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# Trade Study: A Two- Versus Three-Soldier Crew for the Mounted Combat System (MCS) and Other Future Combat System Platforms

Diane K. Mitchell, Charneta L. Samms, Thomas Henthorn, and Josephine Q. Wojciechowski

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Human Research & Engineering Directorate

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**14. ABSTRACT**

Crew size has become a critical issue in military vehicle design. Motivated by the needs of organizations such as the Army Materiel Systems Analysis Activity and the Future Combat System (FCS) lead system integrator, Boeing-Science Applications International Corporation, the U.S. Army Research Laboratory (ARL) decided to take the initiative to investigate this issue. The focus of this trade study was to determine the viability of transitioning to a two-soldier crew for the line-of-sight (LOS) and beyond-line-of-sight (BLOS) platforms in the early FCS force designs for Increment 1. The LOS-BLOS platform is now called the mounted combat system (MCS).

The two- versus three-soldier crew analysis was conducted with task-network models built with the computer simulation tool, Improved Performance Research Integration Tool (IMPRINT). IMPRINT was developed by ARL to evaluate possible system performance by calculating the mental workload associated with each operator to complete a specified mission. Within this trade study, these missions were simulated with networks of functions and tasks representative of possible missions that would be performed by FCS MCS crew members. This study focused on the LOS engagement portion of the MCS mission.

The initial IMPRINT models were developed from existing IMPRINT models of other combat platforms. While the MCS platform should have greater capabilities than its predecessor, the functions of driving, shooting, and communicating are fundamentally the same. FCS concepts seek to equip the MCS crew with technology to enhance their mission performance. These initial models were to be the baseline concept, and the desire was to add technology to the models as applicable. Unfortunately, technology that could affect operator workload such as the ability to off-load driving during dynamic combat operations were not mature enough to allow for accurate model depiction and will not likely be available for FCS Increment 1. Therefore, this functionality was not included in models.
Results of the modeling efforts show that a two-soldier crew for the MCS platform would create a high risk of not meeting necessary system performance requirements. For vehicles whose primary mission is not a combat mission, such as the command and control vehicle, reconnaissance and search vehicle, non-line of sight cannon or mortar, and infantry carrier vehicle, the two-soldier crew may be a lower risk. The results of this study were influential in changing the FCS MCS crew member requirement from two to three in the operational requirements document (25 Nov 2002). This change is also reflected in the operational and organizational plan (25 Nov 2002).

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# 1. Introduction

The Future Combat System (FCS) is an essential component of the Army's Objective Force. It is the next generation, multi-mission, land combat system. To meet the goals of the Objective Force vision, FCS must be responsive, deployable, agile, versatile, lethal, survivable, and sustainable (Unit of Action Maneuver Battle Lab, 2003). These characteristics, in turn, suggest smaller, lighter weight vehicles. The change in vehicle design has led system designers to propose a reduction in FCS crew size. Crew size is a critical issue for FCS systems, specifically the mounted combat system (MCS) platform, because of the deployability constraints of using the C-130 aircraft (Unit of Action Maneuver Battle Lab, 2002). With space and weight at a premium, minimizing crew size without sacrificing operational capability is critical to stay within the C-130 dimension constraints.

It is also important to acknowledge that FCS will require crew members to be very responsive and to perform multiple mission functions. If the crew workload exceeds their capability to perform their assigned tasks, performance of the FCS may decline and the requirements of the Army's Objective Force vision may not be met. Therefore, system analysts must determine the optimum number of crew members, the best allocation of tasks among those crew members, and how technology can assist those crew members in their mission.

The MCS mission profile shows that the MCS crew could expect, on average, 15 line of sight (LOS) engagements and 31 beyond line of sight (BLOS) engagements during a 72-hour high intensity conflict scenario (Unit of Action Maneuver Battle Lab, 2003). If the BLOS capability is unavailable for Increment 1, then LOS missions could increase. Also, if the enemy can develop tactics, techniques, and procedures to mask their forces from U.S. sensors, dismounted enemy "hunter-killer" teams are proliferated on the battlefield or if the network is not working, limiting the common operational picture (COP), then LOS engagements for FCS MCS platforms could increase. Therefore, this study focused on the crew size and operator workload of the LOS engagement, which could be considered one of the most dangerous FCS missions.

Workload issues associated with two- versus three-soldier crew designs have been investigated in the past. In 1989, Technology International, Inc., conducted a study of a two-crew design in which one crew member (the commander) would control multiple robotic combat vehicles while the other crew member was the vehicle driver (Sabri et al., 1989). The authors concluded that the commander's workload would need to be reduced. To accomplish this reduction, it was recommended that some of the commander's tasks should be reallocated to the driver. The Tank-Automotive Command (TACOM) sponsored this study.

TACOM conducted another study that addressed the issue of the commander's workload in a two- versus three-member crew. This study, conducted by Micro Analysis & Design, Inc. in

1997, examined the interaction between crew performance and the application of advanced technologies (Smart, Rapkoch, Dahill, Fritz, and Williams, 1997). The researchers collected data from crew exercises in a baseline M1A2 main battle tank simulator and an advanced technology combat vehicle (ATCV) simulator. The ATCV was designed for a crew of two with the driving tasks and command and control (C2) tasks assigned to the vehicle commander. The targeting, gunnery, weapon management, and countermeasure functions were assigned to the gunner. The performance and mental workload ratings of the ATCV crew were then compared to the performance and mental workload ratings of the baseline M1A2 crew. The results from these exercises were inconclusive. Although the authors concluded that the crew size could be reduced without loss of combat efficiency, they did not have measures that would make it possible to conclude that the ATCV crew station's capability to perform C2 functions was equal to or better than the baseline. The results of the subjective workload measures that were collected were significantly poorer for the ATCV crews than the baseline crews.

These workload discrepancies were also predicted by computer models built by the U.S. Army Research Laboratory's (ARL's) Human Research and Engineering Directorate in support of the crew integration and automation test bed (CAT) advanced technology demonstrator (ATD). To support the CAT ATD program, ARL researchers built three baseline models of current size crews conducting scout, combat, and carrying missions. The combat model was then modified to reflect two crew members operating in the CAT ATD simulator. The baseline and two-crew-member models were task-network computer models built with IMPRINT. For the two-soldier combat model, it was assumed that the commander would also be the vehicle driver. The mental workload profiles produced by the models indicated that the commander-driver had high workload peaks a number of times during the mission. Operators tend to make performance errors when workload peaks beyond their capability to cope with it; therefore, it can be concluded that the commander-driver may make errors at these points in the mission. Specifically, the commander's workload became excessive when multiple tasks were being performed such as driving and communicating. Because of the outcome of the CAT ATD modeling effort, ARL researchers decided to build models to determine the function allocation that would result in a more manageable, evenly distributed workload for a two-soldier crew design. This trade study report documents this modeling effort.

## 2. Objective

The objective of this trade study was to examine the mental workload of the FCS MCS crew to determine the best allocation of the combat functions among two- and three-soldier crews.

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# 3. Trade Methodology (Models and Simulations)

The ARL Improved Performance Research Integration Tool (IMPRINT) is a stochastic network-modeling tool designed to help assess the interaction of soldier and system performance from concept and design through field testing and system upgrades. An important feature of IMPRINT is that it helps researchers and designers evaluate operator and crew mental workload while testing alternate system-crew function allocations. The amount of mental workload that is required to use a system has a significant effect on human performance within the system. IMPRINT gives system designers the information they need to predict how changes in design can affect overall system performance. Since FCS is in the conceptual phase, IMPRINT was the ideal tool to use in order to perform this trade study.

## 3.1 Mental Workload and Performance

The relationship between workload and performance is complicated. Often, it is assumed that as workload increases, performance decreases. In actuality, the relationship between workload and performance can be best described as an inverted "U" because decrements in performance may occur if workload is either too low or too high (Nachreiner, 1995).

Furthermore, there can be a disassociation between workload and performance at certain levels. This means that as workload increases, the operator's performance may not decrease because the operator has a strategy for handling task demands to compensate for the increased workload. Hart (1989) proposed that operator workload strategies play an important role "in determining the relationship between objective task demands, experienced workload, and system performance (p. 4)." By using two types of mental workload (visual, auditory, cognitive, and psychomotor [VACP] and advanced), IMPRINT allows system analysts to look at each of these situations.

### 3.1.1 VACP Workload

In the VACP workload option of IMPRINT, mental workload is divided into four resources: visual, auditory, cognitive, and psychomotor. The amount of each of these resources necessary to perform a task is estimated via 7-point scales developed by McCracken and Aldrich (1984). IMPRINT calculated a workload number for each task by summing across all four resources for that task. Each time a task begins or ends, IMPRINT calculates an overall workload value for that time by summing across the totals for all tasks occurring. Any time a workload value exceeds 7 for visual, auditory, cognitive, or psychomotor, the person is considered to have exceeded his or her workload capacity for that particular resource (McCracken and Aldrich, 1984). In addition, some researchers believe that when the overall workload value (V+A+C+P) exceeds 40, a person is considered to have exceeded his or her overall workload capacity (Reid and Colle, 1988). This method of calculating overall workload is most effective when one is comparing different variations of a particular model.

### 3.1.2 Advanced Workload

The advanced workload analysis feature of IMPRINT allows the system analyst to incorporate operator workload management strategies into the workload model. The advanced workload algorithm calculates workload based on the resources being used by the operator and incorporates the fact that multiple tasks are being performed simultaneously (Little et al., 1993).

Within the advanced workload option, mental workload is divided into five resources: visual, auditory, cognitive, psychomotor, and speech. Although these five resources are the default within IMPRINT, it is also possible to create and add new resources if desired. When using the default resources, analysts rate the amount of each of these resources required to do a task on 7-point rating scales. These scales are modified versions of the scales used in VACP (Little et al., 1993). The system analyst uses these scales to estimate the resources required for each task that an operator performs. Once the workload values have been entered, the workload algorithm embedded in IMPRINT calculates the mental workload. The calculation method in this algorithm is based on the Multiple Resource Theory (MRT) (Wickens, 1991).

According to MRT, when an individual performs a task, he or she requires different mental operations and to some extent, each operation uses the mental processing resources necessary to accomplish the task. These mental resources are limited, and a supply-and-demand problem occurs when the individual performs two or more tasks that require a single resource. As a result of time sharing of resources, some task performance times may increase, the probability of successfully completing a task may change, or performance times may decrease (Little et al., 1993). These MRT concepts are the underlying assumptions for the advanced workload option in IMPRINT. The analyst runs the advanced model and determines where the workload peaks are and which tasks were operating at that time and contributed to the peaks. These tasks can then be identified as candidates for redesign, automation, or reallocation to another crew member (Archer, 1998).

For the purpose of this trade study, when the overall workload value exceeded 60 for the advanced model, the operator was considered to be in a state of high workload. The workload value of 60 was determined by consensus of subject matter experts (SMEs) familiar with the MCS concept.

### 3.1.3 VACP Workload Models

The models are comprised of a primary mission with several underlying functions (see Table 1). Each underlying function, in turn, is reduced to a number of tasks. The primary mission is to drive from a starting point to the area of engagement. In order to determine an optimum crew size and function allocation for the FCS MCS vehicle, several variations of FCS crews performing combat missions were modeled in IMPRINT via VACP workload.

As the vehicle moves from one location to another, the driver needs to avoid hindrances, such as obstacles or threats. The driver must also correct problems that occur with the vehicle such as

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mechanical failures or damage to the vehicle from threats. Driving is a continuous function that occurs throughout the mission, including when the crew members are engaging targets. Scanning for targets and communicating within and between vehicles are also continuous functions that occur throughout the mission. Targets are engaged, vehicle problems are corrected, and hindrances are avoided intermittently throughout the model run. The ARL system analysts met with several military SMEs from Aberdeen Proving Ground, Maryland, and Fort Knox, Kentucky, who verified that the tasks in the model adequately represented a conceptual MCS mission.

Table 1. Model structure and functions

| Model Structure | Function Name |
|---|---|
| Primary Mission | Drive |
| Function 1 | Avoid hindrance (probabilistic) |
| Function 2 | Remediation necessary (probabilistic) |
| Function 3 | Engage targets (probabilistic) |
| Function 4 | Scan for targets (ongoing) |
| Function 5 | External communications (ongoing) |
| Function 6 | Crew communications (ongoing) |

Table 2 describes four different model conditions. Each condition represents a different function allocation between crew members. Conditions 1 through 3 represent the allocation of functions between two crew members, whereas Condition 4 represents the allocation of functions among three crew members. The possible crew positions are tank commander (C), driver (D), gunner (G), and the combinations of these: commander-driver (CD), gunner-driver (GD), and commander-gunner (CG), as shown in Table 3.

Table 2. Function allocation over all four conditions

| Function Labels | Condition 1 | | Condition 2 | | Condition 3 | | Condition 4 | | |
|---|---|---|---|---|---|---|---|---|---|
| | GD | C | CD | G | CG | D | C | G | D |
| Drive | YES | NO | YES | NO | NO | YES | NO | NO | YES |
| Hindrance | YES | NO | YES | NO | NO | YES | NO | NO | YES |
| Remediate | YES | NO | YES | NO | NO | YES | NO | NO | YES |
| Engage | YES | YES | YES | YES | YES | NO | YES | YES | NO |
| Scan | NO | YES | NO | YES | YES | NO | YES | YES | NO |
| External Commo[a] | NO | YES | YES | NO | YES | NO | YES | NO | NO |
| Crew Commo | YES | YES | YES | YES | YES | YES | YES | YES | YES |

[a]Commo = communications

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Table 3. Experimental design matrix for two-soldier crew
function allocation

|  | Commander | Driver | Gunner |
|---|---|---|---|
| Commander | - | CD | CG |
| Driver | CD* | - | GD |
| Gunner | CG* | GD* | - |

\* Similar combinations

In all the modeled conditions, both the commander and gunner are involved in some part of engaging the target. The commander verifies the target, decides whether to engage the target, and sends reports to higher headquarters after the target is destroyed. The gunner chooses the weapon and ammunition, arms and auto-loads the weapon, and then shoots and destroys the target. If the commander or gunner is also the driver, then scanning is only performed in the context of driving. The driver would not scan via the sight or sight extension. The crew member who is not driving scans via the sight. In condition 3, where the commander is also the gunner, the CG performs all the engage target tasks. In all the modeled conditions, the commander always handles the communications with higher headquarters and lateral units and determines how to respond to the messages. All the crew members talk to each other within the vehicle. Also, in all conditions, the driver remedies problems with the vehicle and also avoids hindrances.

### 3.1.4 Advanced Workload Models

In order to take a closer look at the workload issues of the FCS MCS, one VACP model was converted to four advanced workload models. Since condition 3 was determined to be the best two-soldier crew function allocation, the CG and driver allocation were selected for further study. The basic composition of the models as explained before was not changed during the conversion to advanced workload. In the advanced workload study, two new conditions were created to look at issues suggested in the previous study: (a) the addition of an automated scanning system and (b) a non-combat FCS platform. Table 4 lists the advanced models that were developed.

Table 4. Advanced workload study conditions

| Condition | Model Concept |
|---|---|
| 1 | Combat Scenario |
| 2 | Automated Scanning Scenario |
| 3 | Combat Scenario with No Engagements (baseline) |
| 4 | Non-combat scenario |

### 3.1.5 Model Execution

Since mental workload of the crew was the focus of this trade study (not time and accuracy), each VACP and advanced workload model was executed one time. In order to ensure that each model ran on a similar path, a common random number seed was determined. The path that was selected allowed each model to complete the combinations of tasks that provided a reasonable picture of mental workload required by the crew to complete its mission. This method provides a measure of workload that is indicative of the average overall workload. The results of the advanced workload models were based on one run, but each model was run ten times to ensure that the average workload that would be experienced by the crew was reflected.

## 4. Results

### 4.1 VACP Workload Analysis of Optimum Crew Size

#### 4.1.1 Condition 4: Commander, Gunner, and Driver

Condition 4 was the only condition that represents three crew members performing the combat mission (see Table 5). The only crew member whose workload capacity is exceeded in this condition is the driver. There were 28 instances when the driver's overall workload exceeded the workload threshold of 40 (see Table 5).

Table 5. VACP workload for condition 4

| Resources | Max Value | | | Instances in Overload (No. of times >7) | | |
|---|---|---|---|---|---|---|
| | D | C | G | D | C | G |
| Visual | 23 | 7 | 7 | 199 | 0 | 0 |
| Auditory | 11 | 1 | 5 | 5 | 0 | 0 |
| Cognitive | 24 | 17 | 14 | 173 | 16 | 7 |
| Psychomotor | 6 | 15 | 9 | 0 | 16 | 5 |
| Overall Workload | Max Value (V+A+C+P) | | | Instances in Overload (No. of times >40) | | |
| | D | C | G | D | C | G |
| | 56 | 34 | 33 | 28 | 0 | 0 |

Additionally, there were 199 instances when the driver's visual workload exceeded the threshold of 7 and another 173 instances when the driver's cognitive resource exceeded 7 (see Table 6). This high workload represents the complexity of the drive function itself. The driver must perform the motions of driving (accelerate, steer, or brake) while visualizing the route and

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maintaining awareness of the vehicle's status. The driver must also avoid obstacles and correct problems with the vehicle. Because the driver's workload is already excessive, combining any other tasks with driving increases the probability of mistakes. The high level of workload associated with driving can also increase the possibly of mistakes occurring while driving is the only function being performed (National Highway Transportation Safety Administration, 1997). Condition 4 is also the only condition in which two crew members are scanning for targets. Because two crew members are scanning for targets, it can be assumed the probability that a target is detected would be increased. In addition, having two crew members scanning permits the "hunter-killer" technique to be used. With this technique, the gunner can actively engage a target while the commander scans for the next one. This technique also increases the chance of target detection and therefore, survival of the crew. This is also the only condition in which there is a secondary operator available if one of the crew members becomes incapacitated by fatigue or injury. As shown in Table 5, the gunner and commander are rarely overloaded. Considering the lower workload profiles and increased survivability of the crew, condition 4 is the best of all the modeled function allocations. In contrast, the worst was condition 2, commander-driver and gunner.

### 4.1.2 Condition 2: Commander-Driver and Gunner

As shown in Table 5, condition 2 requires the commander to assume a larger portion of the system functions. The CD role combines the high workload resulting from the tasks demands of the driving function with the additional workload of commanding the vehicle and participating in target engagements. This combination resulted in the highest workload of any of the four conditions modeled. As seen in Table 6, a maximum overall workload value of 86 was recorded. There were 61 instances when the CD's workload exceeded a threshold of 60, whereas none of the other conditions ever exceeded 60. Furthermore, there were an additional 225 instances when the CD workload exceeded the threshold of 40 (see Table 6). There were more than 200 instances when the workload threshold of 7 was exceeded for each of the visual, cognitive, and psychomotor resources of the CD. The gunner's workload, on the other hand, never exceeded the overall threshold of 40 and rarely exceeded 7 for any of the individual resources. Because the gunner's workload was lower than the commander's in the three-crew model, it was expected that condition 1 with a gunner-driver would result in less workload than the CD condition.

Table 6. VACP workload for condition 2

| Resources | Max Value | | Instances in Overload (No. times >7) | |
|---|---|---|---|---|
| | CD | G | CD | G |
| Visual | 35 | 7 | 293 | 0 |
| Auditory | 12 | 5 | 12 | 0 |
| Cognitive | 31 | 9 | 296 | 2 |
| Psychomotor | 14 | 9 | 229 | 5 |
| Overall Workload | Max Value (V+A+C+P) | | Instances in Overload (No. times >40) | |
| | CD | G | CD | G |
| | 86 | 23 | 225 | 0 |
| | | | (No. times >60) | |
| | | | 61 | 0 |

### 4.1.3  Condition 1: Commander, Gunner-Driver

As shown in Table 2, condition 1 represents the GD being responsible for all driving and engagement functions whereas the commander is responsible scanning and external communication while overseeing the gunner's engagements. In this condition, the GD's workload never exceeds 60 (see Table 7). There are 42 instances when the GD's workload exceeds the workload threshold of 40. However, this is much less than the 225 instances over 40 in condition 2 with the CD. Furthermore, this number of instances is not many more instances than the 28 experienced by the crew member acting only as the driver in condition 4 with three crew members. The difficulty with this function allocation lies not with the workload levels but with real-world practicality. If the gunner is also acting as driver, then he must stop driving while actively engaging a target since the controls preclude him from doing both tasks at once. This eliminates any engagements while he is moving, which violates the FCS concept. Since this condition seems impractical for the FCS concept, condition 3 driver and CG, was modeled.

Table 7. VACP workload values for condition 1

| Resources | Max Value | | Instances in Overload (No. times >7) | |
|---|---|---|---|---|
| | GD | C | GD | C |
| Visual | 25 | 13 | 256 | 11 |
| Auditory | 16 | 1 | 13 | 0 |
| Cognitive | 25 | 16 | 232 | 16 |
| Psychomotor | 6 | 16 | 0 | 17 |
| Overall Workload | Max Value (V+A+C+P) | | Instances in Overload (No. times >40) | |
| | GD | C | GD | C |
| | 60 | 39 | 42 | 0 |

### 4.1.4 Condition 3: Commander-Gunner and Driver

In condition 3, the driver's workload results are similar to the results in the three-crew-member function allocation condition. The CG's overall workload, however, never exceeds the workload threshold value of 40 (see Table 8). The CG also had few instances when the workload of the individual resources exceeds 7. Therefore, this is the preferred two-crew member function allocation. Note, however, that this was a model of a CG commanding a single tank. If the CG were the lead platoon commander, the additional task demands of commanding a platoon would be expected to greatly increase mental workload and therefore most likely exceed acceptable levels. Furthermore, a two-crew-member design does not allow for substitution if a crew member is incapacitated or resting during modes of continuous operation.

Table 8. VACP workload values for condition 3

| Resources | Max Value | | Instances in Overload (No. times >7) | |
|---|---|---|---|---|
| | D | CG | D | CG |
| Visual | 24 | 13 | 250 | 15 |
| Auditory | 16 | 1 | 13 | 0 |
| Cognitive | 25 | 16 | 229 | 20 |
| Psychomotor | 6 | 16 | 0 | 21 |
| Overall Workload | Max Value (V+A+C+P) | | Instances in Overload (No. times >40) | |
| | D | CG | D | CG |
| | 60 | 39 | 41 | 0 |

### 4.1.5 Discussion of VACP Workload Analysis

In all the modeled conditions, the visual and cognitive mental resources thresholds were exceeded most often. Therefore, converting some of the tasks from visually demanding tasks to auditory tasks might help reduce the crew members' workload. Also, automatic target recognition (ATR) might help increase the probability of survival of the crews. However, it could also increase the commander's visual and cognitive workload because the commander would still be required to confirm targets. In situations when the ATR system is not precise (i.e., creates many false alarm targets), this automation would become a nuisance and could actually increase the commander's workload beyond current levels.

The preliminary IMPRINT models indicated that the combat vehicle should commit one crew member as the driver. Furthermore, the driver should not do any tasks other than driving. Research studies conducted by other organizations, such as the National Highway Transportation Safety Administration (NHTSA) and Transport Research Laboratory (TRL) in the United Kingdom support the findings of the ARL models. The NHTSA studies focused on the potential safety implications associated with driver distraction while using advanced within-vehicle technologies such as a cell phone or navigation systems. These studies indicate that when a driver performs any additional visual or manual tasks along with driving, such as engaging in a cell phone conversation, his or her performance suffers and the risk of accidents increases (National Highway Transportation Safety Administration, 1997). Specifically, the TRL study (Direct Line Insurance, 2002) concluded that reaction times for drivers were an average of 30% slower when the driver was engaged in a cell phone conversation while driving than when the driver was legally over the limit for alcohol consumption and driving. Furthermore, the reaction times for drivers talking on a mobile phone were 50% slower than when they were driving without one. These findings suggest that distractions are detrimental to driving performance and support recommendations for a separate driver in a two-soldier crew design.

If one crew member in a two-soldier crew design is functioning as a driver, then the other crew member must perform all the commanding and gunning functions. The two- versus three-soldier issue then becomes an issue of whether the other crew member can perform these functions successfully and concurrently. Therefore, to further investigate this issue, ARL modelers built an advanced workload IMPRINT model of the CG and driver two-soldier crew design.

## 4.2 Advanced Workload Analysis of the Commander-Gunner's Role

Preliminary runs of the advanced workload model of the MCS two-crew member design indicated that the CG experiences high workload whenever he needs to scan for targets and also be aware of his unit's position on a map. If the MCS vehicle is equipped with automated target scanning, the CG workload may be alleviated because the need to scan for targets will be eliminated. However, with automated target recognition systems, the commander will still be required to identify and then confirm or deny targets detected by the automated system. If the automated system requires the commander's intervention too many times, this need to intervene

may actually increase rather than decrease the CG's mental workload. Therefore, future modeling efforts should look at the commander's ability to effectively perform the identification task while he is performing other tasks. Similarly, the CG's mental workload peaked when he was required to communicate with headquarters while maintaining awareness of the unit and scanning for potential threats.

Table 9 summarizes the workload of the CG from four advanced workload models that represent four different vehicle scenarios: combat, automated scanning, combat with no engagements, and non-combat. The model runs for a total of 600 seconds (10 minutes). Although 10 minutes may seem a short period of time, in the military arena, success or failure in engagements can be measured in seconds and fractions of seconds.

Table 9. Results of four advanced workload models

|  | Combat | AutoScan | No Engage | Non-Combat |
|---|---|---|---|---|
| Number of Times over 60 | 112 | 91 | 97 | 50 |
| Percent of time in overload > 60 | 46.9% | 37.7% | 39.8% | 34.2% |
| Max Workload Value | 244.18 | 287.02 | 283.9 | 245.82 |
| Number of Times over 100 | 69 | 44 | 59 | 29 |
| Percent of time in overload > 100 | 28.3% | 19.1% | 24.0% | 23.5% |

### 4.2.1  Condition 1:  Combat Scenario

In the dynamic combat environment modeled here, the CG experiences high workload (>60) 112 times over almost half of the scenario run. Also, the CG has 46 instances of very high workload (>100) that occur over 28% of the scenario. The workload as a function of time is graphed in Figure 1.
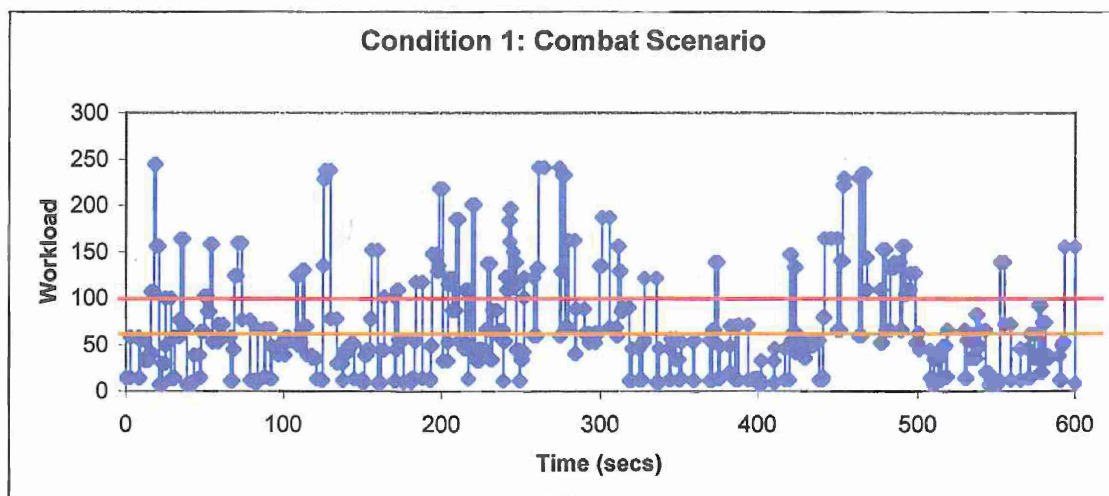


Figure 1.  Workload-over-time graph of the combat scenario.

While lethality and survivability cannot be specifically derived from this model, task success and failure can be predicted. As noted in previous discussion, instances of high workload would likely cause a task to fail. Task failures significantly decrease soldier performance. With this in mind, a look at the portion of the model from 225 to 270 seconds highlights the type of tasks that the CG is required to perform and the potential conflicts between multiple tasks occurring simultaneously (see Figure 2). The enemy vehicle appears at second 242 (Figure 2). The graph shows the task conflict in the seconds leading to the initiation of the engagement. In the 4 seconds just before the target appears, the CG is managing four separate tasks (see Table 10). From 232 seconds to 237 seconds, the CG is attempting to scan for targets and manage the COP. Both tasks have visual components that are in direct conflict. The CG must prioritize these tasks and ignore, degrade, or delay the lower priority task. Management of these tasks does not include those tasks that may be delayed and "pushed" (i.e., scanning or maintaining COP) into this time frame. The soldier is experiencing very high workload at this point. The "in vehicle communications," "looking at the COP," and beginning to "send a digital message" (even a simple one) are likely prioritized at this point (second 242). When these tasks conflict with the scanning task, then the soldier may lose precious seconds beginning (and finishing) the engagement sequence.
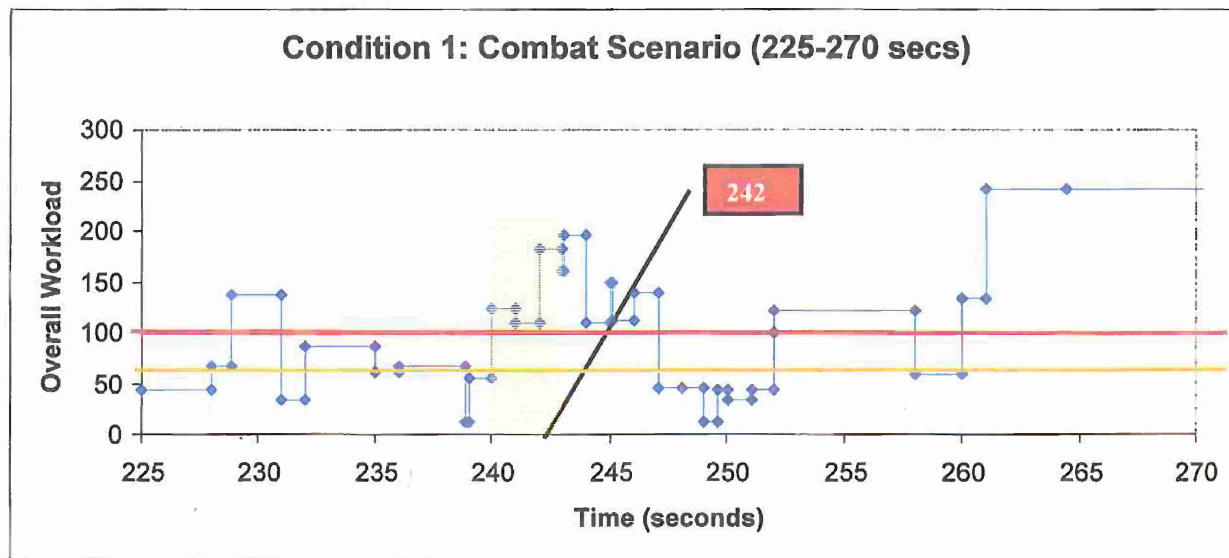


Figure 2. Enlargement of the workload-over-time graph of the combat scenario for time 225 to 270 seconds.

Table 10. Function, task, times, and action list before engagement

| Function Name | Task Name | Beginning Time | Ending Time | Actual Task Description |
|---|---|---|---|---|
| Crew communication in vehicle | CG hears D message via intercom | 238.84 | 244.67 | Driver: Sgt Smith, PL confirms location south of checkpoint BRAVO |
| CG Scan | monitor + update C4 display | 239.00 | 241.00 | CG scans for enemy targets/obstacles |
| Maintain awareness of | CG looks at enemy location on map | 240.00 | 244.00 | CG : Looks at COP to confirm location south of checkpoint BRAVO |
| Communication with HQ | Send Digital Message CG | 241.00 | 244.00 | CG: Clicks "confirms location" in digital message to PL |

One option would be to ensure that "scanning is always the priority". Since scanning is generally deemed a continuous function that would preclude the CG from accomplishing other tasks because of functions such as crew communication, communication with headquarters and management of the COP (the essential information dominance element of FCS) would always be ignored or delayed. This leads to the question of whether automated scanning could reduce soldier workload—an option that was explored in condition 2.

### 4.2.2 Condition 2: Automated Scanning

In this condition, scanning was reduced to an automatic function, meaning that the CG or any other crew member would have NO scanning responsibility for the platform. Scanning is automatic and continuous for the vehicle. There are two problems with this premise. First, as has been stated elsewhere, automated scanning does not exist today. However, for the sake of analysis, this capability is presumed. Second, even if scanning were automated, the crew member would still have to interact with the automated scanner. Whether it is strictly a monitoring function or waiting for a "target identified" signal, there will be some interaction with the system (unless it was automatic AND autonomous). Because the interactions required with these technologies and projected modalities (VCAP) are unknown, the model was developed and executed by the elimination of the scanning workload contributions.

The chart in Figure 3 represents the first 240 seconds in combat and the automated scanning scenarios. In the combat scenario, once the engagement started, the scanning function was stopped to represent the CG dropping the scanning task in order to fulfill engagement tasks. Since scanning is dropped during an engagement in the combat model and completely eliminated in the automated scanning model, the only workload results that would be different are the times before engagement. Since the engagement takes place at the 242nd second, the first 240 seconds are valuable for analysis.

Table 11 shows the workload results for both models. By the introduction of the automated scanning function, a drop in workload can be noted. The number of instances of high workload for the CG (>60) is reduced from 46 to 26. The percentage of time in overload dropped approximately 30% (from 40 seconds in overload down to 28 seconds). Even larger drops were

expected in the very high workload region (>100). The number of instances in high workload dropped from 28 to 6. In this scenario, the CG only spent approximately 7 seconds of the first 4 minutes (240 seconds) with very high workload compared to 23 seconds in the combat scenario.
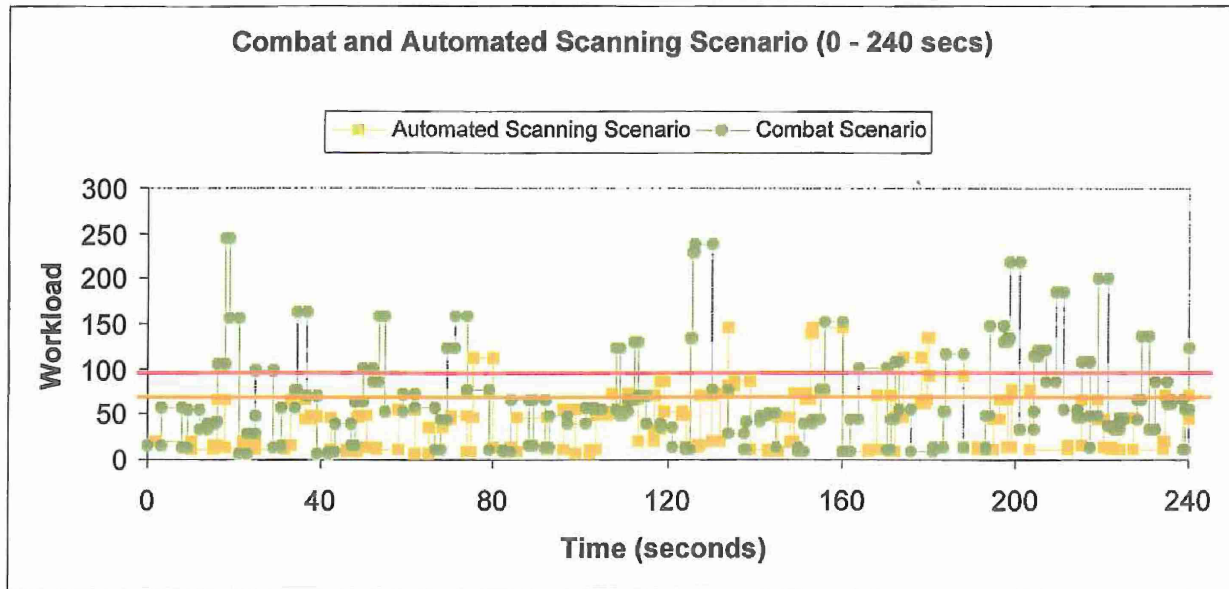


Figure 3.  Workload-over-time graph of the combat and automated scanning scenarios (0 to 240 secs).

Table 11.  Results of combat and automated scanning scenarios*

|  | Combat | AutoScan | Baseline | Non-Combat |
|---|---|---|---|---|
| Number of Times over 60 | 46 | 26 | 46 | 19 |
| Percent of time in overload >60 | 16.7% | 11.8% | 16.7% | 14.2% |
| Maximum Workload Value | 244.18 | 146.11 | 244.18 | 245.82 |
| Number of Times over 100 | 28 | 6 | 28 | 15 |
| Percent of time in overload >100 | 9.6% | 2.8% | 9.6% | 12.3% |

*represents time 0 to 240 seconds

### 4.2.3  Condition 3: Combat Run, No Engagements

This "baseline" condition, Table 9 and Figure 4, examines the workload reduction if engagements are not part of the scenario. Fundamentally, without engagements, the consequence of task failure may be significantly less because the failure to effectively scan or manage other system functions would not result in a missed target and thus, vehicle casualties. However, soldiers may spend significant time in a high risk environment where contact is possible or even expected, and the task loading in those situations may be representative of the combat environment when the actual shooting function is not executed.
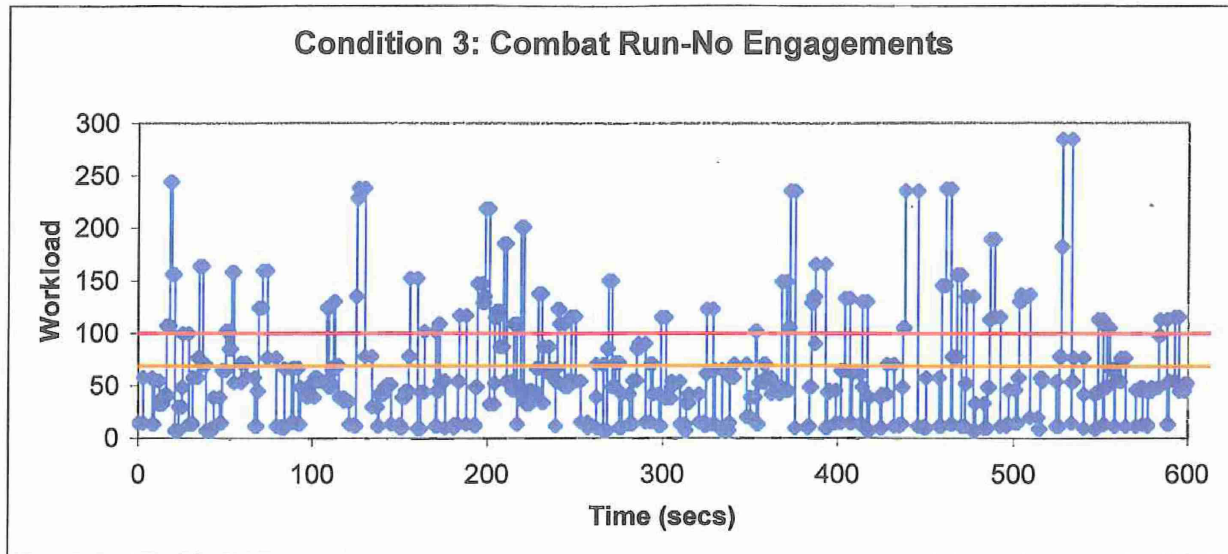
Figure 4. Workload-over-time graph of combat scenario with no engagements.

In this scenario, the CG's high workload instances (>60) and the total time in high workload both decrease. Both measures drop about 13% to 15% from the combat scenario. Note: Table 9 shows a peak workload value for the "autoscan" run at 287 and in the baseline run at 284, versus a peak value for the more complex (more tasks with the engagement function) combat environment, which had a peak value of 244. This occurs because of the random nature by which the frequencies and durations of recurring tasks are accomplished by the model. Occasionally, multiple conflicting tasks may coincide to create very high workload, even if the task network layout is simpler than another run.

### 4.2.4 Condition 4: Non-combat Model

The "non-combat" model is similar to the "baseline" model in condition 3. However, the premise of many of the "non-combat" vehicles in FCS (i.e., those vehicles such as the infantry carrier vehicle [ICV], the command and control vehicle [C2V] and the medical variations [MEV]) is that they intentionally (based on the information network) stay OUT of the most likely and most dangerous dynamic combat environments. That does not mean that operators can shed tasks such as scanning, but the frequencies of some tasks may be reduced while the durations of others, such as external vehicle communication, may increase slightly without associated combat pressure. The results of this run are shown in Figure 5.

Table 12 shows the changes made between the combat and non-combat runs for the major function in both frequency and duration. These values have been based on professional judgment since there is no fidelity in current force-on-force modeling efforts for this level of individual soldier performance.

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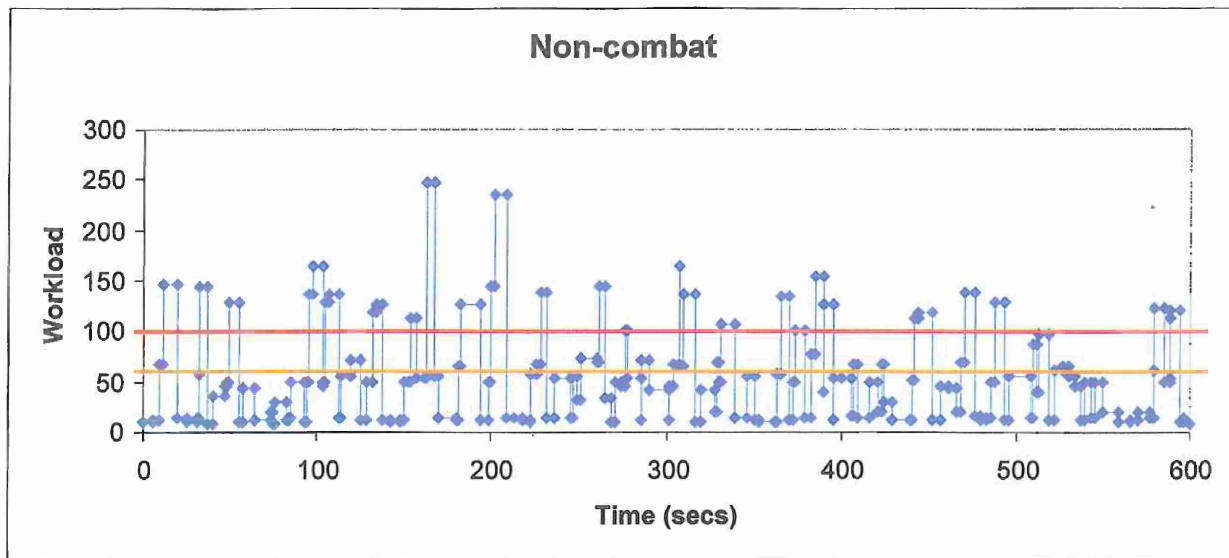
Figure 5. Workload-over-time graph of non-combat scenario.

Table 12. Model variable values for combat and non-combat scenario

| | Combat Scenario | | Non-Combat Scenario | |
| Functions | Frequency | Duration | Frequency | Duration |
| --- | --- | --- | --- | --- |
| Maintain Awareness | 1 to 20 secs | 1 to 5 secs | 5 to 30 secs | 1 to 10 secs |
| Scan for Targets | 1 to 10 secs | 2 to 5 secs | 1 to 20 secs | 2 to 5 secs |
| Communications, external | 1 to 10 secs | 2 to 4 secs | 1 to 20 secs | 2 to 5 secs |
| Communications, internal | 1 to 10 secs | 2 to 4 secs | 1 to 15 secs | 2 to 5 secs |

For the non-combat runs, there was a large decrease in the task loading of the CG. The instances of high workload (>60) drop from 112 to 50 (-55%) and the time spent in overload was approximately 30%. The number of instances in very high workload (>100) drops from 69 to 29 (-58%) while the time spent at above this level drops 17%.

To ensure that the analysis of each important condition was valid, multiple runs were conducted for the combat and non-combat models. Each model was run ten different times in order to force the model down a variety of paths. This procedure shows the variability in workload that is caused by what the operator is actually doing throughout the model. Table 13 shows the runs from the non-combat model while Table 14 shows the combat model data. For the non-combat series, run 9 represents the analyzed combat model. For the combat series, run 6 represents the analyzed combat model.

As shown in Table 15, the average of the multiple runs in comparison to the analyzed run is very close. This confirms that the analyzed model was indicative of general model behavior.

Table 13. Data from multiple runs of the non-combat model

| NonCombat Model (10 runs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Number of Times over 60 | 53 | 51 | 52 | 57 | 47 | 50 | 50 | 45 | 50 | 54 |
| Percent of time in overload >60 | 33.3% | 34.0% | 30.6% | 34.7% | 31.9% | 33.6% | 34.2% | 31.1% | 34.2% | 34.9% |
| Max Workload Value | 248.1 | 286.14 | 274.9 | 230.2 | 226.41 | 252.6 | 237.8 | 218.2 | 245.82 | 282.1 |
| Number of Times over 100 | 36 | 23 | 31 | 33 | 24 | 29 | 25 | 26 | 29 | 28 |
| Percent of time in overload >100 | 23.6% | 20.5% | 18.5% | 21.3% | 17.2% | 21.9% | 19.0% | 21.0% | 23.5% | 17.1% |

Table 14. Data from multiple runs of the combat model

| Combat Model (10 runs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Number of Times over 60 | 126 | 104 | 118 | 95 | 94 | 112 | 112 | 107 | 114 | 111 |
| Percent of time in overload >60 | 54.7% | 50.0% | 49.0% | 42.9% | 44.2% | 46.9% | 50.8% | 46.7% | 46.0% | 51.3% |
| Max Workload Value | 288.8 | 288.8 | 287 | 291.5 | 287 | 244.2 | 262.3 | 291.5 | 287 | 283.9 |
| Number of Times over 100 | 72 | 62 | 73 | 61 | 55 | 69 | 69 | 69 | 80 | 66 |
| Percent of time in overload >100 | 33.0% | 29.7% | 32.0% | 29.4% | 27.0% | 28.3% | 32.1% | 31.6% | 32.1% | 28.8% |

Table 15. Comparison of multiple runs with original run

| | Combat | | Non-Combat | |
|---|---|---|---|---|
| | Original Run | Average | Original Run | Average |
| Number of times > 60 | 112 | 109 | 50 | 51 |
| Percentage of time in overload > 60 | 47% | 48% | 34% | 33% |
| Maximum Value | 244 | 281 | 246 | 250 |
| Number of times > 100 | 69 | 68 | 29 | 28 |
| Percentage of time in overload > 100 | 28% | 30% | 23% | 20% |

## 5. Recommendations

Based on the results of this trade study, options other than a two-soldier crew for the MCS platform should be strongly pursued. In order to make two-soldier crews low risk from a soldier workload perspective for combat platforms, significant automation would be required, which is currently unavailable. While driving and sensor aids may be of value to the operator (reduced workload) during the execution of mundane tasks, neither capability has the technical maturity to enable the crew to disregard these functions (driving and scanning) at the critical point of combat in a scenario.

While these data indicate that a three-soldier crew better distributes the workload associated with the MCS platform to manageable levels, this analysis cannot conclude the effectiveness (lethality and survivability) of the MCS platform with that crew. Based on this workload analysis, for a two-soldier crew, the failure point or critical path for mission accomplishment (in a LOS engagement) will reside in the crew workload. By the addition of a third crew member, the success of the MCS platform will reside in the technical capability associated with the platform, not in management of the crew's workload. When non-combat platforms of the FCS are designed, a two-soldier crew can be considered. However, further analysis of each specific platform and function allocation should be conducted.

These results do not show the impact of task failure on survivability and lethality, but they do establish a clear distinction between various scenarios and identify areas for potential improvement in future design. Also, an analysis of time and accuracy of the mission conditions has not been conducted. More specific FCS information is needed to complete this analysis, with the initial models serving as the basis for this work.

Sustainment and maintenance aspects of the mission were not considered in this analysis. IMPRINT tools can be used to do platform maintenance assessments for manpower requirements as well. However, there is not enough fidelity in the performance parameters of platform sub-systems to obtain relevant results at this time.

While fatigue will certainly have an impact on soldier performance over the 72-hour mission, the time and accuracy data required to conduct this analysis within IMPRINT are not available at this time.

This study is a good starting point for future analysis. The models currently developed will continue to be revised and refined throughout the development process. With a credible baseline model available, crew performance can be evaluated as technologies mature. ARL is also exploring techniques to quantify results, not just in terms of workload but also by examining the consequences of task failure and the impacts of workload and accuracy (performance) data on system (and ideally systems of systems) lethality and survivability. Building a better relationship among high soldier workload, task failure, and the relative impact on survivability and lethality is the focus of continiuing efforts.

## 5.1 Impact

The results of this study were influential in changing the FCS MCS crew member requirement from two to three in the operational requirements Document (25 Nov 2002). This change is also reflected in the operational and organizational plan (25 Nov 2002).

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# Appendix A. Data for Condition 1: Combat Scenario

| \multicolumn{4}{c}{Workload Profile for CG During Combat Scenario} | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 0 | 14.7 | CG Scan | monitor + update C4 display |
| 3 | 58.01 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | monitor + update C4 display |
| 8 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 9 | 54.6 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 12 | 32.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 14 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random 2-5s) CG |
| 15.89 | 42.09 | CG Scan | Scan (random 2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 16 | 106.91 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random 2-5s) CG |
| 18 | 244.18 | CG Scan | Scan (random 2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 19 | 155.93 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 21 | 7 | Commo with HQ | Assess Situation CG |
| 23 | 29.66 | CG Scan | Scan (random 2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| 25 | 48.96 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | CG Scan | Scan (random 2-5s) CG |
| 25.12 | 99.93 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | CG Scan | Scan (random 2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 29 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 31 | 14.7 | CG Scan | monitor + update C4 display |
| 31.06 | 57.86 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | monitor + update C4 display |
| 34 | 76.89 | Commo with HQ | Send voice message CG |
| | | CG Scan | monitor + update C4 display |
| 34.69 | 163.74 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send voice message CG |
| 37 | 69.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |

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| Time | Total Workload | Function Name | Task Name |
|------|----------------|---------------|-----------|
| 39 | 7 | Commo with HQ | Assess Situation CG |
| 42 | 9.6 | CG Scan | Scan (random 2-5s) CG |
| 43.26 | 38.67 | CG Scan | Scan (random 2-5s) CG |
|  |  | Crew commo in vehicle | CG hears D message via intercom |
| 47 | 14.7 | CG Scan | monitor + update C4 display |
| 48 | 64.29 | CG Scan | monitor + update C4 display |
|  |  | Commo with HQ | Receive Voice Message CG |
| 50 | 101.97 | CG Scan | monitor + update C4 display |
|  |  | Maintain awareness of enemy, own units | CG looks at his unit on map |
|  |  | Commo with HQ | Assess Situation CG |
| 52 | 85.22 | Maintain awareness of enemy, own units | CG looks at his unit on map |
|  |  | Commo with HQ | Assess Situation CG |
|  |  | CG Scan | Scan (random 2-5s) CG |
| 53.56 | 158.2 | Crew commo in vehicle | CG talks via intercom |
|  |  | Maintain awareness of enemy, own units | CG looks at his unit on map |
|  |  | CG Scan | Scan (random 2-5s) CG |
|  |  | Commo with HQ | Assess Situation CG |
| 55 | 52.72 | Crew commo in vehicle | CG talks via intercom |
|  |  | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 59 | 71.98 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
|  |  | Commo with HQ | Send voice message CG |
| 62 | 57.87 | Commo with HQ | Send voice message CG |
|  |  | CG Scan | Scan (random 2-5s) CG |
| 66.56 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 68 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on |
|  |  | Crew commo in vehicle | CG hears D message via intercom |
| 69 | 124.2 | Maintain awareness of enemy, own units | CG looks at enemy location on |
|  |  | Commo with HQ | Receive Digital Message CG |
|  |  | Crew commo in vehicle | CG hears D message via intercom |
| 71 | 159.34 | CG Scan | monitor + update C4 display |
|  |  | Maintain awareness of enemy, own units | CG compares enemy location to own location |
|  |  | Commo with HQ | Receive Digital Message CG |
| 74 | 76.89 | Commo with HQ | Send voice message CG |
|  |  | CG Scan | monitor + update C4 display |
| 78.95 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 82 | 9.6 | CG Scan | Scan (random 2-5s) CG |
| 84 | 66.38 | CG Scan | Scan (random 2-5s) CG |
|  |  | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 88 | 15.5 | Commo with HQ | Send voice message CG |
| 89 | 66.76 | Maintain awareness of enemy, own units | CG looks at enemy location on |
|  |  | Commo with HQ | Send voice message CG |
| 92 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 92.96 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
|  |  | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 97 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |

The table title: **Workload Profile for CG During Combat Scenario**

| \multicolumn{4}{c}{Workload Profile for CG During Combat Scenario} | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | CG Scan | Scan (random 2-5s) CG |
| 101 | 58.01 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Send Digital Message CG |
| 103.03 | 54.08 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| 105 | 54.6 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 108 | 124.2 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 109 | 48.96 | CG Scan | Scan (random 2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 110 | 52.32 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | Scan (random 2-5s) CG |
| 111 | 65.32 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Digital Message CG |
| 112.01 | 130.5 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 113 | 69.62 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Digital Message CG |
| 115 | 38.79 | Commo with HQ | Assess Situation CG |
| | | CG Scan | monitor + update C4 display |
| 118 | 35 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 121 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 124 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 125 | 134.87 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | CG Scan | monitor + update C4 display |
| 125.35 | 228.44 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 126 | 237.84 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 130 | 77.92 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 134 | 29.66 | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random 2-5s) CG |
| 137.43 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 138 | 42.09 | CG Scan | Scan (random 2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 141 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Crew commo in vehicle | CG talks via intercom |
| 143 | 50.88 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Send Digital Message CG |
| 145 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 150 | 9.6 | CG Scan | Scan (random 2-5s) CG |
| 151.19 | 38.67 | CG Scan | Scan (random 2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 153 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 155 | 77.92 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 155.78 | 151.95 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 160 | 9.2 | Commo with HQ | Send Digital Message CG |
| 162 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random 2-5s) CG |
| 164 | 101.48 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random 2-5s) CG |
| | | Commo with HQ | Send Digital Message CG |
| 170.31 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 171 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 172 | 109.15 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Send Digital Message CG |
| 173 | 55 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send Digital Message CG |
| 176 | 9.6 | CG Scan | Scan (random 2-5s) CG |
| 181 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 183 | 53.93 | CG Scan | Scan (random 2-5s) CG |
| | | Commo with HQ | Receive Digital Message CG |
| 183.79 | 116.96 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | CG Scan | Scan (random 2-5s) CG |
| 188 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 192.74 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 193 | 48.76 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 194 | 147.41 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 194 | 147.41 | Commo with HQ | Send voice message CG |
| 197 | 129.19 | CG Scan | Scan (random 2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Receive Digital Message CG |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 198 | 135.27 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Digital Message CG |
| | | CG Scan | Scan (random 2-5s) CG |
| 198.5 | 218.22 | CG Scan | Scan (random 2-5s) CG |
| | | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 201 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 204 | 52.4 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Receive Voice Message CG |
| 204.04 | 115.25 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 205 | 121.05 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 207 | 87.01 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 209 | 184.78 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| 211.03 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 214 | 45.57 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 215 | 109.15 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 217 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 217.05 | 48.58 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 219 | 201.03 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random 2-5s) CG |
| 221 | 37.82 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 222.38 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 224 | 45.57 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 225 | 44.04 | CG Scan | Scan (random 2-5s) CG |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Commo with HQ | Send Digital Message CG |
| 228 | 66.38 | CG Scan | Scan (random 2-5s) CG |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 228.82 | 137.36 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random 2-5s) CG |
| 231 | 33.53 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 232 | 86.99 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 235 | 61.68 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | CG Scan | monitor + update C4 display |
| 236 | 65.8 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 238.84 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 239 | 54.08 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| 240 | 122.96 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Crew commo in vehicle | CG hears D message via intercom . |
| 241 | 109.15 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 242 | 183.3 | Engage Targets | CG confirm thru target acq scr |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 243 | 160.84 | Engage Targets | CG makes decision about target |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 243.07 | 196.81 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Engage Targets | CG select firing position |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 244 | 110.72 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage Targets | CG select firing position |
| 245 | 149.66 | Engage Targets | CG select firing position |
| | | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 245.07 | 112.66 | Commo with HQ | Send voice message CG |
| | | Engage target while | CG issues fire CMD voice |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 246.07 | 138.49 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while | CG selects weapon system |
| | | Commo with HQ | Send voice message CG |
| 247.07 | 44.36 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while | CG select ammo |
| 248.07 | 44.36 | Engage target while | CG arms main weapon |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 249.07 | 11.2 | Engage target while | CG Lays Main Gun on Tgt |
| 249.67 | 42.83 | Engage target while | CG Lays Main Gun on Tgt |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 250.07 | 33.75 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while | CG says fire |
| 251.07 | 42.17 | Engage target while | CG fires at tgt |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 252 | 100.68 | Commo with HQ | Send Digital Message CG |
| | | Engage target while | CG fires at tgt |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 252.07 | 121.78 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Send Digital Message CG |
| 258.03 | 58.98 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 260 | 132.38 | Engage target while | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 261 | 240.84 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Send Digital Message CG |
| 264.46 | 240.84 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 274.23 | 58.98 | Engage target while | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| 275 | 128.92 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 276 | 232.2 | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 278 | 68.6 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while | CG inputs updated SITREP |
| 280 | 162.1 | Engage target while | CG inputs updated SITREP |

| | | **Workload Profile for CG During Combat Scenario** | |
|---|---|---|---|
| **Time** | **Total Workload** | **Function Name** | **Task Name** |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Digital Message CG |
| 284 | 40.31 | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Assess Situation CG |
| 284.6 | 88.54 | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 290 | 62.29 | Commo with HQ | Send Digital Message CG |
| | | Engage target while | CG inputs updated SITREP |
| 292.79 | 51.72 | Engage target while | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 297 | 62.55 | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Receive Voice Message CG |
| 299.25 | 134.16 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| | | Engage target while | CG inputs updated SITREP |
| 301 | 186.62 | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 306 | 68.6 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Engage target while | CG inputs updated SITREP |
| 310.17 | 58.98 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 311 | 156.02 | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 312.07 | 129.19 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random 2-5s) CG |
| | | Commo with HQ | Receive Digital Message CG |
| 313 | 85.22 | CG Scan | Scan (random 2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Assess Situation CG |
| 314 | 90 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | Scan (random 2-5s) CG |
| 318.45 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 320 | 45.57 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 325 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 327 | 52.4 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Receive Voice Message CG |
| 328 | 56.02 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Voice Message CG |
| 328.1 | 121.05 | Crew commo in vehicle | CG hears D message via intercom |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Voice Message CG |
| 336 | 9.2 | Commo with HQ | Send Digital Message CG |
| 337.72 | 45.57 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 344.13 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 345 | 55.54 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 348 | 33.53 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 350 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 351 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 351.58 | 52.72 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 359.13 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 360 | 54.6 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 369.73 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 371 | 65.55 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| 373 | 138.71 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Send voice message CG |
| 375 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 376.19 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 382 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 382.37 | 69.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 385.89 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 388 | 70.69 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send voice message CG |
| 394 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 397 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 399 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 401 | 7 | Commo with HQ | Assess Situation CG |
| 401.88 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 410 | 9.2 | Commo with HQ | Send Digital Message CG |
| 410.39 | 45.65 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 417 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 420 | 146.85 | Commo with HQ | Send voice message CG |
| | | Engage Targets | CG detects target stop scan |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 421 | 54.25 | Engage Targets | CG confirm thru target acq scr |
| | | Commo with HQ | Send voice message CG |
| 422 | 45.09 | Commo with HQ | Send voice message CG |
| | | Engage Targets | CG makes decision about target |
| 422.07 | 62.76 | Engage Targets | CG select firing position |
| | | Commo with HQ | Send voice message CG |
| 422.58 | 133.33 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage Targets | CG select firing position |
| | | Commo with HQ | Send voice message CG |
| 424 | 62.76 | Engage Targets | CG select firing position |
| | | Commo with HQ | Send voice message CG |
| 424.07 | 41.02 | Engage target while | CG issues fire CMD voice |
| | | Commo with HQ | Send voice message CG |
| 425.07 | 54.25 | Engage target while | CG selects weapon system |
| | | Commo with HQ | Send voice message CG |
| 426 | 45.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Engage target while | CG selects weapon system |
| 426.07 | 41 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Engage target while | CG select ammo |
| 427.07 | 41 | Engage target while | CG arms main weapon |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 428.07 | 52.8 | Engage target while | CG Lays Main Gun on Tgt |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 429.07 | 34.84 | Engage target while | CG says fire |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 430.07 | 46.08 | Engage target while | CG fires at tgt |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 431 | 50.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Engage target while | CG fires at tgt |
| 432.52 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 435 | 54.6 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 438.6 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 441 | 15.5 | Commo with HQ | Send voice message CG |
| 441.07 | 79.05 | Commo with HQ | Send voice message CG |
| | | Engage target while | CG inputs updated SITREP |
| 441.83 | 164.42 | Commo with HQ | Send voice message CG |
| | | Engage target while | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| 446 | 164.42 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send voice message CG |
| | | Engage target while | CG inputs updated SITREP |
| 450 | 65.24 | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 452 | 140.11 | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| 453.21 | 221.5 | Commo with HQ | Send Digital Message CG |
| | | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 454 | 229.76 | Engage target while | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 462.96 | 58.98 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 465 | 234.66 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 467 | 143.17 | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| 468 | 109.23 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Engage target while | CG inputs updated SITREP |
| 476.6 | 51.72 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 478 | 152.22 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| | | Engage target while | CG inputs updated SITREP |
| 480 | 65.24 | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 482.56 | 132.38 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Engage target while | CG inputs updated SITREP |
| 485 | 138.3 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while | CG inputs updated SITREP |
| 489 | 65.24 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Engage target while | CG inputs updated SITREP |
| 490 | 156.02 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Receive Digital Message CG |
| | | Engage target while | CG inputs updated SITREP |
| 492 | 104.45 | Engage target while | CG inputs updated SITREP |
| | | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 493 | 109.23 | Commo with HQ | Assess Situation CG |

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| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Engage target while | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 495.4 | 127.1 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while | CG inputs updated SITREP |
| 498.78 | 51.72 | Engage target while | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 500 | 62.29 | Commo with HQ | Send Digital Message CG |
| | | Engage target while | CG inputs updated SITREP |
| 501.07 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random 2-5s) CG |
| 508 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 510 | 7 | Commo with HQ | Assess Situation CG |
| 510.33 | 33.53 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 513 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 515.23 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 516 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 518 | 15.5 | Commo with HQ | Send voice message CG |
| 518.94 | 65.55 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| 530 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 531.22 | 54.6 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 533 | 61.2 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Receive Digital Message CG |
| 534 | 35 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Commo with HQ | Assess Situation CG |
| 536.91 | 82.01 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 538 | 48.58 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 539 | 65.55 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 543 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 545 | 7 | Commo with HQ | Assess Situation CG |
| 550.48 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 552 | 138.71 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 555 | 71.98 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |

| Workload Profile for CG During Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 558.89 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 565 | 45.65 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 570 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 571 | 61.2 | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 574 | 35 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Assess Situation CG |
| 575 | 37.82 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| 576.4 | 92.37 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| 578 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 579 | 73.8 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 581 | 35 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 583 | 37.82 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 590 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| 591.26 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on |
| | | Crew commo in vehicle | CG talks via intercom |
| 592 | 52.72 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 593 | 155.19 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 599.92 | 8.2 | Crew commo in vehicle | CG hears D message via intercom |

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## Appendix B. Data for Condition 2: Automated Scanning Scenario

| Time | Total Workload | Function Name | Task Name |
|------|------|------|------|
| span: Workload Profile for CG during Automated Scanning Scenario | | | |
| 2 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 10 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 15 | 15.5 | Commo with HQ | Send voice message CG |
| 16 | 66.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send voice message CG |
| 18 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 22 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 24.95 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 32 | 15.5 | Commo with HQ | Send voice message CG |
| 33 | 66.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send voice message CG |
| 36.24 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 38 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 39 | 45.57 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 42.63 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 46 | 9.2 | Commo with HQ | Send Digital Message CG |
| 48.42 | 45.65 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 49 | 48.76 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 51 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 53.05 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 58 | 54.93 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 62 | 7 | Commo with HQ | Assess Situation CG |
| 65 | 35 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Assess Situation CG |
| 68.19 | 45 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 70 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 74 | 9.2 | Commo with HQ | Send Digital Message CG |

| **Workload Profile for CG during Automated Scanning Scenario** |
|---|---|---|---|
| **Time** | **Total Workload** | **Function Name** | **Task Name** |
| 74.56 | 45.65 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 75 | 112.79 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 80 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 84 | 9.2 | Commo with HQ | Send Digital Message CG |
| 85.53 | 45.65 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 92.48 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 96 | 55.54 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 99 | 7 | Commo with HQ | Assess Situation CG |
| 102 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 103.6 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 106 | 52.72 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 107 | 71.98 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send voice message CG |
| 110.7 | 65.55 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| 113 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 116.6 | 69.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 117 | 33.53 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 118 | 86.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 119 | 52.72 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| 123 | 48.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 124 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 127 | 15.5 | Commo with HQ | Send voice message CG |
| 127.3 | 70.69 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 130 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |

| Workload Profile for CG during Automated Scanning Scenario |||| 
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 132 | 73.8 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 134 | 145.65 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 134 | 82.01 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Assess Situation CG |
| 135 | 87.01 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 139 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 143 | 9.2 | Commo with HQ | Send Digital Message CG |
| 145.3 | 45.65 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 148 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 149 | 73.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 152 | 66.76 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 152.9 | 138.71 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| 153 | 146.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 160 | 9.2 | Commo with HQ | Send Digital Message CG |
| 166 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 168 | 69.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 171 | 9.2 | Commo with HQ | Send Digital Message CG |
| 172 | 45.65 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 174 | 112.79 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 178 | 61.2 | Commo with HQ | Receive Digital Message CG |

| Workload Profile for CG during Automated Scanning Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 179 | 65.32 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Digital Message CG |
| 179.3 | 135.38 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Digital Message CG |
| 180 | 92.37 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| 188 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 191.2 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 194 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 195 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 196 | 66.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send voice message CG |
| 198 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 199 | 77.92 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 203.1 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 212 | 15.5 | Commo with HQ | Send voice message CG |
| 214.9 | 65.55 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| 219 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 220 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 222 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 224 | 45.57 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 227.2 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 234 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 234.6 | 69.99 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG talks via intercom |
| 240 | 45.12 | Commo with HQ | Send Digital Message CG |
| | | Engage Targets | CG detects target stop scan |
| 241 | 108.08 | Engage Targets | CG confirm thru target acq scr |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| 242 | 94.52 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| | | Engage Targets | CG makes decision about target |
| 242.1 | 123.96 | Engage Targets | CG select firing position |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| 244.1 | 31.36 | Engage target while moving | CG issues fire CMD voice |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 245.1 | 49.16 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Engage target while moving | CG selects weapon system |
| 246.1 | 44.36 | Engage target while moving | CG select ammo |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 247.1 | 6.2 | Engage target while moving | CG arms main weapon |
| 247.2 | 35.89 | Engage target while moving | CG arms main weapon |
| | | Crew commo in vehicle | CG talks via intercom |
| 248.1 | 46.77 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG Lays Main Gun on Tgt |
| 249.1 | 40.37 | Engage target while moving | CG says fire |
| | | Crew commo in vehicle | CG talks via intercom |
| 250 | 127.44 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG says fire |
| 250.1 | 142.64 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Engage target while moving | CG fires at tgt |
| 251.1 | 84.63 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Engage target while moving | CG inputs updated SITREP |
| 253 | 40.31 | Commo with HQ | Assess Situation CG |
| | | Engage target while moving | CG inputs updated SITREP |
| 255.4 | 88.54 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| | | Engage target while moving | CG inputs updated SITREP |
| 266 | 65.24 | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 267 | 166.45 | Commo with HQ | Send voice message CG |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 270 | 68.6 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Engage target while moving | CG inputs updated SITREP |
| 270.2 | 138.3 | Maintain awareness of enemy, own units | CG compares other friendly to own location |

Table header: **Workload Profile for CG during Automated Scanning Scenario**

| Workload Profile for CG during Automated Scanning Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| 275 | 132.38 | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 276 | 174.57 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Engage target while moving | CG inputs updated SITREP |
| 277 | 180.65 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Engage target while moving | CG inputs updated SITREP |
| 280.3 | 127.1 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Engage target while moving | CG inputs updated SITREP |
| 285 | 79.05 | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send voice message CG |
| 285.5 | 164.42 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send voice message CG |
| 289 | 79.05 | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send voice message CG |
| 290.5 | 164.42 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send voice message CG |
| 294 | 132.38 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Engage target while moving | CG inputs updated SITREP |
| 296 | 138.3 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 298.4 | 58.98 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| 299 | 164.8 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| 301.9 | 164.8 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Engage target while moving | CG inputs updated SITREP |
| 302 | 40.31 | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Assess Situation CG |
| 304 | 104.45 | Commo with HQ | Assess Situation CG |
| | | Engage target while moving | CG inputs updated SITREP |

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 308 | 68.6 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while moving | CG inputs updated SITREP |
| 312.1 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 314 | 50.88 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 319 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 321.1 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 325 | 48.76 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 327 | 155.19 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 331 | 56.02 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| 334 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 341 | 9.2 | Commo with HQ | Send Digital Message CG |
| 344.9 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 346 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 346 | 48.76 | Crew commo in vehicle | CG talks via intercom |
| 348 | 52.72 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| 352 | 55 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send Digital Message CG |
| 357.8 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 362 | 45.65 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 367 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 369 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 369 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 373 | 54.6 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 379.5 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 382 | 124.2 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |

Table title: **Workload Profile for CG during Automated Scanning Scenario**

| Workload Profile for CG during Automated Scanning Scenario | | | |
| --- | --- | --- | --- |
| Time | Total Workload | Function Name | Task Name |
| 386 | 82.01 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Assess Situation CG |
| 387 | 37.82 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 392.4 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 394 | 54.45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 396 | 115.25 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 397 | 82.01 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 398 | 87.01 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 400.5 | 32.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 408 | 15.5 | Commo with HQ | Send voice message CG |
| 415.7 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 416 | 54.45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 417 | 115.25 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 419 | 82.01 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 421 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 422 | 49.16 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage Targets | CG confirm thru C4 display |
| 423 | 37.34 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage Targets | CG makes decision about target |
| 423.1 | 54.82 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage Targets | CG select firing position |
| 425.1 | 3 | Engage target while moving | CG issues fire CMD voice |
| 426 | 31.42 | Commo with HQ | Receive Digital Message CG |
| | | Engage target while moving | CG issues fire CMD voice |
| 426.1 | 50.49 | Engage target while moving | CG selects weapon system |

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| Workload Profile for CG during Automated Scanning Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Commo with HQ | Receive Digital Message CG |
| 427.1 | 45.29 | Engage target while moving | CG select ammo |
| | | Commo with HQ | Receive Digital Message CG |
| 427.7 | 101.94 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while moving | CG select ammo |
| | | Commo with HQ | Receive Digital Message CG |
| 428.1 | 101.94 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | Engage target while moving | CG arms main weapon |
| 429.1 | 119.88 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | Engage target while moving | CG Lays Main Gun on Tgt |
| 430 | 78.22 | Commo with HQ | Assess Situation CG |
| | | Engage target while moving | CG Lays Main Gun on Tgt |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 430.1 | 65.58 | Engage target while moving | CG says fire |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 431.1 | 77.7 | Engage target while moving | CG fires at tgt |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 433.8 | 32.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 435 | 69.95 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 438 | 32.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 440.9 | 32.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 445 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 447 | 66.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send voice message CG |
| 448 | 71.98 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send voice message CG |
| 451.2 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 455 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 456.6 | 69.99 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG talks via intercom |
| 457 | 33.53 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 461 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 462.1 | 65.24 | Maintain awareness of enemy, own units | CG looks at his unit on map |

| Workload Profile for CG during Automated Scanning Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Engage target while moving | CG inputs updated SITREP |
| 463 | 68.6 | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 465 | 143.17 | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| 468 | 40.31 | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Assess Situation CG |
| 470.6 | 51.72 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| 480 | 62.29 | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send Digital Message CG |
| 481.9 | 121.78 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send Digital Message CG |
| 482 | 221.5 | Commo with HQ | Send Digital Message CG |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 483 | 229.76 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 490.9 | 51.72 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| 492 | 152.22 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| 498.8 | 58.98 | Engage target while moving | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| 503 | 62.55 | Commo with HQ | Receive Voice Message CG |
| | | Engage target while moving | CG inputs updated SITREP |
| 504 | 137.59 | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Receive Voice Message CG |
| 505 | 143.17 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Receive Voice Message CG |
| 508.8 | 127.1 | Crew commo in vehicle | CG hears D message via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 513.7 | 58.98 | Engage target while moving | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| 514 | 277.28 | Maintain awareness of enemy, own units | CG looks at enemy location on map |

| Workload Profile for CG during Automated Scanning Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send voice message CG |
| | | Engage target while moving | CG inputs updated SITREP |
| 516 | 287.02 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Engage target while moving | CG inputs updated SITREP |
| | | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 519.9 | 58.98 | Crew commo in vehicle | CG talks via intercom |
| | | Engage target while moving | CG inputs updated SITREP |
| 521 | 144.4 | Engage target while moving | CG inputs updated SITREP |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 524.6 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 525 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 528 | 50.88 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| 530 | 55 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| 533 | 56.02 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| 533.8 | 121.05 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 535 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 536 | 82.01 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 540 | 50.88 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| 541 | 55 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| 546.6 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 548 | 54.45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 555 | 66.76 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 558 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 562.8 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 568 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 571 | 7 | Commo with HQ | Assess Situation CG |

| Workload Profile for CG during Automated Scanning Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 572.5 | 33.53 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 576 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 579 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 583 | 71.98 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 584.7 | 70.69 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 590 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 591.4 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 592 | 145.65 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 593 | 151.95 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 597 | 45.57 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |

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# Appendix C. Data for Condition 3: Combat, No Engagements Scenario

| | Workload Profile for CG during Baseline Scenario | | |
|------|-------------------|-------------------|-------------------|
| Time | Total Workload | Function Name | Task Name |
| 0 | 14.7 | CG Scan | monitor + update C4 display |
| 3 | 58.01 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | monitor + update C4 display |
| 8 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 9 | 54.6 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 12 | 32.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| 14 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 15.89 | 42.09 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 16 | 106.91 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| 18 | 244.18 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 19 | 155.93 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| 21 | 7 | Commo with HQ | Assess Situation CG |
| 23 | 29.66 | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random2-5s) CG |
| 25 | 48.96 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | Scan (random2-5s) CG |
| 25.12 | 99.93 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 29 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 31 | 14.7 | CG Scan | monitor + update C4 display |
| 31.06 | 57.86 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | monitor + update C4 display |
| 34 | 76.89 | Commo with HQ | Send voice message CG |
| | | CG Scan | monitor + update C4 display |
| 34.69 | 163.74 | Commo with HQ | Send voice message CG |
| | | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| 37 | 69.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 39 | 7 | Commo with HQ | Assess Situation CG |
| 42 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 43.26 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 47 | 14.7 | CG Scan | monitor + update C4 display |
| 48 | 64.29 | Commo with HQ | Receive Voice Message CG |

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| | | CG Scan | monitor + update C4 display |
| 50 | 101.97 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Assess Situation CG |
| 52 | 85.22 | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 53.56 | 158.2 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| 55 | 52.72 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 59 | 71.98 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 62 | 57.87 | Commo with HQ | Send voice message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 66.56 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 68 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 69 | 124.2 | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 71 | 159.34 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Digital Message CG |
| 74 | 76.89 | Commo with HQ | Send voice message CG |
| | | CG Scan | monitor + update C4 display |
| 78.95 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 82 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 84 | 66.38 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | CG Scan | Scan (random2-5s) CG |
| 88 | 15.5 | Commo with HQ | Send voice message CG |
| 89 | 66.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send voice message CG |
| 92 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 92.96 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 97 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 101 | 58.01 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | monitor + update C4 display |
| 103.03 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 105 | 54.6 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 108 | 124.2 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 109 | 48.96 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 110 | 52.32 | CG Scan | Scan (random2-5s) CG |

| | | Workload Profile for CG during Baseline Scenario | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 111 | 65.32 | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 112.01 | 130.5 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 113 | 69.62 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Digital Message CG |
| 115 | 38.79 | Commo with HQ | Assess Situation CG |
| | | CG Scan | monitor + update C4 display |
| 118 | 35 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Assess Situation CG |
| 121 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 124 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 125 | 134.87 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 125.35 | 228.44 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | monitor + update C4 display |
| 126 | 237.84 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 130 | 77.92 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 134 | 29.66 | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random2-5s) CG |
| 137.43 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 138 | 42.09 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 141 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 143 | 50.88 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send Digital Message CG |
| 145 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 150 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 151.19 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 153 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 155 | 77.92 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 155.78 | 151.95 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 160 | 9.2 | Commo with HQ | Send Digital Message CG |
| 162 | 44.04 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Send Digital Message CG |
| 164 | 101.48 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| | | Commo with HQ | Send Digital Message CG |
| 170.31 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 171 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 172 | 109.15 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send Digital Message CG |
| 173 | 55 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send Digital Message CG |
| 176 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 181 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 183 | 53.93 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Receive Digital Message CG |
| 183.79 | 116.96 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 188 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 192.74 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 193 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 194 | 147.41 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 197 | 129.19 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Receive Digital Message CG |
| 198 | 135.27 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Digital Message CG |
| 198.5 | 218.22 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 201 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 204 | 52.4 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Receive Voice Message CG |
| 204.04 | 115.25 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 205 | 121.05 | Commo with HQ | Receive Voice Message CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 207 | 87.01 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 209 | 184.78 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| 211.03 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |

Table title: **Workload Profile for CG during Baseline Scenario**

| | | Workload Profile for CG during Baseline Scenario | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 214 | 45.57 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 215 | 109.15 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| 217 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 217.05 | 48.58 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 219 | 201.03 | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 221 | 37.82 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 222.38 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 224 | 45.57 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 225 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 228 | 66.38 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | CG Scan | Scan (random2-5s) CG |
| 228.82 | 137.36 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 231 | 33.53 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 232 | 86.99 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 235 | 61.68 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | monitor + update C4 display |
| 236 | 65.8 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 238.84 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 239 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 240 | 122.96 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 241 | 109.15 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 244 | 48.58 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 246 | 55 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send Digital Message CG |
| 247.67 | 115.45 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 250 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| 253 | 15.5 | Commo with HQ | Send voice message CG |
| 257 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 261.74 | 38.67 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 262 | 69.95 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 266 | 7 | Commo with HQ | Assess Situation CG |
| 268 | 85.22 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| 268.75 | 150 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random2-5s) CG |
| 271 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 273 | 71.98 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send voice message CG |
| 275 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 276.73 | 42.09 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 281 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 282.8 | 54.6 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 285 | 85.22 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| 286 | 90 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 290 | 15.5 | Commo with HQ | Send voice message CG |
| 292.86 | 70.69 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send voice message CG |
| 294 | 42.09 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 297.79 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 299 | 115.25 | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 302 | 37.82 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 304.73 | 48.58 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 305 | 54.08 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| 310 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 313 | 7 | Commo with HQ | Assess Situation CG |
| 313.57 | 33.53 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 315 | 42.09 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 321 | 15.5 | Commo with HQ | Send voice message CG |

| | | Workload Profile for CG during Baseline Scenario | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 324 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 325 | 61.68 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | monitor + update C4 display |
| 325.4 | 122.96 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 329 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 330 | 65.32 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Receive Digital Message CG |
| 334 | 7 | Commo with HQ | Assess Situation CG |
| 338 | 14.7 | CG Scan | monitor + update C4 display |
| 338.4 | 57.86 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| 341 | 70.69 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 348 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 350 | 38.79 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Assess Situation CG |
| 353 | 101.97 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 354 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 354.89 | 52.72 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 358 | 70.69 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 359 | 57.87 | Commo with HQ | Send voice message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 362.41 | 42.09 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 367 | 48.76 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 368 | 149.25 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 371.15 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 372 | 105.47 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 373 | 235.77 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 376 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 383 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 384 | 48.96 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| 385 | 129.19 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Receive Digital Message CG |
| 386 | 135.27 | Commo with HQ | Receive Digital Message CG |

| | | Workload Profile for CG during Baseline Scenario | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 387 | 90 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random2-5s) CG |
| 387.12 | 165.54 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Assess Situation CG |
| 393 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 394 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 395.07 | 45.65 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 399 | 14.7 | CG Scan | monitor + update C4 display |
| 402 | 64.29 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Voice Message CG |
| 403.96 | 133.32 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Voice Message CG |
| 407 | 14.7 | CG Scan | monitor + update C4 display |
| 408 | 61.68 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 413 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 413.83 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 414 | 130.5 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| 417 | 7 | Commo with HQ | Assess Situation CG |
| 418 | 38.79 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Assess Situation CG |
| 424 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 425 | 42.09 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 428 | 70.69 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 432 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 435 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 436.45 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 437 | 105.47 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 438 | 235.77 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 445.34 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 449 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 450 | 57.87 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Send voice message CG |

| Workload Profile for CG during Baseline Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 457.65 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 459 | 145.65 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 461 | 237.36 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 464 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 465 | 77.92 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 467.37 | 155.93 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 470 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 472 | 52.32 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 473 | 135.27 | Commo with HQ | Receive Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 477 | 7 | Commo with HQ | Assess Situation CG |
| 477.89 | 33.53 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Assess Situation CG |
| 483 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 485 | 48.96 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 486 | 113.28 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 486.36 | 189.32 | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send Digital Message CG |
| 489 | 115.45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 492.44 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 496 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 497 | 46.19 | Commo with HQ | Receive Voice Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 501 | 14.7 | CG Scan | monitor + update C4 display |
| 502.38 | 57.86 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| 503 | 130.3 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 504 | 136.98 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG talks via intercom |
| 509 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 514 | 9.2 | Commo with HQ | Send Digital Message CG |
| 515 | 58.01 | Commo with HQ | Send Digital Message CG |

## Workload Profile for CG during Baseline Scenario

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| | | CG Scan | monitor + update C4 display |
| 516.23 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 524 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 526 | 77.92 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 527 | 181.79 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 527.32 | 283.9 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 533 | 14.7 | CG Scan | monitor + update C4 display |
| 533.01 | 54.08 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| 534 | 76.89 | Commo with HQ | Send voice message CG |
| | | CG Scan | monitor + update C4 display |
| 540 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 540.04 | 42.09 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 546 | 9.2 | Commo with HQ | Send Digital Message CG |
| 547 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 548 | 113.28 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Send Digital Message CG |
| 551 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 551.67 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 553 | 105.47 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 555 | 66.38 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 557.35 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 558 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 561 | 76.89 | Commo with HQ | Send voice message CG |
| | | CG Scan | monitor + update C4 display |
| 564.01 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 570 | 46.19 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Receive Voice Message CG |
| 573 | 48.96 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 574 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 577 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 577.09 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 579 | 48.58 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 583 | 98.18 | Crew commo in vehicle | CG hears D message via intercom |

| Workload Profile for CG during Baseline Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Send Digital Message CG |
| 584 | 113.28 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 588 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 589 | 55 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 592.35 | 115.45 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 595 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 598 | 52.32 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |

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# Appendix D. Data for Condition 4: Non-Combat Scenario

| | | Workload Profile for CG during Combat Scenario | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 0 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 6 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 9 | 66.76 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 11 | 146.11 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 20 | 14.7 | CG Scan | monitor + update C4 display |
| 25 | 9.2 | Commo with HQ | Send Digital Message CG |
| 31 | 14.7 | CG Scan | monitor + update C4 display |
| 31.62 | 57.86 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | monitor + update C4 display |
| 32 | 143.32 | Commo with HQ | Receive Digital Message CG |
| | | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| 37 | 7 | Commo with HQ | Assess Situation CG |
| 40 | 35 | Commo with HQ | Assess Situation CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 46.51 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 48 | 48.58 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 49 | 129.26 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 55 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 57 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 64.52 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 73 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 75 | 7 | Commo with HQ | Assess Situation CG |
| 76 | 29.66 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| 83 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 84 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 84.75 | 48.58 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 93 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 94 | 48.96 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| 95 | 136.69 | Commo with HQ | Send voice message CG |
| | | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 98 | 163.33 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send voice message CG |

| Workload Profile for CG during Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| 102.88 | 45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 103 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 104 | 129.26 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | monitor + update C4 display |
| 106.55 | 136.98 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| 112 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 113.43 | 55.54 | Commo with HQ | Receive Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 119 | 70.69 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send voice message CG |
| 125 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 129 | 48.96 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 131.84 | 48.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 132 | 119.29 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 134 | 125.47 | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 137.15 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 142 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 147.53 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 150 | 48.76 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 153 | 48.96 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | Scan (random2-5s) CG |
| 154 | 113.28 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | Scan (random2-5s) CG |
| 157 | 52.32 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 161.44 | 52.72 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 163 | 245.82 | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | monitor + update C4 display |
| 167.94 | 54.45 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 170 | 14.7 | CG Scan | monitor + update C4 display |
| 180.21 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 181 | 65.55 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Send voice message CG |
| 182 | 125.69 | Commo with HQ | Send voice message CG |

| Workload Profile for CG during Combat Scenario | | | |
|---|---|---|---|
| Time | Total Workload | Function Name | Task Name |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 194 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 199 | 48.96 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | Scan (random2-5s) CG |
| 200 | 143.87 | Commo with HQ | Send voice message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 201.88 | 235.77 | Commo with HQ | Send voice message CG |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 209 | 14.7 | CG Scan | monitor + update C4 display |
| 213 | 14.7 | CG Scan | monitor + update C4 display |
| 217.68 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 222 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 223 | 57.87 | Commo with HQ | Send voice message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 226 | 66.76 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send voice message CG |
| 227.95 | 138.71 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 232 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 236 | 52.32 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 246 | 13.5 | Commo with HQ | Receive Voice Message CG |
| 246.73 | 54.45 | Commo with HQ | Receive Voice Message CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 249 | 32.11 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 251 | 72.54 | Crew commo in vehicle | CG hears D message via intercom |
| | | Commo with HQ | Assess Situation CG |
| | | CG Scan | Scan (random2-5s) CG |
| 260 | 69.62 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Digital Message CG |
| 261.12 | 143.32 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Digital Message CG |
| | | CG Scan | monitor + update C4 display |
| 265 | 33.53 | Commo with HQ | Assess Situation CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 269 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 271 | 48.96 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 274.31 | 45 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 277 | 99.93 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 278 | 52.32 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |

| **Workload Profile for CG during Combat Scenario** | | | |
| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| 285.95 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 286 | 70.69 | Commo with HQ | Send voice message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 290 | 42.09 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 301.88 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 302 | 45 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 304 | 66.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send voice message CG |
| 307 | 163.33 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Send voice message CG |
| 308 | 65.8 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | monitor + update C4 display |
| 309.73 | 136.98 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 317 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 319.57 | 42.09 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 328 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 329.51 | 69.99 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Crew commo in vehicle | CG talks via intercom |
| 330 | 48.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Crew commo in vehicle | CG talks via intercom |
| 332 | 106.91 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 340 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 346 | 55 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 350.53 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 353 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 362 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 364 | 57.87 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Send voice message CG |
| 365.98 | 134.05 | Crew commo in vehicle | CG talks via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Send voice message CG |
| 370 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 373 | 48.96 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 374.12 | 99.93 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 380 | 13.2 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 383 | 77.92 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 386 | 153.82 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |

| Time | Total Workload | Function Name | Task Name |
|---|---|---|---|
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| 389.63 | 38.67 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | Scan (random2-5s) CG |
| 390 | 125.69 | Commo with HQ | Send voice message CG |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 395.97 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 396 | 54.08 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 400 | 54.08 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| 406 | 15.5 | Commo with HQ | Send voice message CG |
| 407 | 66.76 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | Commo with HQ | Send voice message CG |
| 409 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 416.67 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 421 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 423 | 66.38 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | CG Scan | Scan (random2-5s) CG |
| 425 | 29.66 | CG Scan | Scan (random2-5s) CG |
| | | Commo with HQ | Assess Situation CG |
| 429.02 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 439 | 11.8 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 441 | 50.88 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 442 | 113.28 | CG Scan | Scan (random2-5s) CG |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | Commo with HQ | Send Digital Message CG |
| 444 | 119.36 | Commo with HQ | Send Digital Message CG |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 452.1 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 457 | 45.65 | Commo with HQ | Send Digital Message CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 461 | 44.04 | Commo with HQ | Send Digital Message CG |
| | | CG Scan | Scan (random2-5s) CG |
| 466 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 467.74 | 69.99 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 470 | 137.36 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 476 | 15.5 | Commo with HQ | Send voice message CG |
| 480 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 483 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 485.57 | 48.58 | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 487 | 129.26 | Crew commo in vehicle | CG hears D message via intercom |
| | | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG compares other friendly to own location |

| **Workload Profile for CG during Combat Scenario** |
|---|---|---|---|
| **Time** | **Total Workload** | **Function Name** | **Task Name** |
| 493.3 | 11.5 | Crew commo in vehicle | CG talks via intercom |
| 496 | 54.93 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Receive Voice Message CG |
| 508 | 14.7 | CG Scan | monitor + update C4 display |
| 509 | 85.97 | CG Scan | monitor + update C4 display |
| | | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 512 | 38.79 | Commo with HQ | Assess Situation CG |
| | | CG Scan | monitor + update C4 display |
| 512.77 | 96.98 | Commo with HQ | Assess Situation CG |
| | | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG talks via intercom |
| 519 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 522 | 61.68 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | monitor + update C4 display |
| 527 | 65.8 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | CG Scan | monitor + update C4 display |
| 530 | 55 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Commo with HQ | Send Digital Message CG |
| 533.37 | 45.65 | Crew commo in vehicle | CG talks via intercom |
| | | Commo with HQ | Send Digital Message CG |
| 537 | 11.8 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| 539 | 48.96 | Maintain awareness of enemy, own units | CG looks at his unit on map |
| | | CG Scan | Scan (random2-5s) CG |
| 543 | 13.2 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| 545.07 | 48.58 | Maintain awareness of enemy, own units | CG compares other friendly to own location |
| | | Crew commo in vehicle | CG hears D message via intercom |
| 550 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 559 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 565.41 | 11.3 | Crew commo in vehicle | CG hears D message via intercom |
| 570 | 20 | Commo with HQ | Receive Simultaneous Digital and Voice Messages |
| 577 | 14.7 | CG Scan | monitor + update C4 display |
| 579 | 61.68 | CG Scan | monitor + update C4 display |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 579.8 | 122.96 | CG Scan | monitor + update C4 display |
| | | Crew commo in vehicle | CG hears D message via intercom |
| | | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| 585 | 48.96 | Maintain awareness of enemy, own units | CG looks at enemy location on map |
| | | CG Scan | Scan (random2-5s) CG |
| 588 | 52.32 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| 588.46 | 112.83 | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | CG Scan | Scan (random2-5s) CG |
| | | Crew commo in vehicle | CG talks via intercom |
| 589 | 119.47 | Crew commo in vehicle | CG talks via intercom |
| | | Maintain awareness of enemy, own units | CG compares enemy location to own location |
| | | Commo with HQ | Send Digital Message CG |
| 594 | 9.6 | CG Scan | Scan (random2-5s) CG |
| 597 | 13.5 | Commo with HQ | Receive Digital Message CG |
| 600 | 7 | Commo with HQ | Assess Situation CG |

1   ARL HRED  AVNC FLD ELMT
    ATTN AMSRL HR MJ  D DURBIN
    BLDG 4506 (DCD)  RM 107
    FT RUCKER  AL  36362-5000

1   ARL HRED  CECOM FLD ELMT
    ATTN AMSRL HR ML J  MARTIN
    MYER CENTER  RM 2D311
    FT MONMOUTH  NJ  07703-5630

1   ARL HRED FT BELVOIR FLD ELMT
    ATTN  AMSRL HR MK   J REINHART
    10170 BEACH RD
    FORT BELVOIR  VA  22060-5800

1   ARL HRED  FT HOOD FLD ELMT
    ATTN AMSRL HR MV HQ USAOTC
          S MIDDLEBROOKS
    91012 STATION AVE  RM 348
    FT HOOD TX  76544-5073

1   ARL HRED FT HUACHUCA FLD ELMT
    ATTN AMSRL HR MY  M BARNES
    2520 HEALY AVE
    BLDG 51005  STE 1172
    FT HUACHUCA AZ  85613

1   ARL HRED  HFID FLD ELMT
    ATTN AMSRL HR MP   D UNGVARSKY
    BATTLE CMD BATTLE LAB
    415 SHERMAN AVE UNIT 3
    FT LEAVENWORTH KS  66027-2326

1   ARL HRED FLW FLD ELMT
    ATTN AMSRL HR MZ  A DAVISON
    320 MANSCEN LOOP STE 166
    FT LEONARD WOOD  MO  65473-8929

1   ARL HRED  NATICK FLD ELMT
    ATTN AMSRL HR MQ M R FLETCHER
    NATICK SOLDIER CTR AMSSB RSS E
    BLDG 3  RM 341
    NATICK  MA  01760-5020

1   ARL HRED SC&FG FLD ELMT
    ATTN  AMSRL HR MS  R ANDERS
    SIGNAL TOWERS  RM 303A
    FORT GORDON GA  30905-5233

1   ARL HRED  STRICOM FLD ELMT
    ATTN AMSRL HR MT A GALBAVY
    12350 RESEARCH PARKWAY
    ORLANDO  FL  32826-3276

1   ARL HRED  TACOM FLD ELMT
    ATTN AMSRL HR MU  M SINGAPORE
    6501 E 11 MILE RD MAIL STOP 284
    BLDG 200A 2ND FL RM 2104
    WARREN  MI  48397-5000

1   ARL HRED  USAIC FLD ELMT
    ATTN AMSRL HR MW  E REDDEN
    BLDG 4  ROOM 332
    FT BENNING  GA  31905-5400

1   ARL HRED  USASOC FLD ELMT
    ATTN  AMSRL HR MN  R SPENCER
    DCSFDI HF
    HQ USASOC BLDG E2929
    FORT BRAGG  NC  28310-5000

1   CDR  AMC - FAST
    JRTC & FORT POLK
    ATTN AFZX GT DR J AINSWORTH
    CMD SCIENCE ADVISOR G3
    FORT POLK  LA  71459-5355

    ABERDEEN PROVING GROUND

2   DIRECTOR
    US ARMY RSCH LABORATORY
    ATTN  AMSRL CI OK  (TECH LIB)
    BLDG 305  APG AA

1   LIBRARY
    ARL  HRED
    BLDG 459

9   ARL HRED
    ATTN AMSRL HR MB  D MITCHELL
           C SAMMS (3 CYS)
           J WOJCIECHOWSKI (3 CYS)
    BLDG 459
    APG-AA

3   ARL HRED
    ATTN AMSRL HR SC  T HENTHORN
    BLDG 459
    APG-AA

2   ARL HRED
    ATTN AMSRL HR MB  F PARAGALLO
           AMSRL HR MC  J HAWLEY
    BLDG 459
    APG-AA