



A META-ANALYSIS OF QUESTIONNAIRE
RESPONSE RATES IN MILITARY SAMPLES

THESIS

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Abstract

The purpose of this research was to examine if factors related to questionnaire response rate in the general public also affect response rate in military-only samples. Very little research pertaining to this specific group was located during the literature review. Four response rate factors taken from studies conducted in the general public were selected for this research topic: questionnaire length, questionnaire delivery mode (postal, e-mail, web-based, direct administration, and mixed mode), use of advance notices, and use of follow-up reminders. Data were gathered for a meta-analysis of 73 previously published studies which utilized a survey or questionnaire to collect data from a military-only sample. After the data were analyzed, only two response rate factors produced significant results for this study: survey length and survey delivery mode. Results were discussed, and recommended research areas and conclusions are given.

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To my wife and sons

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Michael R. Parrish

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I. Introduction

Background

A well-known reality of our current society is that consumers are frequently surveyed by government agencies and commercial entities to better understand consumer attitudes, likes, dislikes, feelings, etc. However, somewhat lesser understood is the value these organizations place on survey data; for example, survey data are so important to the U.S. Census Bureau that the agency allocated an advertising budget of \$167 million in order to promote public awareness of the year 2000 decennial census (McCarthy & Beckler, 2000). The Census Bureau requires this census data in order to achieve their strategic goal, despite facing budgetary constraints and a possible overall decline in census response (U.S. Census Bureau, 2006). Regardless of these constraints, the survey process and the data are important: the census itself is mandated by the U.S. Constitution, and census data are utilized by the federal government to allocate over \$200 billion of federal funds each year (U.S. Census Bureau, 2006).

On a more personal level, our daily interaction with media sources such as the Internet and television broadcasts are replete with survey results from CNN and USA Today surveys, Gallup polls, and Nielsen ratings. In some cases, the desired data are so important to the organization that top leaders make personal endorsements in an attempt to increase participation among its members. For instance, General Moseley, the Chief of

Staff of the Air Force, recently requested participation for the Air Force Climate Survey, specifically asking for “direct, honest, and candid inputs with the goal of making our Air Force even better”, and further emphasizing, “Your frank comments about our common Air Force culture are key to our future success” (2006). While such high-visibility surveys are more notable, there are likely vast quantities of surveys administered at various lower levels within organizations. For instance, at the squadron level, commanders may request a local climate assessment survey to be issued to squadron members to gauge issues pertaining to their respective squadrons (Figlock, 2004). Post-graduate students and other researchers may use surveys in order to gather pertinent information for their respective research topics.

Given these familiar examples, which are not exhaustive by any means, one can easily appreciate a cost which might be associated with obtaining such data: although useful and familiar, surveys incur some type of cost to the developer and user of the survey, and developers must keep within their limited resources (Groves, 1990). In fact, organizations spend considerable resources to develop and distribute surveys in an attempt to maximize survey responses to ensure representative samples are collected (Groves, 1990). It is reasonable to assume that organizational leaders expect some return on this investment into the survey process because this data may be used to make decisions which could positively or negatively impact the performance of the organization. For example, if a survey generates a low response rate or non-response rate, the results may render a non-statistically representative sample, thus wasting organizational resources (Groves, 1990; Porter, 2004). Therefore, one goal of organizations which utilize a survey tool is to maximize survey response rate in order to

increase their return on resources invested into the survey process, with the ultimate goal of improving organizational performance (Karrasch, 2003).

Surveys have been extensively studied (Dillman, 1978; Steeh, 1981) and as a result, researchers have learned much about how survey characteristics can influence response rates (Dillman, 2000; Cychota & Harrison, 2006; Groves, 1990; Porter, 2004; Roth & BeVier, 1998; Simsek & Veiga, 2001). However, despite an increasing level of knowledge of the factors affecting survey response rates, researchers continue to struggle with decreasing response rates as indicated by a decline during a 10-year period from 1990-1999 (Atrostic, Bates, Burt, Silberstein & Winters, 1999; Baruch, 1999; de Heer, 1999); further, response rates may have been on a decline from as far back as 1952 (Steeh, 1981). In fact, some companies which rely on customer feedback have been forced to offer monetary incentives to increase response rate; in 2002, Singer and Kulka (citing James & Bolstein, 1992) reported a \$1 incentive to be the most cost effective, but reported values increased to a few dollars (Goritz, 2004), all the way to a drastic example for highly desirable data (e.g., \$5), especially within certain population demographics, such as young adults and small ethnic groups (Charlebois, 2006).

Other factors complicate the issue of survey response rate. First, most survey studies sampled almost entirely from only a few general population types: students/academia, the consumer marketplace, and civilian organizations (Baruch, 1999; Simsek & Veiga, 2001; Porter, 2004). Second, although a few studies (Cole, 2005; MacElroy, Milucki, & McDowell, 2002; Franke, 2001) researched the effect of delivery mode (e.g., postal mail, e-mail, web-based) on survey response rate, contradictory results were frequently presented; typically, the focus was on one delivery mode against another

delivery mode instead of examining the overall effect of multiple modes to determine the optimal delivery mode (or modes) to improve survey response rate. Last, military organizations were rarely identified as a potential population for significant survey analysis (Roth & BeVier, 1998; Asiu, Antons & Fultz, 1998). Given the overall trend of declining response rates and the almost non-existent research on response rates related to military-only populations, this topic appears to be an area which warrants further study.

Problem Statement

The literature review revealed a general lack of research pertaining to survey response rate in military-only populations. This void of research may be significant. First, some of the factors affecting survey response rate may not apply to a military-only population. For example, while monetary incentives (such as cash or redeemable bonus points) have been utilized in the consumer marketplace, this type of incentive is not typically seen in a military-only survey (Goritz, 2004). Second, during these times of decreasing Department of Defense budgets and implementation of “Force Shaping” reduction in force measures by the military, the requirement exists to retrieve as much information as possible from a shrinking military personnel pool. Last, some branches of the military and programs within the military require use of surveys. For example, Army Regulation 600-20, dated 07 June 2006, requires a unit climate assessment be completed within 90 days following a change of command. If conducting a survey is a regulation-driven requirement, and the goal is to receive quality and quantity of responses, perhaps further investigation into the survey process for military populations might be beneficial. Also, military students participating in post-graduate degree programs or professional military education programs frequently utilize survey data collection as part of their

education and research process. For these reasons, the factors affecting survey response rate on military-only population will be the focus of this thesis research.

After reviewing the literature, many factors were found to increase survey response rate in general populations. The hypothesis statements will postulate how certain response rate factors may potentially influence military-only populations. Factors such as survey length, mode of survey delivery, and utilization of advance notices and follow-up reminders (all previously identified in the literature as factors affecting response rate) will be tested.

Given that the military seems to be an underutilized survey population for survey response rates, by using published research studies of survey response rate factors, a meta-analysis will be performed by examining factors influencing survey response rate with respect to a military population. Electronic databases will be searched for any published research articles which utilized a survey or questionnaire to gather information in a military-only population. A matrix will be developed to show the previously identified survey response factors as compared against each individual study, annotating the existence of each unique factor (or factors) referenced in each specific published research (each treated as one “case.”) The data will then be evaluated via regression analysis in order to show the relative importance of the factors selected for this research. Once the results have been analyzed, the goal of this research is to highlight certain response rate factors which may improve response rates for military-only populations. At the local level, this information may be useful to students at the Air Force Institute of Technology when generating surveys and questionnaires as part of their data gathering process for their respective research areas. At a higher level, the results might help

development of squadron climate assessment surveys with the goal of increasing response rates. In the end, the overall goal is to help identify which response rate factors produce the highest response rates for any studies which seek to acquire information from a military-only population.

II. Literature Review

Survey response rate data has been researched as far back as the 1950s (Steeh, 1981) and continues today (Figlock, 2004; Porter, 2004; Cycyota & Harrison, 2006; Cycyota & Harrison, 2002). The reason is clear: researchers who utilize surveys as a primary data collection means are concerned about maximizing the amount of data returned to them in the form of surveys; they must also ensure that the responses obtained from the surveys are representative of the population from which it was drawn (Groves, 1990; Porter, 2004). However, maximizing the return rate is, in practice, a formidable task. Several studies show that survey response rates were on the decline during a period from 1990 to 1999 (Atrostic, Bates, Burt, Silberstein & Winters, 1999; Baruch, 1999; de Heer, 1999) and may have been on the decline since the early 1950s (Steeh, 1981).

According to Groves, Fowler, Couper, Lepkowski, Singer, and Tourangeau (2004), the use of a survey or questionnaire as a data gathering tool most likely dates back to the late 1800s. For example, Charles Booth, a wealthy businessman and self-taught sociologist, surveyed the poor and indigent of London during the 1890s; he ultimately produced a 17-volume set of data from these surveys, titled "Life and Labour of the People of London" (Osborne & Rose, 2004). However, while surveys may have appeared in social research in the 1800s, Groves, et al. (2004) also states the development of survey methodology did not begin to appear until the 1930s and 1940s in large government organizations, being further refined by departments such as the U.S. Bureau of the Census. The war effort during the early 1940s (and the post-war years) contributed greatly to the design and use of survey methodology.

However, shortly after this structured approach began to define survey methodology, an interesting phenomenon began to occur: starting in the 1950s and continuing through the late 1970s, a decline in survey response rates began to emerge, according to a study by Steeh (1981). Similar studies evaluating the time period from 1990 through 1999 reached the same conclusion (Atrostic, Bates, Burt, Silberstein & Winters, 1999; Baruch, 1999; de Heer, 1999). These findings of declining survey response rates prompted researchers to begin studying possible relationships between survey design and effects on response rates; many were examined by utilizing a meta-analysis of survey design research (Groves, 1990; Porter, 2004; Roth & BeVier, 1998; Simsek & Veiga, 2001; Cycyota & Harrison, 2006; Cycyota & Harrison, 2002; Fox, Crask & Kim, 1988).

Overall, these studies cited several factors which appear to impact survey response rates; most are based on Dillman's survey design research published in 1978. Dillman's concept espoused the "total design" concept (updated to "tailored design" approach or "tailored design method" by Dillman in 2000) specifically for postal mail surveys (Cycyota & Harrison, 2002; Kaplowitz, Hadlock & Levine, 2004). Examples of these factors listed by Dillman and others include survey design (length, time to complete, and ease of use), survey delivery mode (postal mail, e-mail, web/Internet based, or a combination of modes), issue salience, advance notice and follow-up reminders (number of contacts), anonymity and confidentiality, availability of final results to participants, monetary incentives, and sponsorship level of the survey (Dillman, 1978; Roth & BeVier, 1998; Cycyota & Harrison, 2006; Cycyota & Harrison, 2002; Fox et al, 1988). These factors include a wide variety of variable types (nominal, ordinal,

interval and ratio) which capture different types of data. Some variables are objective and quantitative, such as length, but others are more subjective, such as issue salience. The following is a brief discussion of some of the many factors that influence survey response rates.

Issue Salience

Surveys and studies which appear to offer a respondent a measure of perceived value or an opportunity for improvement (i.e., salience) appear to increase survey response rate (Groves, Cialdini and Couper, 1992). Issue salience is a factor which may initially appear easy to measure: how salient was the specific content or topics included in the survey to each respondent? While issue salience has the potential to cause the most damage to survey data collection via non-response (Wolford, 1994), salience of an issue is subjective and difficult to measure (Sheehan, 2001; Cychota & Harrison, 2002). One way researchers have tried to measure issue salience is by using researchers' ratings of respondents' salience using an ordinal, three-tier scale: "1" for salience to a general population, "2" for salience to a sub-population, and "3" for salience to a group within the sub-population (Porter, 2004; McCarty, House, Harman & Richards, 2006). However, even these researchers have admitted that their process of assigning a value to issue salience is subjective because the final ranking is solely determined by the researchers, not the respondents. In addition, survey designers may find the issue salience factor is out of their control, and yet it still may contribute to survey non-response rate (McCarty et al, 2006). Early analysis of the salience factor indicates the need for additional research in this area (Roth & BeVier, 1998).

Anonymity and Confidentiality

Anonymity and confidentiality are two separate, but related, factors which impact survey response rate, and the complexities of each are difficult to measure; thus far, different studies arrive at opposing viewpoints as to the actual impact of each on response rate (Porter, 2004; McCarthy & Beckler, 2000).

Simsek and Veiga (2001) found that anonymity and confidentiality are highly complex issues comprised of social desirability, social settings, and perceived consequences caused by legally-retrieved survey responses contained in e-mail transmissions and web-based surveys. Additionally, a worker's level of desired anonymity did not merely apply to an individual survey, but is actually a personality characteristic that is directly related to the individual's competence level, method of interaction with people, and job enthusiasm level (Simsek and Veiga, 2001). Perceptions of anonymity and confidentiality may also be affected by method of delivery (Roth & BeVier, 1998). For example, when surveys are handed out by supervisors, some respondents may feel an obligation to participate in the survey due to the proximity of their supervisors, but then provide non-truthful results. In addition, mailed surveys may leave respondents with perceptions of being tracked for survey completion, even when given an "anonymous" user identification code designed to promote anonymity; completed surveys sent back to a specific e-mail account may incur the same perceptions (Simsek and Veiga, 2001). Last, perceived confidentiality of sensitive data may impact respondents' willingness to participate (McCarthy, Johnson & Ott, 1999). All the findings by these researchers indicate a wide range of response to

anonymity/confidentiality issues with respect to survey research and therefore indicate further research in this area should be explored by trained psychology professionals.

Availability of Final Results

Sheehan (2001) noted in many electronic surveys, the promise of a study's results in a future publication was announced to the survey respondent as possible motivation to take the survey. Goritz (2004) also tested respondents for interest in the final results of the survey. While survey participants have expressed interest in how their data from a survey had been used, many of these requests were received after the survey had been completed (McCarthy, Johnson & Ott, 1999). Simsek and Veiga (2001) briefly mention "an offer of survey results" as a factor, but fail to mention it as a significant factor. In these instances, the availability of final survey results was included as part of several other factors under consideration, but was never again identified as a major contributor to survey response rates (Simsek & Veiga, 2001).

Monetary Incentives/Compensation

Singer (2002) found monetary incentives increased response rate for participants perceiving little issue salience, but contributed almost nothing toward increasing response rate for participants expressing high issue salience. Goritz (2004) ran experiments using a monetary raffle as an incentive to complete a survey against surveys without a raffle and found that the raffle did not significantly influence responses. Sheehan (2001) observed that while some mail surveys in the past have contained a small monetary incentive for participation, with the advent of e-mail and web-based surveys, this "pre-paid" option available to mail surveys was now becoming difficult to implement for the

e-mail and web-based surveys. Porter (2004) found similar findings: surveys with a pre-paid incentive were more effective than post-paid incentives (i.e., incentives received after the survey was completed.) Different avenues are being explored as to how this incentive process can become more effective for e-mail and web-based surveys, but very little research has compared the effects (and implementation) of monetary incentives across all survey delivery modes, and thus little data are available to make substantial comparisons (Goritz, 2004).

Survey Sponsorship Level

Another factor affecting survey response rate is the level at which the survey or study receives sponsorship or endorsement. As with many of the previously mentioned survey response rate factors, a review of the literature revealed findings which support both (or neither) theories. For example, one study found that while researchers might assume sponsorship by the government or a university increases response rate, this study found little evidence to support this assumption (McCarthy, Johnson & Ott, 1999). However, in Porter's study (2004), he did find that, in general, respondents are more likely to respond to a survey sponsored by the government or a university than a survey sponsored by the commercial sector. As previously mentioned, though, as has been the case with several of the other survey response factors, the overall data pertaining to the effect of sponsorship level on response rate is inconclusive. For example, Roth and BeVier (1998) described two studies supporting the idea that sponsorship contributed to survey response rate (Bruvold, Comer & Rospert, 1990; Fox, Crask & Kim, 1988), but also detailed another study (Yammarino, Skinner & Childers, 1991) which found either little or no contribution from sponsorship toward increasing survey response rate.

The literature has indicated a need for further research of each of these previously discussed factors. However, while an investigation of these factors would no doubt be of value, such variables are more difficult to obtain and are therefore less readily available in the literature. Considering that this study will rely on meta-analytic data, it is necessary to constrain the scope of variables to those that are readily available and quantifiable from the literature. The following section describes the factors which will be considered in this study: survey length, delivery mode, advance notice, and follow-up reminders.

Survey Length

One frequently investigated factor affecting survey response rate is survey length (Dillman, Sinclair & Clark, 1993; Bogen, 1996). Intuitively, the impact of survey length on response rate may seem obvious: the longer the survey, the lower the response rate (Sheehan, 2001). Smith, Olah, Hansen, and Cumbo (2003) found nearly a doubling of response rate during their study comparing a one page survey against a similar three page survey covering the same topics. Similarly, Dillman et al (1993) found that survey length negatively impacted survey response rate. The result is basically a negative linear relationship, with one major exception: when a survey's length was reduced to five questions or less, the response rate began to decrease (Dillman et al, 1993). This implies the linear relationship no longer exists for determining response rate based on survey length when the survey is composed of five or fewer questions. However, for this study, all the surveys and questionnaires selected for final analysis will contain more than five questions which will allow analysis to be performed in the region which is basically linear.

Additional studies offer more support for the impact of survey length on response rate. For example, potential respondents are interested in the amount of time a survey will take to complete (Bogen, 1996; Groves, Cialdini & Couper, 1992). Yu and Cooper (1983) and Heberlein and Baumgartner (1978) conducted quantitative studies in these areas, and their results reached the same conclusion: longer surveys generally produce lower response rates.

Given these studies on how survey length affects response rate, the initial research question will bring forth the concept that military samples will act the same as the general population samples surveyed from the research previously discussed. While these studies were not directed at military-only samples (and there appears to be almost no research specific to how survey length affects response rate in military samples), the experts in the field of survey response rates appear to agree that in most cases, longer surveys will decrease survey response rates.

Based on the studies pertaining to survey length as a factor affecting survey response rates, the following hypothesis statement is proposed:

H_{A_1} : Survey length is related to response rates in military samples, while controlling for all other variables.

Conversely, two major studies reached conflicting conclusions as to the actual effect of survey length on response rate (Bogen, 1996; Sheehan, 2001). Bogen (1996) referenced a small number of studies which either found no impact or minimal impact from survey length on response rate; however, several of these studies examined surveys in which both a long version and a short version were completed in less than 5 minutes.

These types of surveys would probably best be described as “short” based on the small amount of time required to complete either. Sheehan (2001) referenced a study by Bean and Roszkowski (1995) in which longer surveys actually produced a somewhat elevated response rate as compared to the shorter surveys.

Survey length may not have a substantial impact on military members because they may be perceived as having greater organizational commitment. Gade (2003) mentions a military member’s support of the military as not just a job, but actually a “calling” that far exceeds a regular job. This level of organizational commitment could lead a military member to feel more obligated to participate in and complete surveys, regardless of the length of the survey. This area for exploration is stated in the following hypothesis statement:

H₀₁: Survey length is not related to response rates in military samples, while controlling for all other variables.

Survey Delivery Mode

Several types of survey delivery modes will be considered in this study: Internet (or web-based), e-mail, paper and pencil surveys (composed of postal and direct administered), and various combinations thereof (multi-mode.) While paper surveys are known to have been in use since the early 1900s, the infusion of the Internet into American culture since the mid-1990s has created opportunity for electronic surveys, both web-based surveys and e-mail surveys (Weible & Wallace, 1998; Zhang, 1999). An analysis in 2002 found almost 60% of Americans had access to the Internet; accordingly, the rise in the use of electronic surveys (either e-mail or Internet-based) rose as well (Lenhart, Horrigan, Rainie, Allen, Boyce, Madden & O’Grady, 2003; MacElroy, Milucki

& McDowell, 2002). Surprisingly, different survey delivery modes may offer different levels of data. MacElroy, Milucki, and McDowell (2002) found that in a comparison between a web-based survey and a pencil and paper survey, when respondents were given the option to choose, the results from open-ended responses obtained from the web-based survey contained more detail and were written at a higher education level. Also, electronic surveys may offer the ability to collect more data than paper surveys. For example, the use of hyper-text markup language (HTML) in a web-based survey enables variable color, font, and graphics enhancements which are typically unavailable or not cost effective in paper surveys; survey designers may also use HTML code to prevent respondents from entering incomplete or duplicate data, as well as requiring responses to certain questions before continuing with the survey (Schleyer & Forrest, 2000).

Access to computer resources for military populations (both at work and at home) is currently at an all-time high. One indication of the ever-increasing computer resource demand was the implementation of the Common Access Card (CAC), directed by former Deputy Secretary of Defense (DEPSECDEF), Dr. John Hamre, in a 1999 memo titled “Smart Card Adoption and Implementation” (GAO, 2003). These cards will be used by over 4 million military and Department of Defense personnel and will primarily be utilized to control access to computing devices and networks (desktop, laptops, and other networked devices) and also regulate access to controlled areas (GAO, 2003). Using the large number of CAC cards as an indicator of the number of computers the military uses on a day to day basis implies that most military members readily have access to computers in their daily work activities. Therefore, the access availability for military populations and the rise in utilization of the electronic survey (MacElroy, Milucki &

McDowell, 2002) leads to the following hypothesis statement relating delivery modes to survey response rate:

H_{A2}: Delivery mode does influence response rates in military samples, while controlling for all other variables.

Conversely, by focusing on one type of delivery mode without fully understanding its impact on the surveyed population, a researcher may miss or lose data from a segment within that population. One concern regarding different delivery modes is the availability of computer resources for a certain portion of a population. The term “digital divide” describes the difference between respondents who own or have access to computer resources required for an electronic survey as compared to those who do not own or do not have computer access (Lenhart, et al., 2003). This disparity can be attributed to differences between age, income, and geographic locations (Schleyer & Forrest, 2000).

Pencil and paper surveys appear to hold interest in certain populations. Older generations are less interested in participating in electronic surveys, either e-mail or web-based, than in a traditional paper survey (Lenhart, et al., 2003; Kaplowitz, Hadlock & Levine, 2004). Also, Mehta and Sivadas (1995) found a slightly higher response rate for mailed surveys rather than electronic surveys for one military sample (Adams, 1996). Two studies found different patterns of responses when subjects responded to a paper survey versus an electronic survey (McCoy, Marks, Carr & Mbarika, 2004; Webster & Compeau, 1996). However, a study conducted by Franke in 2001 found almost no difference between similar paper and electronic surveys. In another example, the

Defense Manpower Data Center (DMDC) conducts nine web-only “Status of Forces” surveys each year (DMDC, 2006) and also many surveys given by AFIT thesis students (e.g., Martinson, 2005) utilized only web-based surveys, given their populations of interest all have official e-mail accounts and access to computers at work. However, by utilizing only one survey delivery mode, researchers assume the risk of survey non-response for any segments within populations who don’t prefer that specific delivery mode. Therefore, if researchers are interested in capturing data from broad, general populations, perhaps merely using only one survey delivery mode is insufficient, and multiple delivery modes (or mixed-modes) should be considered in order to collect as much data as possible (Kaplowitz, Hadlock & Levine, 2004; Dillman, 2000; Schaefer and Dillman, 1998). This leads to the following hypothesis statement:

H₀₂: Delivery mode does not influence response rates in military samples, while controlling for all other variables.

Advance Notice and Follow-Up Reminders

Advance notice and follow-up reminders (pre/post-contact) have shown to almost always produce positive results toward increasing response rates (Groves, et al., 2004; Fox, et al., 1988; Yammarino, et al., 1991). Roth and BeVier (1998) surmised that advance notice and follow-up reminders are almost synonymous and that advance notice could be counted as one follow-up notice instead of being counted as an advance notice. Some of the research has gone as far as recommending a simple formula to determine the number of reminders and length of time between reminders (Roth & BeVier, 1998; Martin, Duncan, Powers & Sawyer, 1989). Also, in one very specific example, Kaplowitz, Hadlock & Levine (2004) found that an advance notice (or prenotice, as they

prefer to call the factor) sent by postal mail increased the response rate for a web-based survey. Additionally, two additional studies found that advance notice had the strongest overall impact on response rate (Dillman, 2000; Dillman, Clark & Sinclair, 1993).

Review of these studies leads to the following hypothesis statements:

H_{A3}: Advance notice is related to military member response rates, while controlling for all other variables.

H_{A4}: Follow-up reminders are related to response rates in military samples, while controlling for all other variables.

Alternatively, some researchers have surmised that members of large organizations (including the military) are affected by the “good soldier” syndrome in which members are expected to do (and will do) what they are told; these members may also marginalize undesirable information in order to present a positive image for their respective organizations (Moradi, 2006; Organ, 1988). Additionally, in the previously mentioned study by Kaplowitz, Hadlock and Levine (2004) where they found that an advance notice sent by postal mail helped improve the response rate for a web-based survey, their research also found that postal mail follow-up reminders (or reminder notifications) for the same web-based survey were found to be *less* effective. This finding is interesting on another level because the purpose of their study was to examine the results of a mixed-mode type of survey, but the fact that notification by one mode (postal mail) giving notice about a survey to be completed in another mode (on the Internet) is an interesting twist on what most researchers would label “typical” advance notice or follow-up reminders.

Last, Cycyota and Harrison (2006) found that advance notice and follow-up reminders did not improve response rates for executives at higher echelons of the business world, according to a meta-analysis they performed which covered a ten-year time span ending in early 2000. These results were almost identical to results they published in 2002 which stated that traditional response rate factors which have been proven effective at the employee level or consumer level (specifically, advance notice and follow-up) did not improve the survey response rate for true executive level populations.

Given the aforementioned published research support, the following hypotheses are given:

H_{O_3} : Advance notice is not related to military member response rates, while controlling for all other variables.

H_{O_4} : Follow-up reminders are not related to response rates in military samples, while controlling for all other variables.

III. Methodology

This chapter will describe the method and analysis utilized to determine the effect of the four questionnaire response rate factors on military-only samples. A meta-analysis of previously published research pertaining to military-only populations was performed to analyze the relative importance of each of the survey response rate factors. Based on previously published meta-analysis research (Cycyota & Harrison, 2006; Fox, Crask & Kim, 1988), the following steps were taken. First, electronic sources of published articles were identified which contained pertinent search words. Second, once a potential article was found, the article was searched for individual and combinations of search terms. Third, any and all of the data contained in the article which described the independent variables and the dependent variables were coded into the data matrix. Last, once the data matrix was complete, the data were imported into SPSS for Windows and a linear regression process was executed to analyze the data. This process is based on recommendations found in research conducted by Viswesvaran and Ones (1995) regarding the use of operational measures for meta-analytical research. Cycyota and Harrison (2006) continued this method which allowed them to broadly interpret constructs and variables in order to develop new constructs and hypotheses which lead to conclusions not available in single case analysis; their process focused on collecting and analyzing response rate data instead of focusing on effect size due to sample size. This research followed a similar process.

Sample Description

The target studies involved surveys of military-only populations that appeared in a published electronic report of some type (e.g., journal article, thesis), published after 1990, and made available through an on-line, electronic database. Questionnaire formats ranged from simple yes/no response, fill in the blank, short answer (especially for demographic data), to Likert scales for measuring perceptions and feelings, up to and including free flow text blocks for collection of lengthy responses in sentence or paragraph form. The questionnaires contained within the published research were completed using pencil and paper, electronically in a format supported on a computer system, by utilizing the Internet to complete a web-based version, direct administration (in which the researcher or designee handed out the surveys to the target audience), or a combination of these modes, referred to as mixed mode.

Only studies involving populations or samples of members in the following military categories were considered for this meta-analysis: active duty, National Guard, Reserve, cadets from the military service academies, or veterans (if the survey pertained to their time as military members). Additionally, several studies and surveys included samples or populations interlaced with the military-only samples or populations, such as civilians working in military organizations or military spouses. These data sets were only used if the military-only sections were broken out from the non-military sections of the survey population; in many instances where the military and non-military data were combined, these two sectors were not broken out during the statistical analysis in the published paper, and therefore were unusable for this particular research effort.

Multiple data sources were utilized during the data search process. By far the largest source of published research was found in the Defense Technical Information Center (DTIC) Scientific and Technical Information Network (STINET) website. The STINET service supports the Department of Defense community, but is available to the general public and offers extensive search tools. Next, several electronic data repositories, such as ProQuest and ABI/INFORM, were utilized. The Google Scholar website (located at <http://scholar.google.com/>) was another source of information available to the general public and offers a search tool to find full titles of published works. Last, published research stored on the PsycINFO database was searched for potential data sources.

Procedure

The procedure for locating published journal articles which could possibly be utilized in this research consisted of several different search techniques. By utilizing the resources described in the preceding paragraphs, a very general list of search terms were input into the respective database search tools. Because this research was to consider response rate on surveys of military-only samples, keywords such as “military,” “sample,” “response,” “rate,” and “survey” were the first search terms used when accessing a new, unsearched database. As one might imagine, however, these generic terms usually returned many hundreds (or thousands) of “hits.” For example, the DTIC database returns over 35,000 hits of “survey”, and almost 8,000 hits when “survey” and “military” are both used. Further refinement of the search terms included “veterans”, “thesis”, “dissertation”, “abstract”, “paper survey”, “electronic survey”, “web-based survey”, “Internet-based survey”, and “Internet survey.” Because the term “survey” is

synonymous with the term “questionnaire”, both terms were utilized in subsequent database searches. Also, to reduce the number of hits, terms such as “telephone” and “interview” were considered undesirable, and therefore the “not” option was utilized to prevent return of any possible hits which included either or both of these two terms.

Additionally, on each of the respective database search pages, the “find full-text articles only” option was selected whenever available. For this research, the process for reviewing the methodology section and attachments for each published research document required having the full-text available for viewing.

Measures and Coding Procedures

Reported response rate was the dependent variable contained in each of the published articles; specifically, useable response rate, which is defined as the total number of useable surveys returned divided by the total number of surveys sent. Also collected was the maximum response rate, which is the total number of surveys returned (useable or not) divided by the total number of surveys sent (American Association for Public Opinion Research [AAPOR], 2006).

Additionally, the article had to contain values for at least one of the independent variables. Data were collected for the response rate factors of interest: survey length, survey delivery mode (postal, e-mail, web-based, direct administered, or multi-mode), advance notice, and follow-up reminders. Survey length and follow-up reminder variables were coded as interval data. Survey length is merely the number of questions contained in the survey. Follow-up reminders were coded either zero (for missing or not utilized), or one through four to indicate the number of follow-up reminders sent as part of the respective study. The other independent variables (survey delivery mode and

advance notice) were coded as dummy variables: zero for not present or not utilized, or one for present or utilized.

Related data were also collected and recorded on variables for branch of military service (e.g., USAF, USMC), sponsorship level (subjectively assigned a value of high, medium, or low), sponsor details (office symbol of sponsor, if available), sampling technique (e.g., random, stratified random, convenience), and other/notes. Sponsorship level, although subjectively assigned, utilized the following coding scheme: “high” was reserved for the President of the United States, the service secretaries, and large, national organizations; “medium” was assigned to sponsors at the major command (MAJCOM) level, or commanders in wings, groups, or squadrons; “low” was given when either no sponsor was assigned or the sponsor was another student or only the student was identified (i.e., no sponsor).

IV. Data Analysis and Results

The data analysis for the collected questionnaire data began with an examination of the entire data matrix to determine which specific variables would be analyzed. As previously described, some data were collected in the data matrix in order to enhance the overall data richness and would not be considered for the final analysis. However, this non-analyzed data might offer additional information for consideration during the final chapter of this thesis.

The final independent variables selected for analysis were questionnaire length (number of questions), method of delivery (postal, e-mail, web-based, direct administration, or multi-mode), use of advance notice notifications, and use of follow-up reminders. These variables were selected and copied from the main worksheet in the data matrix file, and pasted into a new Excel worksheet. Portions of the data in this worksheet were then recoded for entry into SPSS 14 for Windows, changing all variations of dichotomous variables (e.g., Y/N) into “0” and “1”. No recoding was required for the dependent variable (response rate) and one of the independent variables (survey length).

Data Analysis

For the first part of this section, the analysis only compared the effect of one of the four response rate factors, delivery mode, on response rate. The second part of this section compared the effect of all of the response rate factors on response rate by utilizing regression analysis tools in SPSS.

For the deliver mode analysis, 73 records contained useable response rate data ($n = 73$). This analysis required creation of a fifth variable named “multi_mode” to account

for a double count of data if more than one delivery mode was used in the case (i.e., both postal and web-based.) When this situation occurred in the data, the “multi_mode” variable was set to “1” and each of the delivery mode variables which previously equaled “1” were now set to zero. The table below shows the response rate for each respective delivery mode, and an overall response rate of 69% for these surveys. Upon initial review, e-mail and direct administration surveys appeared to have the highest response rate of 88%. However, these results are not weighted for individual sample size.

Table 1. Response Rates by Delivery Mode

Response Rates by Delivery Mode		
	n	RR avg
Postal	25	63.0%
E-Mail	2	88.9%
Web	22	44.8%
DA	13	88.3%
Multi_Mode	11	63.5%
Overall Average RR:		69.7%
Total Questionnaires:	73	

Further analysis of more complex combinations of delivery mode and either advance notice or follow-up reminders are displayed below.

Table 2. Response Rates by Delivery Mode and Advance Notice

Response Rates by Delivery Mode and Advance Notice												
		<u>Postal</u>		<u>E-Mail</u>		<u>Web</u>		<u>DA</u>		<u>Multi_Mode</u>		
n = 73		25	2	22	13	11						
RR avg		63.0%	88.9%	44.8%	88.3%	63.5%						
Advance Notice	40	64.4%	64.6%	12	100.0%	1	53.8%	14	86.4%	4	66.8%	9
No Advance Notice	33	60.9%	61.6%	13	77.8%	1	29.1%	8	89.2%	9	48.7%	2

Table 3. Response Rates by Delivery Mode and Follow-up Reminders

Response Rates by Delivery Mode and Follow-up Reminders												
		<u>Postal</u>		<u>E-Mail</u>		<u>Web</u>		<u>DA</u>		<u>Multi_Mode</u>		
n = 73		25	2	22	13	11						
RR avg		63.0%	88.9%	44.8%	88.3%	63.5%						
Follow-up Reminders	31	58.0%	70.5%	13		0	32.8%	9		0	65.3%	9
No Follow-ups	42	66.3%	55.0%	12	88.9%	2	53.1%	13	88.3%	13	55.2%	2

Additionally, this spreadsheet was utilized to create an F distribution for an analysis of variance comparison of the independent variables which composed the delivery mode. The results from this analysis are shown below.

Table 4. Analysis of Variance

Source	Sum of Squares	df	s ²	F _{test} =	F _{crit} =	α = .10
Between	4.0000	4	0.5101	7.7293	2.03	
Within	0.1294	68	0.0660			
Total	4.1294	72				

Based on the analysis, the results indicate F_{test} is greater than F_{crit} ($F_{test} > F_{crit}$) for $F_{crit} (.10, 4, 68)$, which suggests the means of the separate groups are not similar (Agresti & Finlay, 1997).

Next, all of the response rate factors were analyzed for effect on response rate. SPSS was utilized to import the recoded data for the dependent and all the independent variables from the Excel spreadsheet. The data were then analyzed, and the results are presented in the remainder of this chapter.

A descriptive analysis was run in SPSS in order to perform a quick quality check of the data before further analysis was performed. N, range, minimum and maximum were reviewed and found to be acceptable.

Table 5. Descriptive Statistics

	Descriptive Statistics								
	N	Range	Minimum	Maximum	Sum	Mean		Std.	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
RR_Max	73	1.0	.0	1.0	45.9	.628	.0343	.2930	.086
Length	73	586	10	596	5814	79.64	11.556	98.737	9749.010
Postal	73	1	0	1	30	.41	.058	.495	.245
E_Mail	73	1	0	1	5	.07	.030	.254	.065
Web	73	1	0	1	30	.41	.058	.495	.245
Direct_Admin	73	1	0	1	22	.30	.054	.462	.213
Multi_Mode	73	1	0	1	11	.15	.042	.360	.130
Adv_Notice	73	1	0	1	40	.55	.059	.501	.251
Followup	73	4	0	4	48	.66	.107	.916	.839
Valid N (listwise)	73								

Based on data contained in the correlation table, the following correlations between either web-based delivery mode and response rate, or direct administration delivery mode and response rate, were found to be significant:

1) Web-based delivery mode (IV) and response rate (DV). With a correlation coefficient of $r = -.32$ ($p < .01$), the data indicate a significant, medium strength negative relationship between web-based delivery mode and response rate.

2) Direct administration delivery mode (IV) and response rate (DV). With a correlation coefficient of $r = .40$ ($p < .01$), the data indicate a significant, fairly strong positive relationship between direct administration delivery mode and response rate.

Table 6. Correlations

	Mean	Std Dev	Correlations							
			1	2	3	4	5	6	7	8
1	0.628	0.2930	1							
2	79.64	98.737	.192	1						
3	0.41	0.495	-.098	-.147	1					
4	0.07	0.254	.035	-.067	-.116	1				
5	0.41	0.495	-.321**	.211	-.584**	-.006	1			
6	0.30	0.462	.404**	-.046	-.367**	.176	-.185	1		
7	0.55	0.501	.059	.206	-.080	.028	.255*	-.003	1	
8	0.66	0.916	-.153	.019	.100	.042	.345**	-.048	.475**	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

1 RR_Max
2 Length
3 Postal
4 E_Mail
5 Web
6 Direct_Admin
7 Adv_Notice
8 Followup

Continuing the regression analysis from output generated in SPSS, the following tables were generated and are analyzed in the following paragraphs.

First, the model summary is shown. R^2 , the multiple coefficient of determination, was .34; this indicates that the independent variables in the model explain 34% of the variance in the dependent variable, response rate.

Table 7. Model Summary

Model Summary ^b										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.583 ^a	.340	.269	.2505	.340	4.784	7	65	.000	1.758

a. Predictors: (Constant), Followup, Length, Direct_Admin, E_Mail, Postal, Adv_Notice, Web
b. Dependent Variable: RR_Max

Second, the ANOVA table shown below confirms 34% of the variance is accounted for in this model ($2.102 / 6.182 = .340$). Additionally, the F value indicates the ability of the independent variables to predict the dependent variable in the model is significant and the variation is not due to chance ($F = 4.784$; $p < .001$, $n = 72$).

Table 8. ANOVA

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.102	7	.300	4.784	.000 ^a
	Residual	4.080	65	.063		
	Total	6.182	72			

a. Predictors: (Constant), Followup, Length, Direct_Admin, E_Mail, Postal, Adv_Notice, Web
b. Dependent Variable: RR_Max

Next, a coefficients table was compiled in order to find the coefficients for each of the variables and their respective significance levels. The table below shows that although seven independent variables were entered in the model, only two were found to be significant: survey length and web-based delivery mode ($p < .05$). However, while survey length was found to be significant, it has such a low value that it will have minimal impact on the overall output of the model and, therefore, is of minimal practical significance.

Table 9. Coefficients

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	.695	.101		6.876	.000
	Length	.001	.000	.246	2.330	.023
	Postal	-.176	.107	-.297	-1.645	.105
	E_Mail	-.032	.119	-.028	-.271	.787
	Web	-.321	.107	-.543	-2.994	.004
	Direct_Admin	.135	.086	.212	1.557	.124
	Adv_Notice	.068	.069	.117	.988	.327
	Followup	.005	.044	.015	.112	.911

a. Dependent Variable: RR_Max

Last, the residuals from the regression process were analyzed to ensure their distribution was normal or nearly normal, which is a requirement for the ANOVA analysis. The analysis confirmed the residual distributions met this requirement.

Results and Hypothesis Analysis

Hypothesis 1 tested the relationship between survey length and response rate in military samples, while controlling for all other variables. Although a significant bivariate correlation between survey length and response rate was not found, results from further regression analysis indicate that survey length was significantly related to response rate. However, with a value of only .001, even though significant ($p < .05$), the overall impact of survey length on response rate is negligible (i.e., minimal practical significance.) Due to the significance finding, though, the null hypothesis H_{O1} , which states survey length is not related to response rates in military samples while controlling for all other variables, must therefore be rejected. The alternate hypothesis H_{A1} , which states survey length is related to response rates in military samples while controlling for all other variables, is supported.

Hypothesis 2 tested if delivery mode influences response rates in military samples, while controlling for all other variables. First, the results from the F distribution found that the means between the different survey delivery modes were probably not equal. Next, only web-based delivery mode was found to have a significant correlation, and it was found to be related to response rate ($r = -.32, p < .01$). These results indicate a significant, negative correlation. Last, further regression analysis presented two independent variables found to be statistically significant, one of which was a delivery mode variable. Web-based delivery mode was found to have the largest regression coefficient of $-.32$ ($p < .01$). Based on these data, delivery mode appears to have an impact on response rate. Therefore, reject the null hypothesis H_{O_2} which supposed that delivery mode does not influence response rates in military samples, while controlling for all other variables. Since the null was rejected, H_{A_2} must be accepted; H_{A_2} stated that delivery mode does influence response rates in military samples, while controlling for all other variables.

Hypothesis 3 tested if advance notice is related to military member response rates, while controlling for all other variables. Based on the analysis from the regression procedures, no statistically significant results were found to reject the null hypothesis H_{O_3} . Therefore, fail to reject H_{O_3} , which stated advance notice is not related to military member response rates, while controlling for all other variables. Also, fail to support H_{A_3} , which stated advance notice is related to military member response rates, while controlling for all other variables.

Hypothesis 4 tested if follow-up reminders are related to military member response rates, while controlling for all other variables. Based on analysis of the regression procedures, no statistically significant results were found to reject the null hypothesis H_{O_4} . Therefore, fail to reject H_{O_4} , which stated follow-up reminders are not related to military member response rates, while controlling for all other variables. Also, fail to support H_{A_4} , which stated follow-up reminders are related to military member response rates, while controlling for all other variables.

V. Discussion

The overall goal of this research was to evaluate if response rates from military-only samples react to factors found to impact response rates in general populations. The four factors selected for consideration in this study included survey length, delivery mode, advance notice, and follow-up reminders. The only supportable findings for this sample of cases were that survey length and survey delivery mode may influence response rate in military-only samples. Specifically, this meta-analysis suggests that military members respond more to the length of a survey and the method of survey delivery rather than the use of advance notices and follow-up reminders.

The finding for hypothesis 1 regarding the impact of survey length on response rate seems supported by previous research by Dillman, Sinclair, and Clark (1993), Bogen (1996), Sheehan (2001), and Smith, Olah, Hansen, and Cumbo (2003). Although the actual impact found in this research was found to be statistically significant, yet not practically significant, these previous researchers arrived at stronger findings of the relationship between survey length and response rate.

The finding of hypothesis 2 pertaining to how survey delivery mode influences response rate in military samples is a little more difficult to quantify. As previously stated, the web-based survey delivery mode was found to have a negative correlation with response rate, and a negative regression coefficient for this mode was found during further regression analysis. These results may indicate that while the web-based survey is typically easier to generate and a web link can easily be sent to a very large audience, perhaps this is an example of casting the net too wide and too frequently, and a lower

response rate for web-based surveys is the result. MacElroy, Milucki, and McDowell (2002) found an increase in the use of web-based surveys, which may lead to saturation. Regarding different delivery modes, several sources cited differences in responses when comparing one delivery mode against another (McCoy, Marks, Carr & Mbarika, 2004; Webster & Compeau, 1996).

Hypothesis 3 and 4, pertaining to use of advance notice and follow-up reminders, were found to apparently not impact response rate in this research. Perhaps these results are related to similar findings by other researchers. For example, since military-only samples were considered, some suggest that military members are expected to be “good soldiers”, carry out their duties without being reminded, and present a positive, “leaning forward,” military image; follow-up reminders might have little, if any, impact if military members immediately complete surveys upon initial notification (Moradi, 2006; Organ, 1988). Cycyota and Harrison (2006) found similar results from a study among business executives: advance notice and follow-up reminders were inefficient. Last, in 2004, Kaplowitz, Hadlock, and Levine determined follow-up reminders were ineffective in a review of multi-mode surveys. Each of these researchers found little utility for advance notice or follow-up reminders in these situations.

Recommendations

Based on the findings in this research, several areas are recommended for researchers considering use of a survey or questionnaire as part of a data collection project. First, since survey length was found to be a factor in this research, potential data collectors contemplating use of a survey for data collection must consider the effect of survey length. Another consideration closely related to survey length (i.e., number of

questions) is the anticipated time factor for users to complete a survey. Researchers should be cognizant of these areas. Second, survey delivery mode was also found to be significant. Potential researchers should carefully consider the mode (or modes) being considered for potential survey delivery. Is a strictly web-based delivery mode being considered since it is easier and cheaper? Is the web host for the web-based survey competent in building a web-based survey and collecting the results? Researchers should carefully consider all survey delivery modes available, and then choose the best mode (or modes) for their particular subject and target audience. Last, one related area not specifically addressed in the four hypothesis statements: survey design. Researchers are encouraged to follow the guidance given by some of the industry leaders cited in this research. This will help the survey to be easier for the target audience to use and will assist in the process of collecting the desired data from the target audience. A well-written, professional-looking survey tells the audience the topic is relevant, substantial, and worth their time to participate. Each of these recommendations, based on the research conducted for the literature review, should lead to a positive impact on survey response rate.

Limitations

This research contained several limitations. First, when conducting the search for previously published cases which utilized a survey as part of the data collection effort, only electronically available files offered in a “full text” output were included as part of the search process. This almost certainly reduced the number of available of cases to be considered. Second, this research made no attempt to analyze or quantify errors which may have existed within each of the selected cases, such as sampling error or non-

response error, or social desirability considerations, such as acquiescence; the impact of the human factor associated with each of the surveys utilized in each of the selected cases is beyond the scope of this research. Third, a larger sample size would have been desirable; perhaps some of the non-significant findings may have become significant with more cases to analyze. Last, a general lack of consistency among the reviewed and selected cases pertaining to a survey methodology was evident; frequently, information about the specific survey methodology utilized, survey design, and survey results were found scattered throughout the individual cases instead of being explicitly detailed and centralized in what is typically the methodology and results sections. A standardized process for survey methodology, survey design, and survey data reporting would greatly improve this process if additional research were performed in this area.

Suggestions for Future Research

The lack of adequate research into this area becomes apparent when seeking information on how military-only samples react to traditional survey response rate factors. With a potentially dwindling base of military personnel, and an overall decline in survey response rates in the general population, it becomes even more important to gain further understanding of how to increase response rates from military members. Studies conducted on the general public have found many factors which influence survey response, but additional research is required to understand how these factors, if any, can be applied to a military-only sample.

Conclusion

The primary goal of this research was to attempt to verify if general population survey response techniques work for military surveys. The preceding paragraphs indicate significant results were found, but more research is required in this area. A secondary goal was to provide a quick “one-stop shopping” resource for two groups within our military: 1) military members currently in the field who may be tasked by higher authorities to generate a survey, analyze the results, and present the findings; and 2) military members who are advancing their educational goals and need to generate a survey as part of either an off-duty education program or a dedicated educational program such as an advanced degree program or a professional military education program. Hopefully, the preceding sections will provide an entry point into a general overview of military survey response rate considerations, as well as identify in-depth resources written by industry experts. In the end, finding ways to increase survey response rates among military-only populations will give military and civilian leaders the information required to continually improve our smaller, leaner military and ensure our position as the greatest military in the world.

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* = Included in data matrix file

Vita

Major Michael R. Parrish graduated from Alamogordo Senior High School in Alamogordo, New Mexico. He completed undergraduate studies at New Mexico State University in Las Cruces, New Mexico, where he graduated with a Bachelor of Science degree in Electrical Engineering Technology in December 1990. He enlisted in the Air Force in January 1991 and was later commissioned through Officer Training School at Maxwell AFB in Montgomery, Alabama, in March 1994.

After assignments at Lowry AFB, Colorado, and Patrick AFB, Florida, as a scientific measurements technician and software applications programmer, he was selected to attend Officer Training School and was commissioned in March 1994. Lt Parrish then reported to Wright-Patterson AFB, Ohio, where he served as an acquisitions project manager. In June 1997, Lt Parrish reported to Edwards AFB, California, where he served as business and test manager for Project Speckled Trout. Capt Parrish was then selected for career-broadening into aircraft maintenance, and he reported to Fairchild AFB, Washington, in June 2000. Here he served as a KC-135 sortie generation flight commander and then maintenance operations officer. During this time, he deployed several times in support of Operations ENDURING FREEDOM and SOUTHERN WATCH. In June 2003, he was selected for the PHOENIX HAWK program at Headquarters Air Mobility Command at Scott AFB, Illinois, where he served at the Tanker Airlift Control Center and then the A4 Logistics Directorate.

In August 2005, Major Parrish entered the Air Force Institute of Technology. Upon graduation, he will be assigned to Randolph AFB, Texas.

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