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Occupational Health Screenings of the Virtual Warrior: Distributed Common Ground System Intelligence Operators Compared with Non-Combatant Support Personnel

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14. ABSTRACT

U.S. Air Force Distributed Common Ground System intelligence operators have a critical role in the analyses and exploitation of vast amounts of real-time and archival auditory and visual information from the battlefield and other global regions of national interest. The health and wellness of these airmen are key to sustaining intelligence capabilities and readiness across the globe. As a result, the U.S. Air Force School of Aerospace Medicine conducted a field survey that assesses for general areas of health-related behaviors (i.e., sleep and exercise; alcohol, tobacco, and caffeine use; common reasons for seeking medical care and mental health support services; as well as reasons for increased prescription and over-the-counter medication usage). A total of 1,091 intelligence operators and 447 support personnel participated in the study, resulting in an estimated 36% response rate to the survey. Study results reveal a larger proportion of intelligence operators reported an increase in alcohol use, "elevated" alcohol use, and increase in caffeinated beverage use, as well as musculoskeletal injury/pain, sleep problems, and emotional distress created or made worse by their occupational environment. Intelligence operators also reported having less access to medical care during work hours and were at greater odds to cite occupational stress as a reason for increased medical care usage. A larger proportion of intelligence operators reported an increase in mental health care utilization and over-the-counter medication usage. Intelligence operators were also at greater odds to cite sleep-related difficulties as reasons for increased prescription and over-the-counter medication usage. Recommendations are provided for line and medical leadership for optimizing health for intelligence operators as well as airmen including optimizing shift schedule rotations, improving work-rest-break cycles and routines, and embedding mental health providers within line intelligence units.

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1.0 EXECUTIVE SUMMARY

U.S. Air Force Distributed Common Ground System intelligence operators have a critical role in the analyses and exploitation of vast amounts of real-time and archival auditory and visual information from the battlefield and other global regions of national interest. They sustain around-the-clock operations to meet the growing demand from military leadership for information and intelligence exploitation that supports a wide range of military operations. The health and wellness of these airmen are key to sustaining Distributed Common Ground System intelligence capabilities and readiness across the globe. As a result, the U.S. Air Force School of Aerospace Medicine was requested by the Air Force Intelligence, Surveillance, and Reconnaissance Agency to conduct a field survey that assesses for general areas of health-related behaviors (i.e., sleep and exercise; alcohol, tobacco, and caffeine use; common reasons for seeking medical care and mental health support services; as well as reasons for increased prescription and over-the-counter medication usage). A web-based survey composed of non-standardized items was developed for intelligence operators and support personnel assigned to the 480th Intelligence, Surveillance, and Reconnaissance Wing (ISRW). Leadership within this organization sent out e-mail invitations for participation in this anonymous, voluntary, self-report survey. A total of 1,091 intelligence operators and 447 support personnel across the 480th ISRW participated in the study, resulting in an estimated 36% response rate to the survey. Study results revealed a larger proportion of intelligence operators reported an increase in alcohol use, "elevated" alcohol use, and increase in caffeinated beverage use, as well as musculoskeletal injury/pain, sleep problems, and emotional distress created or made worse by their occupational environment. Intelligence operators also reported having less access to medical care during work hours and were at greater odds to cite occupational stress as a reason for increased medical care usage. A larger proportion of intelligence operators reported an increase in mental healthcare utilization and over-the-counter medication usage. Intelligence operators were also at greater odds to cite sleep-related difficulties as reasons for increased prescription and over-the-counter medication usage. Recommendations are provided for line and medical leadership for optimizing health for intelligence operators as well as airmen across the 480th ISRW. Such recommendations include optimizing shift schedule rotations, improving work-rest-break cycles and routines, and embedding mental health providers within line intelligence units.

2.0 INTRODUCTION

Since the onset of Operations Enduring and Iraqi Freedom, the U.S. Air Force (USAF) has increasingly relied upon intelligence, surveillance, and reconnaissance (ISR) operations to provide critical information to national leaders, combatant commanders, and combat forces. The demand for these operations has rapidly increased and led to an expanding need for mission support in acquiring critical intelligence to keep pace with information and assurance in air, space, and cyberspace operations. The acquisition of this information directly supports the evolving paradigm of modern warfare.

The 480th ISR Wing (ISRW), with headquarters at Langley Air Force Base, VA, is the Air Force leader in globally networked ISR operations (retrieved from http://www.afisr.af.mil). The wing operates and maintains the Air Force Distributed Common Ground System (DCGS), also known as the Sentinel weapon system, conducting imagery and various technical intelligence activities. Regionally focused and globally linked, AF DCGS is known to be the

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foundation of successful Air Force, joint, and coalition ISR operations (retrieved from http://www.afisr.af.mil). The 480th ISRW has 6 groups, 14 squadrons, 4 detachments, and 7 operating locations around the world. To support the rapidly increasing demand for ISR missions, the 480th ISRW intelligence operators are tasked to provide 24-hour support 7 days a week to these military operations, resulting in a significant increase in operational hours and shift work. Typically, the manpower within the USAF DCGS community is composed primarily of intelligence operators. Intelligence operators are often heavily concentrated among enlisted airmen who are specialty technicians. Intelligence operators within the 480th ISRW are responsible for executing the operational mission of the DCGS discussed above. This often involves exploitation of intelligence data, primarily visual (imagery, video) and technical information. A smaller portion of the global DCGS community is composed of support personnel. These individuals engage in many support functions, ranging from an array of administrative activities to critical technical support of the operations mission, such as sustaining computer communications and network support, engineering, etc. (Prince L. Personal communication; Jan 2014).

Recent research by Prince et al. [1] and Langley [2] examined the psychological impact of working within a deployed-in-garrison occupational environment in DCGS. This study shed light on differences in stress levels amongst intelligence operators and support personnel (i.e., sustainment and support personnel). Prince et al. [1] surveyed DCGS intelligence exploitation operators, DCGS system sustainment personnel, and non-combatant support and logistics airmen from the same installations. The survey included items that assessed for sources of stress, as well as standardized instruments assessing occupational burnout (Maslach Burnout Inventory), clinical distress (Outcome Questionnaire-45.2), and post-traumatic stress disorder (PTSD Checklist-Military). Results of their investigation suggested DCGS intelligence operators reported higher incidences of emotional exhaustion and psychological distress when compared to sustainment and support personnel [1]. Specifically, intelligence operators reported significantly higher levels of emotional exhaustion (29% vs. 6%) and cynicism (23% vs. 11%) than their support counterparts. Also of interest, the primary sources of occupational stress for DCGS intelligence operators were reported to be operational in nature [1]. Specifically, long hours, shift work, organizational and leadership challenges, nature of work, additional workload, low manning and training requirements, and work-rest cycle management were frequently reported sources of stress by the participants in the study [1]. Such research makes it reasonable to expect that intelligence operators would be at a greater risk for worsening health conditions, poor health habits, and increased medical service and medication utilization than support personnel.

Although the research by Prince et al. [1] was able to illuminate the sources and levels of psychological stress among intelligence operators and support personnel working within DCGS, the health consequences of these unique operations are still unknown. Occupational stress presents major concerns regarding one's health behaviors. Occupational stress has been shown to lead to high-risk health behaviors (e.g., increased alcohol and drug use) [3,4] and physical symptoms (e.g., back pain, eyestrain, gastrointestinal problems, and headaches) [5]. Furthermore, high-risk work schedules such as shift work, common to DCGS intelligence operators [1,2], can place this population at an elevated risk for problem drinking behavior (i.e., binge drinking) [6] and poor health outcomes [7]. Such health habits can negatively impact an organization's a effectiveness and overall readiness.

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Mission readiness is heavily dependent upon sustaining a fit and healthy workforce. This is made evident by the fitness standards developed and enforced across all military services [8,9]. Many factors come into play when considering health and fitness. Among these are energy management, stress management, maintenance of strength, endurance, and spiritual/emotional well-being. Prince et al. [1] found these topics to be among the most significant areas of interest to DCGS intelligence operators and support personnel. The high operational tempo and the challenges of long-term shift work experienced within the DCGS community can have negative effects in all of these areas of wellness, depending upon the health habits practiced by such personnel.

Coping strategies frequently associated with shift work and highly stressful operations, such as elevated alcohol, caffeine, and nicotine consumption, can be very disruptive to the energy management cycle, strength and endurance, and overall well-being of DCGS personnel ((Prince L. Personal communication; Jan 2014). These less than healthy stress management strategies may also contribute to other significant health issues such as weight gain, diminished cardiovascular health, and increased risk of serious illness or injury. The ramifications of these issues, while health related, are not strictly medical in nature. Excess weight gain and diminished cardiovascular fitness can lead to failed fitness standards, administrative punishment, and involuntary separation. Alcohol-related incidents can result in criminal punishment and the termination of what might otherwise have been a promising military career. Research by Prince et al. [1] points to the likely presence of these risk indicators within the DCGS community. Such health and readiness concerns should be of great importance to both operational leaders directing the DCGS mission, as well as medical leadership charged with providing care to DCGS personnel. Developing and implementing periodic assessment processes and mitigation strategies focused on overall force wellness are a responsibility that should be shared by line and medical leaders associated with DCGS and related virtual warrior communities.

Established health screenings, such as the USAF Preventative Health Assessment, are designed to identify individuals at high risk for significant medical or mental health concerns. However, the effectiveness of this well-designed tool is dependent upon the self-disclosure of the respondents. Based upon discussions with 480th ISRW leadership and line operators, the authors found that it is widely speculated there is a high level of underreporting of health problems among DCGS intelligence operators. The key factor in underreporting is believed to be the direct association between screening responses and responder identity. It was reported that many intelligence operators likely fear career ramifications (i.e., loss of clearance, mission qualification, advancement recommendation) in the event their health habits and medical concerns are formally documented in their personnel records, resulting in a negative impact on their career. As a result, an anonymous screening process that allows for full disclosure may help to better gauge how prevalent certain problems are within and between such airmen.

Based upon the results of previous research [1], it is hypothesized that a significantly higher number of intelligence operators (when compared with support personnel) will report problematic health behaviors, health habits, medical conditions, as well as increased healthcare service and medication utilization. The objectives of this study are to identify and discuss between group differences amongst 480th ISRW intelligence operators and support personnel on the following items:

- The frequency of health behaviors related to the amount of sleep obtained before work and amount of physical exercise throughout the week

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- The frequency and increase in poor health habits related to the consumption of alcohol, tobacco, and caffeine (use of traditional and designer energy drinks)
- Self-reported medical conditions reported to have been caused (or exacerbated) by their occupational duties since being assigned to the 480th ISRW
- Availability or access to care and the increases in healthcare utilization (to include medical, mental health support, and alternative healthcare services) and self-reported reasons for increases in service care utilization
- Self-reported increases in medication usage (over-the-counter and prescription) and reasons for increased utilization

Specific recommendations to medical and line leadership related to these items are discussed.

3.0 METHODS

3.1 Participants

A total of 1,091 intelligence operators and 447 support personnel from the Air Force Intelligence, Surveillance, and Reconnaissance Agency 480th ISRW participated in the study. Based upon numbers of assigned personnel, the overall estimated response rate was 36%. The total number of airmen assigned to each 480th ISRW unit was obtained from AF operational leadership. This number was then compared with the number of airmen who participated in the study to obtain an overall estimated response rate.

3.2 Questionnaire

3.2.1 Demographics. The questionnaire began with demographic items. Questions assessed age range, marital status, gender, rank range, unit of assignment, whether there were dependents living at home, length of time serving with current unit, average number of hours worked in a typical week, current shift schedule, and shift rotation frequency. Since participants are a part of a community where there may be strong cultural stigmas regarding the endorsement of mental health problems, no personal identifiable information (i.e., name, date of birth, etc.) was obtained to ensure respondent anonymity.

3.2.2 Sleep and Physical Exercise Health Behaviors. Following the demographics questionnaire**,** respondents were asked questions based on their current health behaviors. Participants were asked: *On average, how many hours of sleep do you obtain each night or day, prior to starting work?* The response options for this item were *4 hours or less, 5-6, 7-8, 9-10,* and *11 hours or more.* Participants were also asked: *How often do you engage in moderate physical exercise/training each week (e.g., 20-30 minutes of walking, moderate cycling, moderate speed sport or aerobic activity)?* Response options were *none, 1-2, 3-4, 5-6 times a week,* and *daily*.

3.2.3 Alcohol, Tobacco, and Caffeinated Beverage Use. Quantity and frequency of alcohol, tobacco, and caffeine intake and changes in such habits were also assessed. Participants were asked: *On average, how many times per week do you consume alcohol?* Response options were *N/A (do not drink alcohol), 1, 2, 3, 4, 5, 6 times per week,* and *daily (7 days per week).*

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Participants were asked: *On average, how many alcoholic beverages do you have on each occasion (1 drink = 12 ounces of beer, or 5 ounces of wine, or 1.5 ounces of liquor)?* Response options were *N/A (do not drink alcohol), 1, 2, 3, 4,* and *5 or more beverages*. Participants were also asked: *Since being assigned to this unit, has your use of alcohol changed?* Response options were *yes, no,* and *not applicable (do not drink).* If participants endorsed *yes,* they were then asked: *How has it changed?* Response options were *do not drink alcohol anymore, decreased,* and *increased.* They were then given an open-ended, write-in response question: *If your alcohol use changed, what do you attribute the change to?*

Participants were asked: *What if any types of tobacco products do you use? List all that apply (e.g., cigarettes, smokeless tobacco, electric cigarettes, etc.).* Participants were asked: *On average, how much tobacco have you used over the past month*? Response options were *none, no more than ½ pack of cigarettes per day, no more than ½ packet of chew tobacco per day, no more than ½ can of dip per day, 1 pack of cigarettes per day, 1 packet of chew tobacco per day, 1 can of dip per day, more than 1 pack of cigarettes per day, more than 1 packet of chew tobacco per day,* and *more than 1 can of dip per day*. Participants were also asked: *Since being assigned to this unit, has your use of tobacco changed?* Response options were *yes, no, and not applicable (do not use tobacco).* Unlike alcohol and caffeine items assessing quantity of use, participants were able to select more than one response option for this item. If participants endorsed *yes,* they were then asked: *How has it changed?* Response options were *do not use tobacco anymore, decreased,* and *increased.* They were then given an open-ended, write-in response question: *If your tobacco use changed, what do you attribute the change to?*

Participants were asked: *What type of traditional caffeinated or designer energy beverages do you typically drink? Please list all types and sizes (e.g., coffee, tea, soda, Monster, Red Bull, 5-Hr Energy….8-oz/ 12-oz/ 16-oz portion).* Participants were asked: *On average, how many caffeinated/energy drinks do you consume on a given day?* Response options were *N/A (do not consume caffeine), 1-2, 3-4,* and *5 or more beverages.* Participants were also asked: *Since your assignment to this unit, has your use of caffeinated/energy drinks changed?* Response options were *increased, decreased, has not changed,* and *not applicable.* They were then given an open-ended, write-in response question: *If your caffeinated/energy drink use has changed, to what do you attribute the change?*

3.2.4 Medical Conditions Created or Made Worse by Current Unit Assignment. Participants were given an open-ended, write-in response question: *Please list any medical conditions you have that you believe have been created or worsened by your current unit of assignment (e.g., back pain, chest pain, neck pain, heart palpitations, heartburn, nausea, diarrhea, constipation, sleep problems, depression, anxiety).*

3.2.5 Medical, Mental Support, and Alternative Healthcare Utilization. Participants were asked: *Is access to medical care readily available while you are at work, regardless of your work schedule?* Response options were *yes* and *no*. Participants were asked: *In general, since your current assignment, has your use of medical services changed (e.g., visits for healthcare, consultation with physician)?* Responses were *yes, no*. If participants endorsed *yes,* they were then asked: *How has it changed?* Response options were *do not use medical services, decreased,* and *increased.* They were then given an open-ended, write-in response question: *If your use of medical support services has changed, to what do you attribute the change?*

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Participants were asked: *In general, since your current assignment, has your use of mental health support services changed?* Response options were *yes, no,* and *not applicable (have never used mental health support services)*. If participants endorsed *yes,* they were then asked: *How has it changed?* Response options were *decreased* and *increased.* They were then given an open-ended, write-in response question: *If your use of mental health support services has changed, what do you attribute the change to?*

Participants were asked: *Have you sought treatment from an alternative health provider (e.g., chiropractor, massage therapist, acupuncturist) for the medical condition(s) listed above while in your current assignment?* Responses were *yes* and *no*. If participants endorsed *yes,* they were then asked: *Has the frequency of treatment changed since your current assignment?* Response options were *increased* and *decreased.* They were then given an open-ended, write-in response question: *To what do you attribute the change?*

3.2.6 Medication Utilization (Prescription and Over-the-Counter). Participants were asked: *Has your usage of prescription medication(s) changed since arrival at your current assignment?* Response options were *yes* and *no*. If participants endorsed *yes,* they were then asked: *How has it changed?* Response options were *increased* and *decreased.* They were then given an open-ended, write-in response question: *To what do you attribute the change?*

Participants were asked: *Has your usage of over-the-counter medication changed since arrival at your current assignment?* Response options were *yes* and *no*. If participants endorsed *yes,* they were then asked: *How has it changed?* Response options were *increased* and *decreased.* They were then given an open-ended, write-in response question: *To what do you attribute the change?*

3.3 Procedure

Invitations to participate in the survey were sent by USAF 480th ISRW leadership and group commanders via a mass e-mail to all intelligence operators and support personnel throughout the organization assigned to units in the United States and foreign locations across the globe. To reduce the potential for perceived coercion due to requests for participation coming from USAF leadership, the e-mail invitation to participate informed airmen that participation was voluntary and anonymous.

The group e-mail invitation to participate had an internet link to the USAF School of Aerospace Medicine web-based survey that contained an opening page with an introductory script further explaining the study was conducted by independent researchers and participation was voluntary and anonymous. Additionally, the introductory script on the opening page of the survey further explained to potential participants the nature, purpose, and instructions of the study. The introductory page also informed participants that operational leadership would not have access to individual responses, and results would be presented in a summarized format at the squadron level. The introductory script informed participants they could withdraw at any time without negative repercussions.

Before participants could begin the electronic survey, they were asked to respond to a question asking if they understood the nature, purpose, and instructions of the survey and were voluntarily consenting to participate. Those who endorsed “yes” were then allowed to proceed and take the survey. Those who endorsed “no” were not given the survey and redirected to

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another web page that instructed them on how to contact the independent researchers of the study for additional information.

The survey was distributed electronically via a Department of Defense approved electronic survey tool. The survey was open to all 480th ISRW intelligence operators and support personnel over a 6-week period and re-advertised every other week. Participants who completed the survey were instructed on how to obtain the results of the study and when information would be available. Results were aggregated at the squadron level without any identification of individual responses. In general, the survey took 25-30 minutes to complete. The purpose and methodology of the study were reviewed and approved by the Air Force Research Laboratory Institutional Review Board.

3.4 Data Analysis

3.4.1 Quantitative Analyses. Group frequencies and proportions were calculated for items assessing the following:

- Demographics (gender, age range, marital status, and dependents at home)
- Occupational variables (rank range, time on station, shift schedule, frequency of shift rotation, and hours worked per week)
- Health behaviors (average number of hours of sleep before work and average number of days engaged in moderate exercise per week)
- Poor health habits (amount of alcohol, tobacco, and caffeinated beverage use) and changes in such health habits
- Availability of medical care at work and increased healthcare utilization (medical, mental, and alternative health services)
- Increased medication utilization (prescription and over-the-counter)

The percentages for group proportions regarding self-reported increases in poor health habits, healthcare utilization, and medication utilization were based on the overall number of intelligence operators and support personnel for each group in the study, rather than the number of individuals responding to each of these questions individually.

Comparisons of independent proportions (intelligence operators vs. support personnel) were run on all the variables listed above for frequency analyses to see if the proportions were significantly different from one another. Logistic regression analyses were run to predict intelligence operator group membership (compared to support personnel group membership) regarding the variables listed above. Logistic regressions were not run for number of days of alcohol consumed per week or average number of alcoholic beverages consumed per occasion because the analysis was run on an "elevated alcohol use" variable that was created based upon the consumption of alcohol three or more days a week and consuming at least three or more alcoholic beverages on each occasion. Logistic regressions were not run in instances where sample size assumptions were not met for the outcome variable. Intelligence operators and support personnel groups were required to have $n \geq 30$, and the individual categories for each predictor required $n \geq 5$ for that category to be included in the logistic regression analysis. The comparison category is indicated for each categorical predictor in the tables. The comparison category was chosen based on the following for the demographic variables: category with the majority proportion (e.g., males, enlisted, hours worked per week) or category of interest (e.g.,

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age range 18-25, single, dependents at home, more than 24 months on current station). The comparison category was chosen based on the behavior of interest for health behaviors (e.g., sleeping 4 hours or less per week, no moderate exercise per week, drinking five or more caffeinated beverages), and the comparison category was the baseline for the elevated alcohol use (e.g., below elevated alcohol use threshold) and health behavior increase comparisons, (e.g., no increase in medical services) to compute the odds ratios of interest to this study. A statistical significance level of $p < .05$ was established *a priori* for the logistic regression chi-squares. Two instances of chi-squares with a significance level of $p < .10$ are noted.

3.4.2 Qualitative Analyses. Two behavioral science researchers performed qualitative analyses on textual responses to the open-ended, write-in response items listed above. The semantics of participants' textual responses were independently analyzed and coded into a list of categories by each researcher. The list of coded categories from each researcher for each item was then compared for inter-rater reliability. Categories that appeared to label the same or similar attribute were consolidated into a single category. For example, responses such as *sleep issues, insomnia,* and *trouble sleeping* were all coded into a category of Sleep Problems. The frequency of coded responses for each semantic category was computed and the top responses are reported.

4.0 RESULTS

4.1 Demographics

The overall (and by group) demographics for 480th ISRW participants are shown in Table 1. Significant and insignificant differences in group proportions for each category and the results for logistic regressions predicting intelligence operator group memberships are also shown in Table 1. Statistically significant larger proportions of intelligence operators were as follows: younger, female, officer, those in their current 24 months or less, engaged in shift work (swing and night shifts), more frequently rotate shift work (e.g., every 2 weeks or less, every 30 to 90 days), and work 51 or more hours a week.

4.2 Sleep and Physical Exercise

Significant and insignificant differences in group proportions for each response category are shown in Table 2. A larger proportion of support personnel self-reported exercising five or more times a week when compared with intelligence operators.

4.3 Poor Health Habits (Alcohol, Tobacco, Caffeine Use)

4.3.1 Alcohol Use. Significant and insignificant differences in group proportions for each response category are shown in Table 3. Results of logistic regressions assessing an increase in alcohol use and those engaged in elevated alcohol use are also shown in Table 3. A larger proportion of support personnel reported abstaining from alcohol, and a larger proportion of intelligence operators reported an increase in alcohol use.

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Table 1. Demographics Overall and by Group, Proportion Comparisons, and Regression Results

Demographics	Total		Intelligence Operators		Support Personnel		*p*	Logistic Regressions Predicting Intelligence Operators (Compared to Support Personnel)				
	n	%	n	%	n	%		OR	CI	Omnibus X^2	*df*	*p*
Gender												
Male[a]	1120	74.27	758	70.84	362	82.65	<.01			23.91	1	<.01
Female	388	25.73	312	29.16	76	17.35	<.01	1.96[b]	1.48, 2.60			
Age Range												
18-25[a]	486	31.68	362	33.21	124	27.93	<.05			20.52	4	<.01
26-30	494	32.20	370	33.94	124	27.93	<.05	1.02	0.77, 1.36			
31-34	224	14.60	154	14.13	70	15.77	0.41	0.75	0.53, 1.07			
35-39	186	12.13	118	10.83	68	15.32	<.05	0.59[b,c]	0.41, 0.85			
40+	144	9.39	86	7.89	58	13.06	<.01	0.51[b,d]	0.34, 0.75			
Rank Range												
Enlisted[a]	1335	90.08	945	88.15	390	95.12	<.01			18.31	1	<.01
Officer	147	9.92	127	11.85	20	4.88	<.01	2.62[b]	1.61, 4.26			
Marital Status												
Single[a]	666	43.33	468	42.90	198	44.39	0.59			0.29	1	0.59
Married	871	56.67	623	57.10	248	55.61	0.59	1.06	0.85, 1.33			
Dependents at Home												
Yes[a]	603	39.28	417	38.33	186	41.61	0.23			1.43	1	0.23
No	932	60.72	671	61.67	261	58.39	0.23	1.15	0.92, 1.44			
Time on Station												
≤24 mo	1132	73.70	854	78.35	278	62.33	<.01	2.19[b]	1.72, 2.78			
>24 mo[a]	404	26.30	236	21.65	168	37.67	<.01			40.23	1	<.01
Shift Schedule												
Standard day[a]	689	44.80	421	38.59	268	59.96	<.01			58.50	1	<.01
Shift work	849	55.20	670	61.41	179	40.04	<.01	2.38[b]	1.90, 2.99			
Shift Rotation Frequency												
No rotation[a]	804	52.28	493	45.19	311	69.57	<.01			80.52	2	<.01
≤2 wk	65	4.23	58	5.32	7	1.57	<.01	5.23[b]	2.36, 11.60			
30 days-4x yr	669	43.50	540	49.50	129	28.86	<.01	2.64[b]	2.08, 3.35			
Hours Worked Per Week												
30-50[a]	1122	73.19	757	69.58	365	82.02	<.01			26.28	1	<.01
≥51	411	26.81	331	30.42	80	17.98	<.01	2.00[b]	1.52, 2.63			

Note: OR = odds ratio; CI = confidence interval.
[a]Comparison category for predictor.
[b]Significant chi-square ($p < .05$) and odds ratio.
[c]Inverse OR = 1.69, 95% CI [1.18, 2.44].
[d]Inverse OR = 1.96, 95% CI [1.33, 2.94].

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Table 2. Sleep and Physical Exercise Overall and by Group, Proportion Comparisons, and Regression Results

Sleep and Exercise	Total		Intelligence Operators		Support Personnel		*p*	Logistic Regressions Predicting Intelligence Operators (Compared to Support Personnel)				
	n	%	n	%	n	%		OR	CI	Omnibus X^2	*df*	*p*
Hours of Sleep before Work												
≤4[a]	110	7.16	82	7.52	28	6.29	0.40			4.66	3	0.32
5-6	881	57.36	632	57.93	249	55.96	0.48	0.87	0.55, 1.36			
7-8	530	34.51	364	33.36	166	37.30	0.14	0.75	0.47, 1.19			
≥9	15	<1.00	13	1.19	2	<1.00	N/A[b]	2.05	0.43, 9.72			
Frequency of Moderate Exercise per Week												
None[a]	66	4.31	51	4.69	15	3.36	0.24			20.58	4	<.01
1-2x	472	30.79	359	33.03	113	25.34	<.01	0.93	0.51, 1.73			
3-4x	681	44.42	483	44.43	198	44.39	0.99	0.72	0.39, 1.31			
5-6x	214	13.96	136	12.51	78	17.49	<.01	0.51[c,d]	0.27, 0.97			
Daily	100	6.52	58	5.34	42	9.42	<.01	0.40[c,e]	0.20, 0.82			

[a]Comparison category for predictor.
[b]Sample size assumption (≥5) was not met. N/A = not applicable.
[c]Significant chi-square ($p < .05$) and odds ratio.
[d]Inverse OR = 1.96, 95% CI [1.03, 3.70].
[e]Inverse OR = 1.96, 95% CI [1.22, 5.00].

Table 3. Alcohol Use Overall and by Group, Proportion Comparisons, and Regression Results

Alcohol Use	Total		Intelligence Operators		Support Personnel		*p*	Logistic Regressions Predicting Intelligence Operators (Compared to Support Personnel)				
	n	%	n	%	n	%		OR	CI	Omnibus X^2	*df*	*p*
Times Per Week												
N/A	459	29.96	305	28.03	154	34.68	<.01					
1-2	845	55.16	612	56.25	233	52.48	0.18					
3-4	179	11.68	138	12.68	41	9.23	0.06					
5-6	31	2.02	21	1.93	10	2.25	0.68					
Daily	18	1.17	12	1.10	6	1.35	0.68					
Drinks per Occasion												
N/A	400	26.06	263	24.13	137	30.79	<.05					
1	387	25.21	277	25.41	110	24.72	0.78					
2	442	28.79	319	29.27	123	27.64	0.52					
3	203	13.22	150	13.76	53	11.91	0.33					
4	58	3.78	46	4.22	12	2.70	0.16					
5+	45	2.93	35	3.21	10	2.25	0.31					
Alcohol Increase[a]												
Yes	223	14.50	187	17.14	36	8.05	<.01	2.36[b]	1.62, 3.44			
No[c]	1315	85.50	904	82.86	411	91.95	<.01			23.26	1	<.01
Elevated Use (three or more times a week, three or more drinks per occasion)												
Yes	84	5.48	67	6.16	17	3.83	0.07	1.65[d]	0.96, 2.84			
No[c]	1448	94.52	1021	93.84	427	96.17	0.07			3.53	1	0.06

[a]Intelligence operators n = 1091, support personnel n = 447.
[b]Significant chi-square ($p < .05$) and odds ratio.
[c]Comparison category for predictor.
[d]$p < .10$.

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The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited reasons for an increase in alcohol use included *social climate and squadron events promoting alcohol usage*, *occupational and personal stress*, and *turning the legal age to consume alcohol* for both intelligence operators and support personnel. An increase in alcohol usage among participants from remote and overseas locations was often associated with increased stress and a lower age (i.e., 18 years of age) for legally consuming alcohol.

4.3.2 Tobacco Use. Significant and insignificant differences in group proportions for each response category are shown in Tables 4 and 5. Results of logistic regression assessing an increase in tobacco use are also shown in Table 5. A larger proportion of support personnel self-reported engaging in the use of 1 pack of cigarettes per day.

The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited reasons for an increase in tobacco use included *occupational and personal stress, social climate promoting tobacco usage* (i.e., an approved way for airmen to socialize with others and take a break during shift work), and *personal choice/interest* for both intelligence operators and support personnel.

Table 4. Tobacco Use per Day Overall and by Group and Proportion Comparisons

Tobacco Use	Total		Intelligence Operators		Support Personnel		*p*
	n	%	n	%	n	%	
None	1,219	85.48	875	86.29	344	83.5	0.17
Less than 1/2 pack of cigarettes	131	9.19	91	8.97	40	9.71	0.66
No more than 1/2 packet of chew	7	<1.00	6	<1.00	1	<1.00	[a]
No more than 1/2 can of dip	22	1.54	14	1.38	8	1.94	0.44
1 pack of cigarettes	33	2.31	18	1.78	15	3.64	<.05
1 packet of chew	2	<1.00	2	<1.00	0	0.00	[a]
1 can of dip	6	<1.00	5	<1.00	1	<1.00	[a]
More than 1 pack of cigarettes	5	<1.00	2	<1.00	3	<1.00	[a]
More than 1 packet of chew	1	<1.00	1	<1.00	0	0.00	[a]
More than 1 can of dip	0	0.00	0	0.00	0	0.00	[a]

Note: Unlike similar quantity of alcohol and caffeine use items, participants were able to choose more than one response option for the quantity of tobacco use item. Due to the low n of identical multiple response option selections, these participants were excluded from analysis.
[a] = not applicable.

4.3.3 Caffeine (Combined Use of Traditional and Designer Energy Beverages). Significant and insignificant differences in group proportions for each response category are shown in Table 5. The results of logistic regression assessing caffeine use and an increase in such use are also shown in Table 5. Although there were no statistically significant differences regarding the categories for daily average number of caffeinated beverages consumed, logistic regression revealed the odds of intelligence operators reporting an increase in their use of caffeine was greater than the odds of support personnel reporting an increase.

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The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited reasons for an increase in caffeinated beverage use included *insufficient sleep* (e.g., lack of sleep due to changing shift work rotations), *exhaustion and fatigue* (e.g., working 10-hour shifts, excessive work hours), and *sustaining vigilance* (e.g., increasing alertness during shift) for both intelligence operators and support personnel.

Table 5. Tobacco and Caffeine Use Overall and by Group, Proportion Comparisons, and Regression Results

Tobacco and Caffeine Use	Total		Intelligence Operators		Support Personnel		*p*	Logistic Regressions Predicting Intelligence Operators (Compared to Support Personnel)				
	n	%	n	%	n	%		OR	CI	Omnibus χ^2	*df*	*p*
Tobacco Use												
Yes	254	17.23	171	16.33	83	19.44	0.15	0.81	0.61, 1.08			
No[a]	1220	82.77	876	83.67	344	80.56	0.15			2.01	1	0.16
Tobacco Increase[b]												
Yes	95	6.17	72	6.60	23	5.15	0.28	1.30	0.80, 2.11			
No[a]	1445	93.83	1019	93.40	424	94.85	0.28			1.20	1	0.27
Caffeine per Day												
None	280	18.26	188	17.30	92	20.63	0.13	0.70	0.36, 1.38			
1-2 beverages	957	62.43	690	63.48	267	59.87	0.18	0.89	0.46, 1.69			
3-4 beverages	245	15.98	171	15.73	74	16.59	0.68	0.79	0.40, 1.57			
5 + beverages[a]	51	3.33	38	3.49	13	2.91	0.56			3.02	3	0.39
Caffeine Increase[b]												
Yes	536	34.85	414	37.95	122	27.29	<.01	1.63[c]	1.28, 2.07			
No[a]	1002	65.15	677	62.05	325	72.71	<.01			16.25	1	<.01

[a]Comparison category for predictor.
[b]Intelligence operators n = 1091, support personnel n = 447.
[c]Significant chi-square ($p < .05$) and odds ratio.

4.4 Medical Conditions Created or Made Worse by Assignment

The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited medical symptoms created or made worse by their occupational assignment were similar for both groups (see Table 6). However, a larger proportion of intelligence operators, when compared with support personnel, reported medical conditions created or made worse by their occupational environment. Furthermore, larger proportions of intelligence operators reported *musculoskeletal injury/pain*, *sleep problems*, and *emotional distress* created or made worse by their occupational assignment.

Table 6. Most Frequency Cited Conditions Perceived to be Created or Worsened by Their Unit Assignment and Proportion Comparisons

Medical Condition	Intelligence Operators[a]		Support Personnel[b]		*p*
	n	%	n	%	
Musculoskeletal injury/pain (e.g., back, neck, joint pain)	152	13.93	45	10.06	<.05
Sleep problems (e.g., insufficient sleep)	139	12.74	34	7.61	<.01
Emotional distress (e.g., anxiety, depression)	101	9.23	27	6.04	<.05

Note: There were 628 responses from intelligence operators and 128 responses from support personnel.
[a]Denominator n = 1091.
[b]Denominator n = 447.

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4.5 Healthcare Utilization

4.5.1 Medical Services. Significant and insignificant differences in group proportions reporting the availability of medical care while at work and those reporting an increase in medical care since being assigned to their current unit are shown in Table 7. Although there were no significant differences regarding participants reporting an increase in medical care utilization, the odds of support personnel reporting having access to medical care while at work were greater than the odds of intelligence operators having access.

Table 7. Healthcare Utilization Overall and by Group, Proportion Comparisons, and Regression Results

Healthcare Utilization	Total		Intelligence Operators		Support Personnel		*p*	Logistic Regressions Predicting Intelligence Operators (Compared to Support Personnel)				
	n	%	n	%	n	%		OR	CI	Omnibus X^2	*df*	*p*
Medical Care Available at Work												
Yes	1096	71.96	754	69.62	342	77.73	<.01	1.52[a]	1.18, 1.97			
No[b]	427	28.04	329	30.38	98	22.27	<.01			10.49	1	<.01
Medical Care Increase[c]												
Yes	329	21.39	234	21.45	95	21.25	0.93	1.01	0.77, 1.32			
No[b]	1209	78.61	857	78.55	352	78.75	0.93			0.08	1	0.93
Mental Health Support Increase[c]												
Yes	131	8.52	102	9.35	29	6.49	0.07	1.49[d]	0.97, 2.28			
No[b]	1407	91.48	989	90.65	418	93.51	0.07			3.50	1	0.06
Alternative Healthcare Increase[c]												
Yes	171	11.12	125	11.46	46	10.29	0.51	1.13	0.79, 1.61			
No[b]	1367	88.88	966	88.54	401	89.71	0.51			0.44	1	0.51

[a]Significant chi-square ($p < .05$) and odds ratio.
[b]Comparison category for predictor.
[c]Intelligence operators n = 1091, support personnel n = 447.
[d]$p < .10$.

The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited reasons for an increase in medical care utilization included *increased access to medical care*, *musculoskeletal injury/pain* (back, neck, shoulder joint pain), and *occupational stress* (e.g., stress due to long hours, shift work, coworker/supervisor conflict) for intelligence operators and *musculoskeletal injury/pain*, *increased access to medical care*, and *declining health associated with increasing age* for support personnel. *Environmental conditions* (e.g., poor air quality at work station, poor ergonomic design of work stations, problematic sanitary conditions of workplace and remote overseas locations, and acclimation to new geographical assignments leading to respiratory difficulties) were also endorsed by both groups.

4.5.2 Mental Health Support Services. A significant difference in group proportions reporting an increase in mental healthcare since being assigned to their current unit is shown in Table 7. A larger proportion of intelligence operators reported an increase in mental healthcare utilization.

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The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited reasons for an increase in mental healthcare included *occupational stress* (e.g., long hours, high workload, relational conflict with co-workers/supervisor), *marital/family related problems*, and *emotional distress* (stress/anxiety/depression/stress stemming from adjustment-related difficulties to situational life stressors) for both intelligence operators and support personnel (see Table 8).

Table 8. Most Frequently Self-Reported Reasons for Increased Mental Health Support Services and Proportion Comparisons

Self-Reported Reasons (per coded category)	Intelligence Operators[a]		Support Personnel[b]		*p*
	n	%	n	%	
Occupational stress (e.g., long hours, shift work, relational conflict with co-worker/supervisor)	31	2.84	7	1.57	0.14
Marital/family problems (e.g., partner-relational difficulties, geographical separation from family, workload and duties affecting family relationship)	19	1.74	6	1.34	0.57
Emotional Distress (e.g., stress, anxiety, depression stemming from situational stressors and adjustment-related difficulties)	16	1.47	5	1.11	0.59
Other (e.g., alcohol-related incident, sleep-related difficulties, post-traumatic stress, etc.)	36	3.30	10	2.23	0.27

Note: There were 86 responses from intelligence operators and 19 responses from support personnel.
[a]Denominator n = 1091.
[b]Denominator n = 447.

4.5.3 Alternative Health Services. An insignificant difference in group proportions reporting an increase in alternative healthcare utilization since being assigned to their current unit is shown in Table 7. The results of qualitative analyses of participants' textual responses to the open-ended, write-in response item revealed the most frequently cited reasons for an increase in alternative healthcare utilization included *musculoskeletal injury/pain* (e.g., seeking chiropractic care; acupuncture; massage therapy for back, neck pain), *occupational stress* (e.g., seeking massage therapy to reduce muscle tension from work), and *increased availability of alternative healthcare services* (e.g., interest in using alternative services instead of traditional medical care and prescription medication) for both intelligence operators and support personnel.

4.6 Medication Utilization

4.6.1 Prescription Medication. An insignificant difference in group proportions reporting an increase in prescription medication usage since being assigned to their current unit is shown in Table 9.

The results of qualitative analyses of participants' textual responses to the open-ended item revealed the most frequently cited reasons for an increase in prescription medication usage included *emotional distress* (e.g., stress, anxiety, depression), *musculoskeletal pain* (e.g., back, neck, joint pain), *sleep* (e.g., insufficient sleep, obstructive sleep apnea), and *respiratory issues* (e.g., asthma, allergies) for intelligence operators and *musculoskeletal pain* (e.g., back, neck, joint pain), *respiratory issues* (asthma, allergies), *and emotional distress* (e.g., stress, anxiety, depression) for support personnel.

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Table 9. Medication Use Overall and by Group, Proportion Comparisons, and Regression Results

Medication Use	Total		Intelligence Operators		Support Personnel		*p*	Logistic Regressions Predicting Intelligence Operators (Compared to Support Personnel)				
	n	%	n	%	n	%		OR	CI	Omnibus X^2	*df*	*p*
Prescription Increase[a]												
Yes	257	16.71	179	16.41	78	17.45	0.62	0.93	0.69, 1.24			
No[b]	1281	83.29	912	83.59	369	82.55	0.61			0.25	1	0.62
Over-the-Counter Increase[a]												
Yes	241	15.67	194	17.78	47	10.51	<.01	1.84[c]	1.31, 2.59			
No[b]	1297	84.33	897	82.22	400	89.49	<.01			13.52	1	<.01

[a]Intelligence operators n = 1091, support personnel n = 447.
[b]Comparison category for predictor.
[c]Significant chi-square ($p < .05$) and odds ratio.

4.6.2 Over-the-Counter Medication. A significant difference in group proportions reporting an increase in over-the-counter medication usage since being assigned to their current unit is shown in Table 9. A larger proportion of intelligence operators self-reported an increase in their use of over-the-counter medications.

The results of qualitative analyses of participants' textual responses to the open-ended, write-in response revealed most frequently cited reasons for increased usage included *musculoskeletal injury/pain* (e.g., back, neck, shoulder pain) and *occupational stress* (e.g., high levels of stress and discomfort associated with long work demands and poor ergonomics) for both intelligence operators and support personnel. However, intelligence operators also reported increased usage due to *sleep problems* (i.e., insufficient sleep, poor sleep quality due to shift work), and support personnel cited *respiratory difficulties* (e.g., allergies due to environmental conditions).

5.0 DISCUSSION

The results for each category in current health behaviors, health habits, general medical conditions, medical service utilization (to include access to care), and medication utilization among intelligence operators and support personnel are discussed below. Recommendations to leadership and medical personnel are also provided.

5.1 Health Behaviors

The first objective was to assess differences in group proportions regarding the average amount of sleep prior to work and the average number of days engaged in moderately rigorous physical exercise per week.

5.1.1 Sleep. Although results of the study indicated intelligence operators reportedly engage in more shift work and working over 51 hours a week when compared to support personnel, there were no statistically significant between group differences regarding categorical responses to the average amount of sleep prior to work. However, the overall results of the study revealed that approximately 6-8% of participants obtained 4 or less hours of sleep and 56-58% of participants obtained between 5 and 6 hours of sleep prior to work (see Table 2).

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These results present a concern to the 480th ISRW organization as a whole. According to the National Sleep Foundation [10], the average adult requires 7 to 9 hours of sleep for optimal functioning. The lack of sleep reported by these personnel may present risks to general health, performance, and safety [11-14]. Adults who receive less than or equal to 5 hours of sleep are at an elevated risk for accidents and illnesses [11]. Furthermore, insufficient sleep is associated with several chronic disease outcomes, such as diabetes [15], hypertension [16], cardiovascular disease [17], and obesity [18,19]. The findings of the study reveal a large number of both intelligence operators and support personnel are routinely obtaining inadequate amounts of sleep prior to work, which has the impact of negatively affecting performance and readiness (e.g., health).

Although an exhaustive list of potential reasons for the insufficient sleep reported is beyond the scope of this study, salient areas to target when developing strategies for improving the amount of sleep include operational and educational interventions addressing operational factors (e.g., shift work, long work hours) and problematic health behaviors (e.g., poor sleep hygiene, excessive caffeine use). The findings of this study provide insight into the prevalence of insufficient sleep and point out that efforts to promote a more well rested airman should be a part of line and medical leadership strategies for promoting health and readiness.

5.1.2 Physical Exercise. The results of the study reveal intelligence operators and support personnel report similar numbers of days per week engaged in physical exercise of moderate (or more) intensity (see Table 2). However, a smaller number of intelligence operators reported being engaged in such exercise five or more days a week. Although reasons for this finding are unclear, it is possible intelligence operators have more restriction (such as reduced access to base facilities and physical training time built into work routines) for engaging in daily physical exercise. It is also possible the operational tempo of intelligence operations may serve as a partial obstacle to daily exercise. The finding that the odds of intelligence operators reporting being engaged in shift work and working 51 or more hours a week were greater than the odds of support personnel provides support for this concern.

The results of the study also revealed approximately 3-5% of participants across the 480th ISRW exercise less than 1 day a week, and 25-33% exercise only 1 to 2 days a week. This represents a proportion of airmen across the 480th ISRW who are obtaining less than adequate amounts of physical exercise of moderate or greater intensity. The Centers for Disease Control and Prevention [20] recommends that adults obtain at least 150 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity aerobic activity a week. Increasing the amount of physical exercise for these personnel has benefits for health and performance. For example, being physically active on a regular basis has benefits for long-term health, as it decreases the risk of developing conditions such as cardiovascular diseases, diabetes, and obesity [21]. Physical exercise has also been shown to be beneficial for reducing stress [22].

Overall, the results of the study reveal how frequently airmen engage in exercise of moderate (or greater) intensity throughout the week and serve as a benchmark for comparison for future studies. The results of the study also suggest that line and medical leadership strategies for promoting health and readiness should focus on ways of removing obstacles and promoting physical exercise. Additionally, one of out every three to four airmen across the 480th ISRW would benefit from strategies promoting increased physical exercise.

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5.2 Poor Health Habits

The second objective of the study was to assess for differences between groups regarding poor health habits (alcohol, tobacco, caffeinated beverage use) and increases in such habits since being assigned to their unit.

5.2.1 Alcohol Use. The results of the study indicated more similarities than differences between intelligence operators and support personnel regarding their self-reported consumption of alcohol. However, intelligence operators were at greater odds of engaging in alcohol use, reporting an increase in such use, and being above the threshold for "elevated" alcohol usage (e.g., consumption of alcohol at least three or more days a week and consuming at least three or more beverages each day alcohol was consumed throughout the week). It is possible that age-related differences between the two groups partially contributed to increased alcohol usage among intelligence operators. For example, there was a significantly larger proportion of intelligence operators (when compared with support personnel) between the ages of 18-25 (and subsequently turning the legal age to consume alcohol) who responded to the study. However, it is also possible that occupational stress associated with operational requirements (e.g., long work hours, frequent shift work rotation changes, working swing/night shift) may have been a contributing factor to increased alcohol usage. Regardless of the potential causes, the differences in alcohol usage between intelligence operators and support personnel warrant further investigation for optimizing health and readiness. Line and medical leadership may also consider assessing whether the increased usage among intelligence operators is associated with an increase in alcohol-related incidences.

The results of the study also suggest that 3-6% of airmen across the 480th ISRW are engaged in elevated alcohol usage and may benefit from line and medical leadership interventions to reduce their consumption (see Table 3). Although such usage is not diagnostic of abuse or dependence, elevated alcohol usage is associated with the risk for developing health problems such as alcoholism; liver cirrhosis; diseases of the pancreas, heart, and nervous system; cancers of the upper respiratory and digestive tracts; injuries from motor vehicle accidents; and other associated conditions [23-26].

The results of this study provide salient target areas for line and medical leadership to consider when developing strategies for mitigating alcohol usage. The results of this study reveal the most frequently cited reasons for an increase in alcohol usage (*occupational and personal stress, social culture/events promoting alcohol use,* and *turning the legal age to consume alcohol)* were similar for both intelligence operators and support personnel. The report of increased alcohol intake due to stress is consistent with research that has demonstrated a connection with the experience of daily occupational stress and increased alcohol use [27].

5.2.2 Tobacco Use. The results of the study reveal approximately 16-19% of participants across the 480th ISRW use tobacco (see Table 4). Although there were more similarities than differences between intelligence operators and support personnel regarding self-reported tobacco use, a larger proportion of support personnel reported using 1 pack or more of cigarettes per day. The results of the study suggest the prevalence of tobacco use is consistent with estimates (i.e., approximately 20%) in the general population [28].

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Tobacco usage significantly contributes to numerous health-related problems. Reductions in such usage are included in any strategy for optimizing health and readiness. The results of this study provide line and medical leadership areas to consider when developing strategies to reduce tobacco usage across the 480th ISRW. The most frequently cited reasons for an increase in tobacco use included *occupational and personal stress, social climate promoting tobacco usage* (i.e., an approved way for airmen to take a break during shift work), and *personal choice/interest* for both intelligence operators and support personnel. Such results offer insight into the potential benefits of early intervention that may be valuable to the organization as a whole. For example, medical and line leadership may want to consider offering education on tobacco use early in the assignment process to discourage use of tobacco products as a means for decreasing stress. Line leadership may look for additional strategies that airmen may utilize to take socially acceptable rest breaks during their shifts. Research has indicated that nicotine dependency is more likely to exacerbate stress, and smokers who successfully quit smoking report decreased stress [29]. Strategies that help airmen identify and mitigate stress may also lead to beneficial reductions in tobacco use.

5.2.3 Caffeine Use (Traditional and Designer Energy Beverages). The results of the study revealed intelligence operators and support personnel reported similar amounts of caffeine intake (see Table 5). Although there were no significant differences between groups regarding the number of caffeinated beverages consumed throughout the day, intelligence operators were at a greater odds to report an increase in caffeine consumption. It is possible that intelligence operators are consuming the same number of caffeinated beverages each day, but are now consuming beverages with a higher concentration of caffeine and other stimulants since being assigned to their operational duties. The significant increase in usage warrants additional investigation and monitoring by both line and medical leadership.

The results of the study also reveal that 19-20% of participants across the 480th ISRW consume three or more caffeinated beverages daily (see Table 5). Although data have indicated some benefits to consuming caffeine in moderation, the excessive use of caffeine has been associated with disruption of sleep patterns, sleep deprivation, insomnia, and fatigue [30], as well as other health risks [31]. As a result, such airmen may benefit from strategies that help to reduce caffeine consumption. It is possible such usage is partially contributing to the inadequate levels of sleep reported by participants.

According to Somogyi [32], the vast majority of caffeine consumed in the United States is from beverages (i.e., coffee, tea, soda, and designer energy beverages), and adults, on average, consume 300 mg of caffeine in a day. An 8-ounce cup of coffee contains between 100-200 mg of caffeine, an 8-ounce cup of tea contains 40-120 mg, and an 8-ounce can of soda contains between 30-40 mg. Although an 8-ounce designer energy drink (i.e., Monster, Red Bull, Rock Star) may contain similar amounts of caffeine when compared with a cup of coffee, such drinks also include a blend of other substances (e.g., L-carnitine, glucose, caffeine, guarana, inositol, glucuronolactone, and maltodextrin) that may have a multiplicative impact on physical absorption. Although the results of this study do not provide enough detail to assess for the specific amount of caffeine (and other energy-producing substances) consumed throughout the day, it raises awareness to line and medical leadership regarding how common the use of caffeinated beverages is across both groups and that intelligence operators are increasing their usage.

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The results of the study provide salient areas to consider when developing strategies for raising awareness to increased or excessive caffeine consumption. The most frequently cited reasons for an increase in caffeinated beverage use included *insufficient sleep* (e.g., lack of sleep due to changing shift work rotations), *exhaustion and fatigue* (e.g., working 10-hour shifts, excessive work hours), and *sustaining vigilance* (e.g., increasing alertness during shift) for both intelligence operators and support personnel. The reason for increased caffeine use and higher proportion of increased use among intelligence operators is consistent with the reasons for higher levels of emotional exhaustion and distress found among intelligence operators in an earlier study [1].

5.3 Medical Conditions

The third objective of the study was to assess for the frequency of self-reported medical conditions created or worsened since being assigned to their unit.

The conditions most frequency cited by intelligence operators and support personnel as having been created or worsened by their unit assignment included *musculoskeletal injury/pain* (e.g., back, neck, joint pain), *sleep problems* (insufficient sleep, circadian rhythm maladjustment due to shift work), and *emotional distress* (stress, anxiety, depression) (see Table 6). Although the types of conditions that were made worse were similar for both groups, a larger proportion of intelligence operators reported medical conditions having been created or made worse by their unit assignment.

The results of this study suggest there is a greater risk to physical health related to the performance of intelligence operations. It is likely there are several factors (and combinations thereof) that may contribute to increased risks to health (e.g., ergonomic design of workstations, shift work requirements, longer working hours, higher levels of occupational stress). Regardless of the potential reasons, the increased incidence of self-reported health problems warrants additional investigation. This may include assessment of workplace conditions that may exacerbate stress levels and that are commonly associated with working long hours in a fixed, sedentary, desktop duty environment.

5.4 Healthcare Utilization

The fourth objective of the study was to assess for the frequency of reported access to care, increases in healthcare utilization (to include medical, mental health, and alternative health services) and reasons for an increase in healthcare utilization.

5.4.1 Medical Services. Although the results of the study reveal that the majority of intelligence operators and support personnel report having access to medical care while at work, intelligence operators are at lower odds to report having access to care (see Table 7). It is possible that operational factors (e.g., shift work, long work hours, available medical providers and resources outside of traditional day shift duty hours) are interfering with intelligence operators' access to care. The perception of having less access to care may result in intelligence operators seeking ways to self-medicate via over-the-counter medications and supplements (i.e., alcohol, caffeine, tobacco) to mitigate health-related problems (i.e., occupational stress) affecting their work performance.

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The results of the study did not reveal any significant differences in self-reported increases of medical services utilization (see Table 7). Perhaps, if intelligence operators had equal access to medical care, then the rates would be different in light of a higher proportion of intelligence operators reporting health-related problems created or made worse by their assignment. An alternative view is intelligence operators as a group must engage in more advanced planning to obtain equal access to medical care.

The most commonly cited reasons for an increase in medical care included *increased access to medical care*; *musculoskeletal injury/pain* (back, neck, shoulder joint pain), and e*nvironmental conditions* (e.g., poor air quality at workstation, poor ergonomic design of workstations, problematic sanitary conditions of workplace and remote overseas locations, and acclimation to new geographical assignments leading to respiratory difficulties) for both intelligence operators and support personnel. Such findings reveal that by readily making access to care available, such care will be utilized more frequently. Such findings also suggest strategies for promoting health and readiness may also benefit from workplace evaluations assessing conditions that may exacerbate musculoskeletal injury/pain, as well as general conditions related to quality of air and sanitary conditions within the workplace.

It is also important to note that *occupational stress* (e.g., stress due to long hours, shift work, co-worker/supervisor conflict) was also listed as one of the top reasons for seeking care among intelligence operators, but not by support personnel. This finding directly ties occupational stress to increased utilization of medical care services and suggests medical providers should consider stress screenings when intelligence operators seek care. This is particularly salient given that situational and chronic elevations in stress can lead to an increase in physical health-related problems and symptoms (e.g., weight loss/gain, changes in appetite, increased fatigue, elevated heart rates and blood pressure, insufficient sleep, gastrointestinal distress, headaches, etc.) for which an operator seeks medical care.

5.4.2 Mental Health Support Services. The results of the study revealed that a greater proportion of intelligence operators reported an increase in mental healthcare (see Table 7). Approximately 1 out of every 10 intelligence operators reported an increase in the use of mental health support services. This finding appears to corroborate the finding of increased utilization of medical services by intelligence operators due to occupational stress.

Although the most frequently cited reasons for an increase in mental healthcare were similar for both groups, a higher proportion of intelligence operators reported *occupational stress*, *marital/family related problems*, and *emotional distress* as leading to the need for increased mental healthcare (see Table 8). Such findings reinforce the importance of mental health providers being familiar with occupational demands of airmen and having the capability to provide care related to marital/family related issues. Such findings also reinforce the importance of availability to mental health support services, which may include providing such services beyond traditional day shift duty hours.

Furthermore, when considering the increased rates of elevated alcohol usage and occupational stress among intelligence operators, access to mental healthcare appears critical to sustaining health and readiness. However, the requirement for sustaining a top secret security clearance may reduce self-disclosure of stress-related problems and seeking mental healthcare services by intelligence operators. This is not an uncommon stigma within military culture, particularly among units in which there is a belief that simply seeking mental health treatment may have a negative impact on career progression or result in disqualification for specific duties

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that are necessary to accomplish one's occupational tasks. Developing line and medical leadership strategies to promote self-disclosure may help to identify those in need of mental healthcare.

5.4.3 Alternative Healthcare Services. The results of the study indicated that approximately 1 out of every 10 intelligence operators and support personnel in this study reported an increase in the utilization of alternative health services, such as going to a chiropractor, massage therapist, acupuncturist, or other non-traditional provider (see Table 7). There were no significant between group differences regarding increased utilization.

The results of the study reveal self-reported reasons for an increase in alternative healthcare utilization were centered on *musculoskeletal injury/pain* (e.g., seeking chiropractic care; acupuncture; massage therapy for back, neck pain), *occupational stress* (e.g., seeking massage therapy to reduce muscle tension from work), and *increased availability of alternative healthcare services* (e.g., interest in using alternative services instead of traditional medical care and prescription medication) for both intelligence operators and support personnel. The results of the study suggest that when such services are available, they are likely to be utilized for pain and stress (common reasons for increased prescription, as well as over-the-counter medication usage). Perhaps increasing the availability of alternative care services may help to mitigate the reliance on medication to control such conditions. The reasons for seeking alternative healthcare services also provide support to the importance of an integrated medical/mental health provider approach to the delivery of healthcare services. The management of pain and stress is influenced by emotional, behavioral, and social factors. Understanding and integrating such factors into treatment are necessary for developing a holistic strategy in the evaluation and treatment of such conditions.

5.5 Medication Utilization

The fifth objective of the study was to assess for the frequency of reported increase in medication usage (over-the-counter and prescription) and the attributes for this increase since being assigned to their unit.

5.5.1 Prescription Medication Utilization. The results of the study revealed no difference between intelligence operators and support personnel regarding the proportion of those reporting an increase in the utilization of prescription medication (see Table 9). Overall, 16-17% of participants across the 480th ISRW reported an increase in medication usage. However, the phenomenon of increased prescription medication usage within the U.S. general population was raised in an earlier study by Gu, Dillon, and Burt [33]. Their study revealed the majority of adults in the U.S. general population had at least one prescribed medication and that such usage had increased by 48%. There are a number of possible explanations that range from increasing health-related problems and medications to mitigate such problems to overreliance on medications and liberal prescribing practices by medical practitioners. Regardless of the potential reasons, increased usage warrants additional monitoring by medical leadership to assess for whether such increases are representative of an anomaly or an ongoing trend.

The results of the study revealed *emotional distress* (e.g., stress, anxiety, depression) and *musculoskeletal pain* (e.g., back, neck, joint pain) to be common for both intelligence operators and support personnel. The finding is consistent with previous reports that identify prescription

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narcotics (i.e., hydrocodone) to be the most commonly prescribed medication for adults in the United States [34] and antidepressant medication to be the most commonly cited reason for increased prescription medication usage among adults in the U.S. population [33]. In general, pain and antidepressant prescription medications continue to be among the most commonly prescribed medications within the United States [35].

However, intelligence operators also identified *sleep problems* (e.g., insufficient sleep, obstructive sleep apnea) as reasons for an increase in medication. Such sleep problems were often explained in textual responses to be the result of long work hours, shift work changes, as well as from increased usage of caffeinated beverages to sustain alertness at work and to manage demands associated with sustaining high levels of attention and concentration. This finding reinforces earlier findings that intelligence operators as a group may benefit from line and medical strategies that help improve general sleep. Although intelligence operators reported obtaining similar amounts of sleep when compared with support personnel, perhaps the quality of sleep is lacking among intelligence operators. That is, they are not feeling as rested or refreshed upon awakening when compared with support personnel. Regardless, this particular finding warrants additional investigation and may potentially be mitigated by making improvements in length and frequency of shift work.

5.5.2 Over-the-Counter Medication Utilization. The results of the study revealed intelligence operators were at greater odds to report an increase in the utilization of over-the-counter medication (see Table 9). Although there are numerous benefits to over-the-counter medications, it would be incorrect to assume such use is safe because they do not require a prescription. The use of over-the-counter medications has been increasing among adults in the United States with potential for risks to health due to (a) incorrect self-diagnosis delaying diagnosis and treatment of serious illnesses (delay in seeking advice from a healthcare professional); (b) increased risk of drug-drug interactions; (c) increased risk of adverse events when not used as instructed; and (d) the potential for misuse and abuse, especially with medications designed to reduce pain, increase weight loss, and manage cold and flu-like symptoms [36]. As a result, the increasing use of over-the-counter medications and their high potential for misuse should be given consideration when developing strategies for sustaining health and safety. The results of this study reveal the odds of intelligence operators reporting increased use in over-the-counter medications was almost twice the odds of support personnel. Such results suggest intelligence operators are more likely to seek ways to self-medicate. This finding may be related to their report of having less access to medical care while at work.

The reasons for increased usage of over-the-counter medication were consistent with the findings for increased prescription medication usage. Intelligence operators are at greater odds to utilize over-the-counter medication and to self-medicate for problems associated with *musculoskeletal pain*, *stress*, and *sleep-related difficulties*. This is particularly concerning given the potential for misuse, abuse, and negative interactions with other medications and substances (such as alcohol and caffeine) that can elevate the risk for health-related problems, thereby affecting readiness and performance.

5.6 Recommendations

5.6.1 First Tier – Line Leadership. The results of the study have led to recommendations specific to intelligence operators as well as airmen across the 480th ISRW. Although both

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intelligence operators and support personnel can benefit from optimizing shift work schedules, the results of the study indicate that intelligence operators endorsed significantly higher levels of shift work, occupational stress associated with the length of shift work and frequency of schedule rotations, as well as an increase in related caffeine use and sleep difficulties. As a result, intelligence operators would likely benefit from more optimal shift work schedules. Modifying shift rotations and schedules by increasing their predictability and allowing for appropriated degrees of control in shift schedule development may help reduce certain elements of stress associated with a deployed-in-garrison lifestyle. Additionally, such adjustments may contribute to improvements in sleep and reductions in reliance on stimulants for sustaining alertness during missions. It is recommended that medical and mental health providers assigned to the operational unit be consulted to assist with the development of effective shift work schedules appropriate for this population and for reducing situational and chronic occupational and personal stress negatively impacting performance.

In addition to improving shift work schedules, it is recommended that line leadership consider improvements to work rest cycle and break routines. This is an especially important item to consider for both intelligence operators and support personnel if changes to shift work are not feasible. Ensuring more frequent breaks and shorter shifts may help to mitigate problems with neck and back pain and headaches associated with sedentary desk duties and sitting at a computer workstation for long periods of time with limited mobility. Improvements in rest and break schedules may also allow operators increased opportunity to engage in self-care (e.g., medical appointments and exercise), which may help to ensure they are performing at optimal levels when at work. Furthermore, it is important that leadership create a social climate where breaks and "time outs" for self-care are highly encouraged for airmen who have to sustain vigilance to large amounts of real-time and/or archival data processing. This may help mitigate occupational stress and exhaustion. Equally important is creating an atmosphere in which healthy rest breaks are highly encouraged and working without rest breaks is strongly discouraged.

As mentioned earlier, a larger number of intelligence operators are younger than their support personnel counterparts. As a result, intelligence operators may benefit from stress inoculation interventions at early stages in their training pipeline. It can be difficult to adapt to a military lifestyle, and the challenges of also having to perform intelligence operations may exacerbate such stress. Exposing intelligence operators to the realities and potential strategies for coping with the challenges they are likely to face prior to arrival at their first duty station (especially if their assignment is overseas) may help mitigate adjustment-related difficulties and occupational stress and related conditions (elevated alcohol, tobacco, caffeine use, medical conditions exacerbated by stress, increased need for mental health care, etc.).

Additionally, a larger number of intelligence operators are female. This raises awareness to the need for line leadership to be sensitive to gender-specific issues, especially conditions in the workplace that may elevate stress levels. This may include unwanted sexual advances in a male-dominated milieu as well as gender-specific medical conditions that may not be adequately addressed. An additional area for further investigation by line leadership may be the increased challenges female intelligence operators may face in juggling their warfighter role with their domestic duties and roles.

It is recommended that line leadership encourage and develop time for daily physical fitness. Although increasing physical activity for both intelligence operators and support personnel offers many benefits, results of this study suggest intelligence operators have significantly lower rates of physical activity when compared to their counterpart support

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personnel. Developing creative strategies to engage in physical exercise during work breaks and improving upon access to resources for exercise may help mitigate occupational stress as well as improve overall quality of health (e.g., improve sleep, weight, and cardiovascular health). Physical activity, in particular, has been shown to reduce perceptions of stress [22] and particularly relevant to airmen operating in sedentary duty positions with high levels of psychological stress. Additionally, physical training with emphasis on core strength training could offer significant mitigation to the back and neck pain often reported by intelligence operators. Equally important is the consideration of any barriers to the intelligence operator community for engaging in more physical activity. For example, the requirement for sustaining around-the-clock shift work and long hours may subsequently lead to the need for increased access to base facilities (e.g., the gym, recreational facilities) for exercise use during nontraditional duty hours and when most facilities are closed (i.e., swing and night shift).

Line leadership is also encouraged to identify ways to improve the ergonomic design of workstations to reduce health-related problems (e.g., neck and back pain, cardiovascular disease) common to sedentary desktop duties. This may include development of hydraulic desks that may move up and down allowing operators to perform their duties, at will, from sitting and standing positions. Lighting configurations may also help with reducing visual glare that may cause headaches and ophthalmological strain, as well as day-to-night shift rotations. An exhaustive list of ergonomic improvements is beyond the scope of this section. Nonetheless, the general recommendation is for leadership to consider ways they can improve environmental conditions and workspaces to optimize performance and improve health.

It is likely that the implementation of these recommendations will minimize symptoms of stress, sleep difficulties, and engagement in unhealthy behaviors, as well as increase general health, safety, and performance. Furthermore, research has demonstrated that decreased occupational stress is associated with a decreased need for self-medication through substance use [37,38]. It is expected that implementation of the recommendations discussed above would likely lead to less use of tobacco, caffeine, and alcohol and lower perceived stress levels while also improving factors that are directly related to health, such as exercise and sleep, and increased utilization of medical and mental health support services.

5.6.2 Second Tier – Medical Leadership. The results of this survey identify specific areas medical and mental health leadership and providers can target for prevention and intervention as a means to mitigate some of the health impacts reported by intelligence operators as well as airmen across the 480th ISRW.

An important factor for medical and mental health leadership to consider in supporting intelligence operators and support personnel across the 480th ISRW is reducing the inherent restrictions with access to medical care when these airmen have to work around-the-clock operations. Access to medical and mental health providers is essential to maintaining a safe, healthy, and ready force. As discussed, the results of this study revealed a large number of intelligence operators have increased their need for medical and mental healthcare since being assigned to their unit. Equally concerning is the finding that intelligence operators, who are at greater odds to work shift work, are at lower odds to report access to medical care when compared with their support personnel counterparts. Traditionally, medical treatment facilities are available for scheduled appointments during traditional duty hours (i.e., 0730-1630). As a result, conflicts in accessing care can arise for operators working a night shift rotation. As a

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result, it is likely that intelligence operators would benefit from having access to medical and mental health providers during swing and night shift rotations.

It is also recommended that medical leadership embed dedicated mental health providers within operational units. Being embedded within an operational unit means having an office and workspace location within the operational environment and time solely dedicated to the delivery of mental healthcare, consultations, and promotion strategies for both individual operators and commanders. It is also recommended that experienced mental health providers who are selected for this position are trained on the purpose, intent, and capabilities of intelligence operations, the global missions such operations support, and the inherent stressors and challenges associated with such duties. This will give mental health providers the context and background required for understanding the unique stressors and adjustments faced by intelligence operators during situational events, as well as the routine rigors of daily operations. Such training is necessary for mental health providers to fully understand the rigors of intelligence operations and to make discretionary judgments about an operator's capability to adequately perform his or her duties when there are negative changes to his or her psychological health.

It is also recommended that medical and mental health providers assigned to intelligence operators develop individual and group-specific outreach efforts that target alcohol and stimulant use (caffeinated beverages), sleep hygiene, occupational stress, as well as physical exercise routines and habits tailored to overcoming health problems (neck and back pain) associated with sedentary, desktop duties. It is also recommended to consider briefings to new operators and personnel on topics related to the realities and sources of high occupational stress specific to 480th ISRW operations.

Furthermore, the 480th ISRW would likely benefit from consultation services to leadership and ongoing monitoring of the occupational health status of each unit. This would include medical and mental health providers conducting anonymous assessments (with use of brief, standardized outcome measures) for symptoms of burnout and distress as well as various health habits affecting readiness and performance. Providing such information to leadership may help provide situational awareness to areas affecting performance and insights necessary for developing effective health and performance promotion strategies.

6.0 LIMITATIONS OF THE STUDY

Although this study raises valuable awareness to problematic areas of health that may benefit from interventions, there are several limitations to consider. First, the intent of this study is not to diagnose mental illness, but only to screen for indicators in negative health behavior trends. Second, this study is also not able to account for preexisting conditions (prior to being assigned to intelligence operations) that may have affected self-report and study outcomes. Third, this study did not match the questionnaire pattern to pull information that would allow for direct comparisons with national averages. The non-standardized items provide only a general glimpse into specific areas of health. Subsequent administrations of the survey could benefit modifications to non-standardized items that allow for more direct comparisons in several areas (i.e., caffeine use, designer energy beverage use, medication usage, etc.). Fourth, the nature of this study does not allow for cause-effect conclusions. Although analyses of textual responses provide reasons for increased alcohol, tobacco, caffeine, medical/mental healthcare, and medication usage (prescription and over-the-counter), additional studies are needed for making definitive conclusions. Fifth, the results of this study did not fully address the functional

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impairment of the health behaviors reported, such as insufficient sleep and substance use (i.e., alcohol, prescription drugs). Furthermore, participants reporting high levels of sleep issues, increased medical use, medical problems, and substance abuse do not necessarily require treatment. The study can be improved upon via simultaneous assessment of functional impairment to support the validity of assumptions to performance that are made. It is possible that many 480th ISRW intelligence operators and support personnel who endorse negative health behaviors remain functionally resilient. Sixth, self-report surveys are prone to response bias from a self-selected sample that might affect generalization of results. Simply put, whenever assessing for the impact within an organization, it is always a possibility there will be sampling bias. This bias may occur as a result of those individuals who are at highest risk and wanting to expose their concerns. However, sampling bias is not necessarily a negative issue if it helps reveal the intended, at-risk population. In spite of these limitations, the current findings support the notion that working around-the-clock real-time operations may place one at risk for adverse health consequences that would benefit from being addressed by leadership and medical personnel.

7.0 AREAS OF FUTURE STUDY

This study provides demographic information on the health behaviors and healthcare utilization of the 480th ISRW personnel. Future studies with larger samples of intelligence operators and support personnel are necessary to determine the generalizability of the study findings to this community. In addition, follow-up studies using structured diagnostic interviews would contribute considerably to the understanding of the unique operational factors that contribute to occupational stress experienced by airmen.

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LIST OF ABBREVIATIONS AND ACRONYMS

CI	confidence interval
DCGS	Distributed Common Ground System
ISR	intelligence, surveillance, and reconnaissance
ISRW	intelligence, surveillance, and reconnaissance wing
OR	odds ratio
USAF	United States Air Force

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