, 543–557.

Foster, R. (2001). *Defense Science and Technology Guidance: Cognitive Readiness* (slide presentation), Office of the Deputy Under Secretary of Defense, BioSystems Directorate: Washington, DC, 2001.

Greco, V.; Roger, D. Coping with uncertainty: the construction and validation of a new measure. *Personality and Individual Differences*, **2001**, *31*, 519–534.

Greco, V. & Roger, D. (2003). Coping with uncertainty: the construction and validation of a new measure. *Personality and Individual Differences*, **2003**, *34*, 1057–1068.

Gregory, K.; Oyung, R.; Rosekind, M. *Managing alertness and performance in air traffic controllers* (DOT-FAA-AM-99-2). FAA Office of Aviation Medicine Reports Special Issue: The role of shift work and fatigue in air traffic control operational errors and incidents 1999.

Hancock, P.A.; Mortimer, D.C. *Decision Errors Under Stress*. White paper in the Multi-Disciplinary University Research Initiative-Operator Performance Under Stress Report: Year One 2002.

Hoddes, E.; Zarcone, V.; Smythe, H.; Phillips, R.; Dement. Quantification of sleepiness: A new approach. *Psychophysiology*, **1973**, *10*, 431–436.

John, M. S.; Callan, J.; Proctor, S.; Holste, S.T. *Tactical Decision Making Under Uncertainty: Experiments I and II* (Technical Report: 1821).San Diego, CA: SPAWAR Systems Center 2000.

Joslyn, S.; Hunt, E. (1998). Evaluating individual differences in response to time-pressure situations. *Journal of Experimental Psychology*: *Applied*, **1998**, *4*, 16–43.

King, R.E.; Retzlaff, P.D.; Detwiler, C.A.; Schroeder, D.J.; Broach, D. *Use of personality assessment measures in the selection of Air Traffic Control Specialists* (DOT-FAA-AM-03/20). Oklahoma City, OK: Federal Aviation Administration, Civil Aeromedical Institute 2003.

McCulloh, C.E. & Searle, S.R. *Generalized, Linear and Mixed Models*. New York: John Wiley & Sons 2001.

Mullins, L.F., & Fatkin, L.T. *Personality traits and cognitive performance during sustained operations*. Presented at the APA-NIOSH Joint Conference on "Work, Stress, and Health '99," Baltimore, MD 1999.

Neuberg, S. L. & Newson, J. T. Personal need for structure: Individual differences in the desire for simple structure. *Journal of Personality and Social Psychology*, **1993**, *65*, 113–131.

Potosky, D. A field study of computer efficacy beliefs as an outcome of training: The role of computer playfulness, computer knowledge, and performance during training. *Computers in Human Behavior*, **2002**, *18*, 241–255.

Salas, E.; Driskell, J. E.; Hughes, S. Introduction: The study of stress and human performance. In J. E. Driskell & E. Salas (Eds.), *Stress and Human Performance*, **1996**, 1–45. Mahwah, NJ: Lawrence Erlbaum Associates.

Schellekens, J. M.; Sijtsma, G. J.; Vegter, E.; Meijman, T. F. Immediate and delayed after-effects of long lasting mentally demanding work. *Biological Psychology*, **2000**, *53*, 37–56.

Sherer, M.; Maddux, J.E.; Mercandante, B.; Prentice-Dunn, S.; Jacobs, B.; Roger, R.W. The Self-Efficacy Scale: Construction and validation. *Psychology Reports*, **1982**, *51*, 663–671.

Szalma, J.L. *Individual differences in the stress and workload of sustained attention*. Multi-Disciplinary University Research Initiative-Operator Performance Under Stress Report: Year One, 2002.

United States Marine Corps. *Warfighting*. Marine Corps. Doctrinal Publication 1. Washington, D.C, 1997.

Wojciechowski, J. Q.; Kilduff, P. W.; Plott, B. *Command and control task and information flow: Model development*. (technical report in preparation). U.S. Army Research Laboratory: Aberdeen Proving Ground, MD.

Zuckerman, M.; Kuhlman, D.M.; Joireman, J.; Teta, P.; Kraft, M. A comparison of three structural models for personality: The Big Three, the Big Five, and the Alternate Five. *Journal of Personality and Social Psychology*, **1993**, *65*, 757–768.

Zuckerman, M.; Lubin, B. *Manual for the Multiple Affect Adjective Check List--Revised*. San Diego, CA: Educational and Industrial Testing Service 1985.

Appendix A. Demographics Questionnaire

AGE: _____

1. GENDER: ___Male ___ Female

2. Do you smoke cigarettes? ___Yes ___No

   If yes, how many per day? _____

3. MARITAL STATUS:
   ___ Single
   ___ Married
   ___ Divorced
   ___ Widowed

4. If you are married, is your spouse currently employed? ___Yes ___No
   If yes, how many hours per week? _____

5. Do you have children? ___Yes ___No
   If yes, how many? ___
   How old are your children? _____
   Do your children live at the same residence as you? ___Yes ___No

6. Please indicate your highest level of education:
   ___ High School Diploma
   ___ Undergraduate Degree
   ___ Some graduate courses
   ___ Graduate Degree
   ___ Other

7. Do you have experience in public service? ___Yes ___No
   If yes, what type? _____
   How long? _____

8. Do you have experience with shift work? ___Yes ___No
   If yes, what shift do you typically work? _____
   How long have you been working your current shift? _____

9. How long have you been using a computer?

__Less than 1 year ___ 1-3 years ___4-6 years ___7-10 years ___10 years or more

10. How often do you use a computer?

___Daily ___Weekly ___Monthly ___Once or twice a year

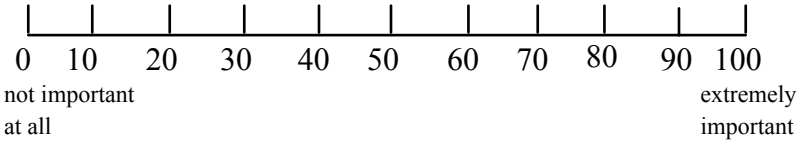
11. Do you have a computer in your house? ___Yes ___No

12. Do you use the computer to play games? ___Yes ___No

If yes, how often? ___Daily ___Weekly ___Monthly ___Once or twice a year

13. On the scale below, please rate how important the completion of the study requirements are to you.

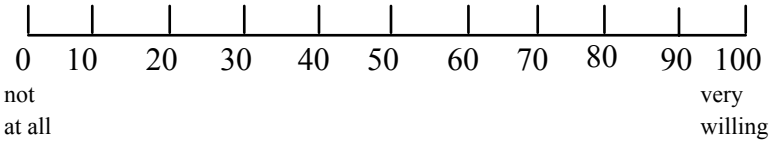
Rating = _____



Please explain why: _____

14. On the scale below, please rate how willing you are to participate in this study.

Rating = _____



Appendix B. Multiple Affect Adjective Checklist - Revised

1 ☐ active
2 ☐ adventurous
3 ☐ affectionate
4 ☐ afraid
5 ☐ agitated
6 ☐ agreeable
7 ☐ aggressive
8 ☐ alive
9 ☐ alone
10 ☐ amiable
11 ☐ amused
12 ☐ angry
13 ☐ annoyed
14 ☐ awful
15 ☐ bashful
16 ☐ bitter
17 ☐ blue
18 ☐ bored
19 ☐ ca
20 ☐ caut
21 ☐ cheerfu
22 ☐
23 ☐
24 ☐ con d
☐ ntra
26 ☐
27 ☐ cooperative
28 ☐ critical
29 ☐ cross
30 ☐ cruel
31 ☐ daring
32 ☐ desperate
33 ☐ destroyed
34 ☐ devoted
35 ☐ disagreeable
36 ☐ discontented
37 ☐ discouraged
38 ☐ disgusted
39 ☐ displeased
40 ☐ energetic
41 ☐ enraged
42 ☐ enthusiastic
43 ☐ fearful
44 ☐ fine

A
PA

45 ☐ fit
46 ☐ forlorn
47 ☐ frank
48 ☐ free
49 ☐ friendly
50 ☐ frighten
51 ☐ fur
52 ☐ lively
53
54 ☐ lad
55 ☐ my
56 ☐ good
☐ good-natured
☐ rrim
☐ ppy
60 ☐ healthy
☐ hopeless
62 ☐ hostile
63 ☐ impatient
64 ☐ incens
65 ☐ indignant
66 ☐ inspired
67 ☐ interested
☐ irrita d
☐ jealous
70 ☐ joyful
☐ kindl
☐ lo y
73 ☐ t
☐ loving
☐ low
76 ☐ lucky
77 ☐ mad
78 ☐ mean
79 ☐ meek
80 ☐ merry
81 ☐ mild
82 ☐ miserable
83 ☐ nervous
84 ☐ obliging
85 ☐ offended
86 ☐ outraged
87 ☐ panicky
88 ☐ patient

D
SS

H

89 ☐ peaceful
90 ☐ pleased
91 ☐ pleasant
92 ☐ polite
93 ☐ powerful
94 ☐ quiet
95 ☐ reckless
96 ☐ rejected
97 ☐ rough
98 ☐ sad
☐ sa
☐ sfied
☐ ecure
☐ shaky
☐ shy
104 ☐ soothed
☐ steady
☐ stubborn
107 ☐ stormy
108 ☐ strong
109 ☐ suffering
110 ☐ sullen
111 ☐ sunk
112 ☐ sympathetic
113 ☐ tame
114 ☐ tender
115 ☐ tense
116 ☐ terrible
117 ☐ terrified
118 ☐ thoughtful
119 ☐ timid
120 ☐ tormented
121 ☐ understanding
122 ☐ unhappy
123 ☐ unsociable
124 ☐ upset
125 ☐ vexed
126 ☐ warm
127 ☐ whole
128 ☐ wild
129 ☐ willful
130 ☐ wilted
131 ☐ worrying
132 ☐ young

SAMPLE ONLY
MAACL-R Stress Perception forms must be purchased from the Educational and Industrial Testing Service

INTENTIONALLY LEFT BLANK

Appendix C. Zuckerman-Kuhlman Personality Questionnaire

ZKPQ III

DIRECTIONS: On the following pages you will find a series of statements that persons might use to describe themselves. Read each statement and decide whether or not it describes you. Then mark each statement as either True (T) if you agree with the statement or if it describes you, or False (F) if you disagree with the statement or if it does not describe you. Answer every statement even if you are not entirely sure of your answer.

____ 1. I tend to begin a new job without much advance planning on how I will do it.

____ 2. I do not worry about unimportant things.

____ 3. I enjoy seeing someone I don't care for humiliated before other people.

____ 4. I never met a person that I didn't like.

____ 5. I do not like to waste time just sitting around and relaxing.

____ 6. I usually think about what I am going to do before doing it.

____ 7. I am not very confident about myself or my abilities.

____ 8. When I get mad, I say ugly things.

____ 9. I tend to start conversations at parties.

____ 10. I have always told the truth.

____ 11. It's natural for me to curse when I am mad.

____ 12. I do not mind going out alone and usually prefer it to being out in a large group.

____ 13. I lead a busier life than most people.

____ 14. I often do things on impulses.

____ 15. I often feel restless for no apparent reason.

____ 16. I almost never litter the streets with wrappers.

____ 17. I would not mind being alone in a place for some days without any human contacts.

____ 18. I like complicated jobs that require a lot of effort and concentration.

____ 19. I very seldom spend much time on the details of planning ahead.

____ 20. I sometimes feel edgy and tense.

____ 21. I almost never feel like I would like to punch or slap someone.

____ 22. I spend as much time with my friends as I can.

____ 23. I do not have a great deal of energy for life's more demanding tasks.

____ 24. I like to have new and exciting experiences and sensations even if they are a little frightening.

____ 25. My body often feels all tightened up for no apparent reason.

____ 26. I always win at games.

____ 27. I often find myself being "the life of the party."

____ 28. I like a challenging task much more than a routine one.

____ 29. Before I begin a complicated job, I make careful plans.

____ 30. I frequently get emotionally upset.

____ 31. If someone offends me, I just try not to think about it.

____ 32. I have never been bored.

____ 33. I like to be doing things all of the time.

____ 34. I would like to take off on a trip with no preplanned or definite routes or timetable.

____ 35. I tend to be oversensitive and easily hurt by thoughtless remarks and actions of others.

____ 36. In many stores you just cannot get served unless you push yourself in front of other people.

____ 37. I do not need a large number of casual friends.

____ 38. I can enjoy myself just lying around and not doing anything active.

____ 39. I enjoy getting into new situations where you can't predict how things will turn out.

____ 40. I never get lost, even in unfamiliar places.

____ 41. I am easily frightened.

____ 42. If people annoy me I do not hesitate to tell them so.

____ 43. I tend to be uncomfortable at big parties.

____ 44. I do not feel the need to be doing things all of the time.

____ 45. I like doing things just for the thrill of it.

____ 46. I sometimes feel panicky.

____ 47. When I am angry with people I do not try to hide it from them.

____ 48. At parties, I enjoy mingling with many people whether I already know them or not.

____ 49. I would like a job that provided a maximum of leisure time.

____ 50. I tend to change interests frequently.

____ 51. I often think people I meet are better than I am.

____ 52. I never get annoyed when people cut ahead of me in line.

____ 53. I tend to start my social weekends on Thursday evenings.

____ 54. I usually seem to be in a hurry.

____ 55. I sometimes like to do things that are a little frightening.

____ 56. Sometimes when emotionally upset I suddenly feel as if my legs are unsteady.

____ 57. I generally do not use strong words even when I am angry.

____ 58. I would rather "hang out" with friends rather than work on something by myself.

____ 59. When on vacation I like to engage in active sports rather than just lie around.

____ 60. I'll try anything once.

____ 61. I often feel unsure of myself.

____ 62. I can easily forgive people who have insulted me or hurt my feelings.

____ 63. I would not mind being socially isolated in some place for some period of time.

____ 64. I like to wear myself out with hard work or exercise.

____ 65. I would like the kind of life where one is on the move and traveling a lot, with lots of change and excitement.

____ 66. I often worry about things that other people think are unimportant.

____ 67. When people disagree with me I cannot help getting into an argument with them.

____ 68. Generally, I like to be alone so I can do things I want to do without social distractions.

____ 69. I never have any trouble understanding anything I read the first time I read it.

____ 70. I sometimes do "crazy" things just for fun.

____ 71. I often have trouble trying to make choices.

____ 72. I have a very strong temper.

____ 73. I have never lost anything.

____ 74. I like to be active as soon as I wake up in the morning.

____ 75. I like to explore a strange city or section of town by myself, even if it means getting lost.

____ 76. My muscles are so tense that I feel tired much of the time.

____ 77. I can't help being a little rude to people I do not like.

____ 78. I am a very sociable person.

____ 79. I prefer friends who are excitingly unpredictable.

____ 80. I often feel like crying sometimes without a reason.

____ 81. No matter how hot or cold it gets, I am always quite comfortable.

____ 82. I need to feel that I am a vital part of a group.

____ 83. I like to keep busy all the time.

____ 84. I often get so carried away by new and exciting things and ideas that I never think of

possible complications.

____ 85. I don't let a lot of trivial things irritate me.

____ 86. I am always patient with others even when they are irritating.

____ 87. I usually prefer to do things alone.

____ 88. I can enjoy routine activities that do not require much concentration or effort.

____ 89. I am an impulsive person.

____ 90. I often feel uncomfortable and ill at ease for no real reason.

____ 91. I often quarrel with others.

____ 92. I probably spend more time than I should socializing with friends.

____ 93. It doesn't bother me if someone takes advantage of me.

____ 94. When I do things, I do them with lots of energy.

____ 95. I like "wild" uninhibited parties.

____ 96. After buying something I often worry about having made the wrong choice.

____ 97. When people shout at me, I shout back.

____ 98. I have more friends than most people do.

____ 99. Other people often urge me to "take it easy."

END OF THIS FORM - THANK YOU

INTENTIONALLY LEFT BLANK

Appendix D. The Need for Cognitive Structure Scale

Directions: Choose one rating for each statement.

1. I feel better when everything is in its own place.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

2. People who appear to be uncertain about various things make me feel uneasy.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

3. It is unpleasant for me to enter a situation without knowing what to expect from it.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

4. I don't like to work on a problem that does not have a clear-cut solution.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

5. I prefer things to be predictable and certain.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

6. I always felt that there is a clear difference between what is right and what is wrong.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

7. I cannot enjoy a movie when I am unclear about the director's purpose.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

8. It irritates me to listen to someone who cannot make up his/her mind.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

9. I don't like to dwell on hypothetical situations.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

10. It annoys me when something unexpected disturbs my daily routine.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

11. I get very disturbed when forced to put aside an unfinished task.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

12. I feel uneasy when I am in the company of people whose behavior I can't understand.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

13. I feel more comfortable in a situation when the rules are clear and well defined.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

14. It bothers me when I doubt my beliefs.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

15. I don't like modern paintings in which I don't know what the painter meant.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

16. In order to prepare a good dish it is absolutely essential to follow the recipe exactly.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

17. I hate to change my plans at the last moment.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

18. I think every problem has a clear-cut solution.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

19. If I were a scientist, it would bother me that my work would never be completed (because in science new things come up all the time).

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

20. I can't enjoy my life when I do not have a stable routine.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

INTENTIONALLY LEFT BLANK

Appendix E. The Ability to Achieve Cognitive Structure Scale

Directions: Choose one rating for each statement.

1. I tend to delay making important decisions until the last possible moment and even then I continue to be troubled by it.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

2. It takes me a long time before I commit myself to interpersonal relationships, because I can never be sure enough of the other persons attitude towards me.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

3. My work is usually carefully planned and well organized.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

4. I have no problem in meeting deadlines.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

5. Even if I make notes of things I have to do, it is hard for me to act upon them.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

6. I've always adopted a very structured way of life.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

7. I tend to hesitate when I have to make an important decision even after thinking a lot about it.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

8. Sometimes I am irritated by my hesitation to make a decision.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

9. I seldom doubt my own beliefs.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

10. Even after I have reached a decision, I continue to think about the pros and cons in order to make sure that I did not make a mistake.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

11. When I find myself involved in a decision, I often do not commit myself to any point of view in case I might be wrong.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

12. Usually, I don't have second thoughts after making a decision.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

13. I find myself avoiding new experiences but I am not comfortable with sticking to the known and experienced.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

14. I frequently feel that time just melts away.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

15. Sometimes I hesitate to commit myself out of fear of making a mistake.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

16. It is easy for me to create a steady routine in my life.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

17. I often experience stress when I have to reach a clear-cut decision.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

18. Even if I finish my exam early, I stay until the end in case I change my mind.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

19. Even when I am bothered by a decision I should make, it is hard for me to make up my mind and free myself from the hassle.

1	2	3	4	5
Strongly	Disagree	Neither Agree	Agree	Strongly

20. It is often hard for me to decide about relatively simple things, such as how to dress or what to order in a restaurant.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

21. Even in new situations I don't need many cues in order to decide what is the appropriate social behavior.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

22. I do not tend to 'dwell' on important decisions before making them.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

23. Sometimes it is difficult for me to decide between two possibilities with similar chances of success or failure.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

24. Rarely do I put something somewhere and cannot find it later.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

Appendix F. The Uncertainty Response Scale

Directions: Please rate each statement as it relates to you.

1. I tend to give up easily when I don't clearly understand a situation.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

2. When I go shopping, I like to have a list exactly of what I need.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

3. I feel better about myself when I know that I have done all I can to accurately plan my future.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

4. Sudden changes make me feel upset.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

5. When making a decision, I am deterred by the fear of making a mistake.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

6. When uncertain, I act very cautiously until I have more information about the situation.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

7. I like to have things under control.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

8. When the future is uncertain, I generally expect the worst to happen.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

9. Facing uncertainty is a nerve-wracking experience.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

10. I get worried when a situation is uncertain.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

11. Thinking about uncertainty makes me feel depressed.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

12. I find the prospect of change exciting and stimulating.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

13. Uncertainty frightens me.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

14. There is something exciting about being kept in suspense.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

15. The idea of taking a trip to a new country fascinates me.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

16. I like going on holidays with nothing planned in advance.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

17. I think you have to be flexible to work effectively.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

18. Taking chances is part of life.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

19. When I feel uncertain about something, I try to rationally weigh up all the information I have.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

20. Before making any changes, I need to think things over thoroughly.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

21. I prefer to stick to tried and tested ways of doing things.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

22. I like to have my weekends planned in advance.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

23. I feel curious about new experiences.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

24. I like to think of a new experience in terms of a challenge.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

25. A new experience is an occasion to learn something new.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

26. When I feel a situation is unclear, I try to do my best to resolve it.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

27. I like to know exactly what I'm going to do next.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

28. When facing an uncertain situation, I tend to prepare as much as possible, and then hope for the best.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

29. I feel relieved when an ambiguous situation suddenly becomes clear.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

30. When I feel uncertain, I try to take decisive steps to clarify the situation.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

31. When I can't clearly discern situations, I get apprehensive.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

32. I enjoy finding new ways of working out problems.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

33. When I'm not certain about someone's intentions towards me, I often become upset or angry.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

34. New experiences can be useful.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

35. When uncertain about what to do next, I tend to feel lost.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

36. I feel anxious when things are changing.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

37. New experiences excite me.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

38. I think variety is the spice of life.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

39. I try to have my life and career clearly mapped out.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

40. I think a mid-life career change is an exciting idea.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

41. When a situation is unclear, it makes me feel angry.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

42. I enjoy unexpected events.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

43. I like things to be ordered and in place, both at work and at home.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

44. I really get anxious if I don't know what someone thinks about me.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

45. I easily adapt to novelty.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

46. I am hesitant when it comes to making changes.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

47. I like to plan ahead in detail rather than leaving things to chance.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

48. Before I buy something, I have to view every sample I can find.

1	2	3	4	5
Never	Sometimes	Now and Then	Often	Always

INTENTIONALLY LEFT BLANK

Appendix G. Daily Log

Instructions: Please complete page one prior to the start of your shift. Complete page two during your shift. At the end of your shift, complete the Multiple Affect Adjective Checklist. When you are finished filling out all the questionnaires, place them back into the envelope and seal it.

Participant # _____
Date: _____
Shift: ____ Day ____ Evening ____ Midnight

Day in Shift: Monday Tuesday Wednesday Thursday Friday Saturday Sunday

Day: 1 2 3 4 5

Work Team: ____ Fire ____ Police

How many hours of sleep did you have in the past 24 hours? ____

On a scale from 1 to 10, how confident are you in your ability to deal with today's experiences?

Please circle one of the numbers below:

1 2 3 4 5 6 7 8 9 10

Not at all confident — Extremely confident

Circle the number for the statement that best describes how sleepy or awake you are right now.

1 - Feeling active and vital; alert; wide awake
2 - Functioning at a high level, but not at peak; able to concentrate
3 - Relaxed; awake; not at full alertness; responsive
4 - A little foggy; not at peak; let down
5 - Fogginess; beginning to lose interest in remaining awake; slowed down
6 - Sleepiness; prefer to be lying down; fighting sleep; woozy
7 - Almost in reverie; sleep onset soon; lost struggle to remain awake

	Time	Breaks (When, How Long?)	Food (When, What)
0-2 Hours Into Shift			
2-4 Hours Into Shift			
4-6 Hours Into Shift			
6-End of Shift			

***Reminder:** Complete the MAACL-R at the beginning and end of your shift

Appendix H. Volunteer Agreement Affidavit

VOLUNTEER AGREEMENT AFFIDAVIT:
ARL-HRED Local Adaptation of DA Form 5303-R. For use of this form, see AR 70-25 or AR 40-38

The proponent for this research is:	**U.S. Army Research Laboratory** **Human Research and Engineering Directorate** **Aberdeen Proving Ground, MD 21005**

Authority:	Privacy Act of 1974, 10 U.S.C. 3013, [Subject to the authority, direction, and control of the Secretary of Defense and subject to the provisions of chapter 6 of this title, the Secretary of the Army is responsible for, and has the authority necessary to conduct, all affairs of the Department of the Army, including the following functions: (4) Equipping (including research and development), 44 USC 3101 [The head of each Federal agency shall make and preserve records containing adequate and proper documentation of the organization, functions, policies, decisions, procedures, and essential transactions of the agency and designed to furnish the information necessary to protect the legal and financial rights of the Government and of persons directly affected by the agency's activities]
Principal purpose:	To document voluntary participation in the Research program.
Routine Uses:	The SSN and home address will be used for identification and locating purposes. Information derived from the project will be used for documentation, adjudication of claims, and mandatory reporting of medical conditions as required by law. Information may be furnished to Federal, State, and local agencies.
Disclosure:	The furnishing of your SSN and home address is mandatory and necessary to provide identification and to contact you if future information indicates that your health may be adversely affected. Failure to provide the information may preclude your voluntary participation in this data collection.

Part A • Volunteer agreement affidavit for subjects in approved Department of Army research projects

Note: Volunteers are authorized medical care for any injury or disease that is the direct result of participating in this project (under the provisions of AR 40-38 and AR 70-25).

Title of Research Project:	Cognitive Uncertainty and Work Shifts in a Real-World Multitask Environment	
Human Use Protocol Log #	**ARL-20098-03026**	
Principal Investigator:	Keryl A. Cosenzo, Ph. D U.S. Army Research Laboratory Soldier Performance Division Cognitive Sciences Branch	Phone: 410-278-2946 E-Mail: kcosenzo@arl.army.mil
Associate Investigator(s)	Teresa A. Branscome U.S. Army Research Laboratory Soldier Performance Division Cognitive Sciences Branch	Phone: 410-278-5951 410-278-5987 E-Mail: tbransco@arl.army.mil lfatkin@arl.army.mil
Location of Research:	Aberdeen Proving Ground, MD	
Dates of Participation:	June 2003 – September 2003	

Date of preparation of current version: 16 May 2003
Date of Human Use Committee Review: 14 May 2003
Expiration Date: TBD

_____ _____
Volunteer Initials Investigator Initials

Part B • To be completed by the Principal Investigator

Note: Instruction for elements of the informed consent provided as detailed explanation in accordance with Appendix C, AR 40-38 or AR 70-25.

Purpose of the Research

You are being asked to volunteer in a research project that will examine the effect of work shifts and individual personality differences on performance in the Harford County Emergency Operations Center. Information gathered from this study will be used in subsequent research endeavors and will contribute to development of standards for the U.S. Army Objective Force. Further it will contribute to improving your work environment.

Results from this study will be presented, as a briefing and final report, to the management of the Harford County EOC. This information will be depicted as "average response" across individuals. No information will be provided to the EOC about an individual dispatcher.

Procedures

If you agree to participate in this study, you will be asked to sign this Volunteer Agreement Affidavit. You will then complete the following questionnaires. The demographics questionnaire requests information regarding age, gender, family status, public safety service and computer experience. The Multiple Affect Adjective Checklist contains a list of adjectives and you will be asked to check all the words that describe how you "generally" feel. The Zuckerman-Kuhlman Personality Questionnaire-Form III will be administered to identify different aspects of personality. The Polychronicity Scale will be used to determine the extent to which you prefer working on several tasks at once. You will complete the Situational Self-Efficacy Scale, in which you will be asked to rate (from 1 to 10) your level of confidence in your ability to do well. Lastly you will complete the Need For Cognitive Structure Scale, the Need for Cognitive Structure and the Uncertainty Response Scale which will assess how you cope with uncertainty. These questionnaires are being used to better understand how personality characteristics impact on performance. Completion of these questionnaires will take less than thirty minutes.

The Harford County Emergency Operations Center will provide us with details regarding the calls you take during your shift. Your names will be eliminated from this data and replaced with your participant identification number.

After you complete the questionnaires, you will be given a blank Daily Log. The experimenter will explain to you how to complete the log during your shift. The Daily Log and the Multiple Affect Adjective Checklist will be placed in an envelope with your identification number on it. On each day of your shift, you will complete the Daily Log and the Today Form of the Multiple Affect Adjective Checklist at the beginning and end of your shift. At the end of your shift you will place the completed Daily Log and Multiple Affect Adjective Checklist back into the envelope and seal it. The experimenter will collect the envelope. Completion of these questionnaires will take less than ten minutes.

Benefits

You will receive the personal satisfaction of providing valuable information to the Army cognitive sciences research and you will be contributing to the improvement your work environment.

Risks

The risks that may be encountered during this study are typical of the everyday risks that you may encounter while performing your job as a dispatcher.

Date of preparation of current version: 16 May 2003
Date of Human Use Committee Review: 14 May 2003
Expiration Date: TBD

_____ _____
Volunteer Initials Investigator Initials

Confidentiality

All data and information obtained about you will be considered privileged and held in confidence. All data and information will be recorded using a participant identification number and the Principal Investigator will keep your assigned volunteer identifier code in a locked cabinet. In order to ensure that your data will not be reported or revealed to anyone, each form will be reviewed upon receipt by one of the investigators. If any identifying information appears on the questionnaires (such as name, social security number, birth date, etc.), the investigators will delete the identifying information and replace it with a neutral code number. Complete confidentiality cannot be promised, particularly if you are a military service member, because information bearing on your health may be required to be reported to appropriate medical or command authorities. In addition, applicable regulations note the possibility that the U.S. Army Medical Research and Materiel Command (MRMC-RCQ) officials may inspect the records.

Disposition of Volunteer Agreement Affidavit

The Principal Investigator will retain the original signed Volunteer Agreement Affidavit and forward a photocopy of it to the Chair of the Human Use Committee after the data collection. The Principal Investigator will provide a copy of the signed and initialed Affidavit to you.

Contacts for Additional Assistance

If you have questions concerning your rights on research-related injury, or if you have any complaints about your treatment while participating in this research, you can contact:

Chair, Human Use Committee
U.S. Army Research Laboratory
Human Research and Engineering Directorate
Aberdeen Proving Ground, MD 21005

(410) 278-4152 or (DSN) 298-4152

OR

Office of the Chief Counsel
U.S. Army Research Laboratory
2800 Powder Mill Road
Adelphi, MD 20783-1197

(301) 394-1070 or (DSN) 290-1070

I do hereby volunteer to participate in the research project described in this document. I have full capacity to consent and have attained my 18th birthday. The implications of my voluntary participation, duration, and purpose of the research project, the methods and means by which it is to be conducted, and the inconveniences and hazards that may reasonably be expected have been explained to me. I have been given an opportunity to ask questions concerning this research project. Any such questions were answered to my full and complete satisfaction. Should any further questions arise concerning my rights or project related injury, I may contact the **ARL-HRED Human Use Committee Chairperson at Aberdeen Proving Ground, Maryland, USA by telephone at 410-278-4152.**I understand that any published data will not reveal my identity. If I choose not to participate, or later wish to withdraw from any portion of it, I may do so without penalty.

Printed Name Of Volunteer (First, MI., Last)	
Social Security Number (SSN)	Permanent Address Of Volunteer
Date Of Birth (Month, Day, Year)	
Today's Date (Month, Day, Year)	
Signature Of Administrator	***Signature Of Volunteer***

Appendix I. Categorization Questionnaire

The individual phone calls were placed into one of eleven categories (See the Attached Spreadsheet). The categories were combined to create three major categories. The categories were the following:

Fire Calls: Fire with Rescue + Fire + Noxious Materials

Police Calls: Motor Vehicle + Police Business + Police Confrontation + Property + Miscellaneous

Emergency Calls (Victim Related) = Illness/Injury + Violent Trauma + Child/ Domestic

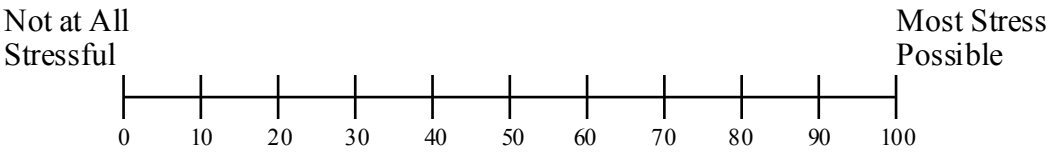
1. Are the groupings above a logical representation of the call types? **Yes or No**

2. If not, based on the original eleven categories, **how would you group them**?
   Please do not include any more than four major categories. These categories can be renamed if necessary.

-

3. Please review the eleven categories on the excel spreadsheet and rate the degree of stressfulness for each category.

The scale below represents a range of how stressful an event might be. Use this scale to rate how much stress you would typically experience during each call category. Write the number on the space provided below.



Category 1 (Illness/Injury): _____

Category 2 (Violent Trauma): _____

Category 3 (Child/Domestic): _____

Category 4 (Motor Vehicle): _____

Category 5 (Police Business): _____

Category 6 (Police Confrontation): _____

Category 7 (Property): _____

Category 8 (Fire with Rescue): _____

Category 9 (Noxious Materials): _____

Category 10 (Fire): _____

Category 11 (Miscellaneous): _____

Appendix J. Call Categories

(1) ILLNESS/INJURY	(2) VIOLENT TRAUMA	(3) CHILD/DOMESTIC
ABDOMINAL PAIN	GUNSHOT WOUND	ANIMAL BITE/
ALLERGIC REACTION	PSYCH/SUICIDE	ANIMAL COMPLAINT
BACK PAIN	RAPE/ATTEMPTED	ASSUALT
BURNS	STABBING	ASSULT & BATTE
CARDIAC ARREST	SUIC/ATTEMPT	CDS VIOLATION
CHEST PAIN		CHILD ABUSE
CHOKING		CHILD SEX OFFENDER/REGIST
HOSPITAL TO HOSPITAL		CIVIL DISPUTE
CPR ASSIST		DOMESTIC/VERBAL OCC
DIABETIC		FAIL TO PAY
ELECTROCUTION		HARASSMENT
EXPOSURE		JUV COMPL
HEMM/LACERATIO		MISSING PERSON
EYE INJURIES		MISSING/JUVENILE
FALL		CHILD NEGLECT
HEADACHE		A/B NO WEAPON
HEART PROBLEM		
INHALATION		
LIFTING ASSIST		
MANPOWER ASSIST		
MISCARRIAGE		
OVERDOSE		
POISONING		
PREGNANCY		
RESPIRATORY		
SEIZURE		
SICK PERSON		
STROKE		
TRAUMA		
UNATTENDED DEATH		
UNCONCIOUS		
UNKNOWN MEDICAL		

(4) MOTOR VEHICLE	(5) POLICE BUSINESS	(6) POLICE CONFRONTATION
ASST MOTORIST	ASSIST AGENCY	ASSIST POLICE
DUI	CFS TRANS TO HCSO FR MS	DISORDERLY COND
M/V ABAND	CHECK WELL BEING	FORGERY/COUNTE
M/V LOCKOUT	DETAIL	FUGITIVE
M/V TAMPERING	EMERGENCY PETITION	INVESTIGATION
M/V UNAUTH USE	ESCORT	PERS INJURY
MOTOR VEHICLE THEFT	EVICTION	PERSONATING PO
MVA	EXPARTE	SEX OFFENSE
OFF RD M/V VIOL	FRAUD	SHOTS FIRED
PARK VIOL	LOCKOUT	SOLIC TRADE
RADAR	LOOKOUT	SUBJ STOP
ROAD HZ	NOTIFCATION	SUSP ACTIVITY
SMART TRAILER	PATROL REQ	TELEPHONE MIS
TRAFF CONTROL	POLICE INFO	VAGRANCY
TRAFFIC OFFENS	PRISONER TRNS	DRUNKENESS
TRAFFIC OFFENSE/NO OFF RO	PROTECTIVE	TARGET SHOOTING
VEHICLE STOP	SEARCH WARR	INDECENT EXPOSURE
MVA RESCUE	SEIZURE	PROSTITUTION
	SERV WARR	SUSPICIOUS CONDUCT
	SUMMONS SERV	PARTY COMPLAINT
	FOOT PATROL	
	PEACE ORDER	
	BANNING LETTER	
	MAIL VIOLATION	

(7) PROPERTY	(8) FIRE W/RESCUE	(9) NOXIOUS MATERIALS	(10) FIRE	(11) MISC
A&B (NO WEAPON)	FIRE W/RESCUE	GAS ODOR INSID	APARTMENT FIRE	911 HANGUP
ALARM BURG COMMERCIAL	NEAR DROWNING	GAS ODOR OUTSIDE	AUTO FIRE	ALL OTHER
ALARM BURG RESIDENTIAL	AIRCRAFT DOWN	HAZ CHEMICALS	BLDG FIRE	CANCEL DISPATCH
ALARM HOLD UP	RESCUE NO MVA	INDUS MACHINE	BOAT FIRE	MISCELLANEOUS
ALARM OTHER	WATER/BASEMENT	HAZ NO CHEMICALS	CHIMNEY FIRE	WIRES/POLES
AUTOMATIC ALARM		FUEL SPILL	DWELLING FIRE	
BURGLARY (OCC)			FIELD/WOOD FIRE	
TRESPASS			FIRE ALARM	
BUSINESS CHECK			FIREWORKS VIOL	
H&R/PROP DAM			MUTUAL AID	
NOISE COMPL			OPENBURNING	
PROP DAM/HCSO			TRASH FIRE	
TRASH DUMPING			TRUCK FIRE	
PROP DAMAGE			ARSON	
PROPERTY LOST				
ROBBERY				
THEFT				
VANDALISM				

Appendix K. Table of Means and Standard Error of the Mean

Table K-1. Mean (standard error of the mean) call times for low and high need for cognitive structure and ability to achieve cognitive structure groups during emergency, police, and fire calls

Need for Cognitive Structure	Ability to Achieve Cognitive Structure	Emergency	Police	Fire
Low	Low	116.76 (7.91)	94.60 (10.83)	99.43 (11.81)
	High	103.11 (4.97)	80.75 (5.97)	80.28 (8.62)
High	Low	86.84 (6.67)	57.26 (5.67)	71.23 (8.86)
	High	93.55 (13.04)	67.45 (10.95)	94.72 (19.49)

Table K-2. Mean (standard error of the mean) call times for low and high groups on the uncertainty response subscales during emergency, police, and fire calls

Emotional Uncertainty:

Emotional Uncertainty	Emergency	Police	Fire
Low	105.40 (4.66)	81.61 (5.29)	83.61 (7.80)
High	93.14 (5.33)	66.03 (5.54)	81.48 (7.47)

Desire for Change:

Desire for Change	Emergency	Police	Fire
Low	101.66 (5.51)	75.72 (5.50)	88.21 (8.82)
High	98.40 (4.46)	75.04 (5.54)	77.66 (6.49)

Cognitive Uncertainty:

Cognitive Uncertainty	Emergency	Police	Fire
Low	109.27 (4.82)	80.80 (5.33)	88.10 (8.60)
High	90.34 (4.92)	69.01 (5.71)	76.79 (6.28)

Table K-3. Mean (standard error of the mean) reported self efficacy for low and high need for cognitive structure and ability to achieve cognitive structure groups

Need for Cognitive Structure	Ability to Achieve Cognitive Structure	Self-Efficacy
Low	Low	8.47 (.11)
	High	9.13 (.17)
High	Low	7.51 (.20)
	High	8.74 (.26)

Table K-4. Mean (standard error of the mean) reported positive affect for low and high need for cognitive structure and ability to achieve cognitive structure groups

Need for Cognitive Structure	Ability to Achieve Cognitive Structure	Positive Affect
Low	Low	57.56 (1.72)
	High	51.85 (1.21)
High	Low	45.92 (.70)
	High	52.85 (1.83)

Table K-5. Mean (standard error of the mean) reported self-efficacy for low and high groups on the uncertainty response subscales

Emotional Uncertainty:

Emotional Uncertainty	Self-Efficacy
Low	9.05 (.13)
High	7.90 (.15)

Desire for Change:

Desire for Change	Self- Efficacy
Low	7.97 (.15)
High	9.00 (.13)

Cognitive Uncertainty:

Cognitive Uncertainty	Self-Efficacy
Low	8.40 (.15)
High	8.55 (.15)

Table K-6. Mean (standard error of the mean) reported positive affect for low and high groups on the uncertainty response subscales

Emotional Uncertainty:

Emotional Uncertainty	Positive Affect
Low	52.68 (1.06)
High	49.89 (.92)

Desire for Change:

Desire for Change	Positive Affect
Low	53.49 (1.10)
High	48.83 (.78)

Cognitive Uncertainty:

Cognitive Uncertainty	Positive Affect
Low	53.09 (1.08)
High	49.47 (.88)

NO. OF COPIES ORGANIZATION

* ADMINISTRATOR
DEFENSE TECHNICAL INFO CTR
ATTN DTIC OCA
8725 JOHN J KINGMAN RD STE 0944
FT BELVOIR VA 22060-6218
*pdf file only

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN IMNE ALC IMS MAIL & REC MGMT
2800 POWDER MILL RD
ADELPHI MD 20783-1197

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL CI OK TL TECH LIB
2800 POWDER MILL RD
ADELPHI MD 20783-1197

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR M DR M STRUB
6359 WALKER LANE SUITE 100
ALEXANDRIA VA 22310

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MA J MARTIN
MYER CENTER RM 2D311
FT MONMOUTH NJ 07703-5630

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MC A DAVISON
320 MANSCEN LOOP STE 166
FT LEONARD WOOD MO 65473-8929

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MD T COOK
BLDG 5400 RM C242
REDSTONE ARSENAL AL 35898-7290

1 COMMANDANT USAADASCH
ATTN ATSA CD
ATTN AMSRD ARL HR ME MS A MARES
5800 CARTER RD
FT BLISS TX 79916-3802

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MI J MINNINGER
BLDG 5400 RM C242
REDSTONE ARSENAL AL 35898-7290

NO. OF COPIES ORGANIZATION

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MM DR V RICE
BLDG 4011 RM 217
1750 GREELEY RD
FT SAM HOUSTON TX 78234-5094

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MG R SPINE
BUILDING 333
PICATINNY ARSENAL NJ 07806-5000

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MH C BURNS
BLDG 1002 ROOM 117
1ST CAVALRY REGIMENT RD
FT KNOX KY 40121

1 ARMY RSCH LABORATORY - HRED
AVNC FIELD ELEMENT
ATTN AMSRD ARL HR MJ D DURBIN
BLDG 4506 (DCD) RM 107
FT RUCKER AL 36362-5000

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MK MR J REINHART
10125 KINGMAN RD
FT BELVOIR VA 22060-5828

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MV HQ USAOTC
S MIDDLEBROOKS
91012 STATION AVE ROOM 111
FT HOOD TX 76544-5073

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MY M BARNES
2520 HEALY AVE STE 1172 BLDG 51005
FT HUACHUCA AZ 85613-7069

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MP D UNGVARSKY
BATTLE CMD BATTLE LAB
415 SHERMAN AVE UNIT 3
FT LEAVENWORTH KS 66027-2326

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR M DR B KNAPP
ARMY G1 MANPRINT DAPE MR
300 ARMY PENTAGON ROOM 2C489
WASHINGTON DC 20310-0300

NO. OF COPIES ORGANIZATION

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MJK MS D BARNETTE
JFCOM JOINT EXPERIMENTATION J9
JOINT FUTURES LAB
115 LAKEVIEW PARKWAY SUITE B
SUFFOLK VA 23435

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MQ M R FLETCHER
US ARMY SBCCOM NATICK SOLDIER CTR
AMSRD NSC SS E BLDG 3 RM 341
NATICK MA 01760-5020

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MT DR J CHEN
12350 RESEARCH PARKWAY
ORLANDO FL 32826-3276

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MS MR C MANASCO
SIGNAL TOWERS RM 303A
FORT GORDON GA 30905-5233

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MU M SINGAPORE
6501 E 11 MILE RD MAIL STOP 284
BLDG 200A 2ND FL RM 2104
WARREN MI 48397-5000

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MF MR C HERNANDEZ
BLDG 3040 RM 220
FORT SILL OK 73503-5600

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MW E REDDEN
BLDG 4 ROOM 332
FT BENNING GA 31905-5400

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MN R SPENCER
DCSFDI HF
HQ USASOC BLDG E2929
FORT BRAGG NC 28310-5000

1 DR THOMAS M COOK
ARL-HRED LIAISON
PHYSICAL SCIENCES LAB
PO BOX 30002
LAS CRUCES NM 88003-8002

NO. OF COPIES ORGANIZATION

ABERDEEN PROVING GROUND

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL CI OK (TECH LIB)
BLDG 4600

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL CI OK TP S FOPPIANO
BLDG 459

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL HR MR
F PARAGALLO
BLDG 459

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL HR SE L PIERCE
BLDG 459

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL HR SE D HEADLEY
BLDG 459

4 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL HR SE
K COSENZO (2 CYS)
L FATKIN T BRANSCOME
BLDG 459