Mission Structure for an Unmanned Vehicle

Alexander Meystel °*, Yigal Moscovitz °, Elena Messina °

°National Institute of Standards and Technology, * Drexel University

ABSTRACT

The 4-D/Real-Time Control Systems Architecture (4-D/RCS) defines a hierarchical decomposition for intelligent systems, with corresponding command and control pathways. In order to design the vehicle's behavior generation functions, we developed a set of task commands, goals, and actions that are organized hierarchically to form the basic vocabulary for planning and control of the vehicle. This paper documents the basic tasks and vocabulary for a scout platoon implemented according to 4-D/RCS.

1. Introduction

The objective of this document is to describe a set of tasks that a scout platoon and its components are expected to perform during the course of a mission[1], and to define a library of task commands that the scout platoon should be able to execute by producing necessary actions. The tasks, their goals, as well as the actions are organized in the corresponding hierarchies and together form a vocabulary of the planning/control language used for Behavior Generation. The scout platoon is presumed to consist of the autonomous vehicles (equipped by the 4-D/RCS system). Functioning and architecture of 4-D/RCS system is described in [2]. In this paper, we will briefly address the general information relevant to the Mission Structure.

"Mission" is understood as the assignment to the scout platoon formulated at the battalion level (**Level 7** of 4-D/RCS). Mission is a set of sequential, or parallel, tasks that the scout platoon should accomplish during a particular period of time within a particular designated space. This assignment is decomposed in the hierarchy of tasks and sub-tasks for the other 6 levels of the architecture. Scout platoon missions are typically defined by Battalion Headquarters (HQ) and conveyed to a platoon through a platoon leader via a set of task commands that refer to knowledge residing in maps and reports that describe the state of the battle-space. This set of task commands assumes that the scout platoon has certain skills, its components have certain capabilities and knowledge of how to perform tasks corresponding to the commands.

Commands and knowledge input from the battalion HQ to a scout platoon are combined with knowledge resident in the scout platoon itself. In 4-D/RCS, task knowledge is formally represented in task frames. The battalion level planning process may consider the exposure of each unit's movements to enemy observation, and the traversability of roads and cross-country routes. At the battalion level, the 4-D/RCS world model maintains a knowledge database containing names, contents, and attributes of friendly and enemy forces and of the force levels required engaging them. Maps have a range of 1000 km.

Level 6—Platoon
A scout platoon is a unit that consists of ten vehicles organized into one or more sections. The platoon commander and section leaders plan activities and allocate resources for the sections in the platoon. At the platoon level, plans are computed for a period of about two hours into the future, and replanning is done about every ten minutes, or more often if necessary. Section waypoints about ten minutes apart are computed.

Level 5—Section
A scout section is a unit that consists of a group of individual scout vehicles. A 4-D/RCS node at the section level corresponds to a squad leader plus his vehicle commanders (humans or intelligent software). This command team assigns duties to vehicles and schedules the activities of each vehicle within a section. Orders are decomposed into assignments for each vehicle, and a schedule is developed for vehicles to maneuver in formation relative to enemy forces and large obstacles. Plans are developed to conduct coordinated maneuvers and to perform reconnaissance, surveillance, or target acquisition functions. At the section level, plans are computed for about ten minutes into the future, and replanning is done about every one minute, or more often if necessary. Vehicle waypoints about 1 minute apart are computed.

Level 4—Individual vehicle
The vehicle is a unit that consists of a group of subsystems, such as locomotion, attention, communication, and mission package. A manned scout vehicle may have a driver, vehicle commander, and a lookout. The vehicle commander assigns job to subsystems and (possibly in collaboration with subsystem controllers) schedules the activities of all the subsystems within the vehicle. A string of waypoints is developed for the locomotion subsystem to be traversed with a particular schedule while avoiding obstacles, maintaining position relative to nearby vehicles, and achieving the desired vehicle heading and speed along the desired path on roads or cross-country. A schedule of tracking activities is generated for the attention subsystem to track obstacles, other vehicles, and targets. Waypoints about 5 seconds apart out to a planning horizon of one minute are replanned every 5 seconds or more often if necessary.

Level 3—Subsystem level
The subsystem is a unit consisting of a group of related primitive systems, such as steering and braking, engine and transmission, sensor stabilization and pointing, message encoding and decoding, and weapons loading and aiming. A schedule of steering and braking commands is developed to avoid obstacles. A schedule of pointing commands is generated for aiming cameras and sensors. A schedule of messages is generated for communications, and a schedule of actions is developed for loading and aiming weapons. For each primitive system, a plan consisting of trajectory of waypoints about 500 milliseconds apart is generated out to a planning horizon of about 5 seconds in the future. A new plan is generated about every 500 milliseconds.

Level 2— Primitive level
The primitive level is a unit consisting of a group of controllers that plans and executes velocities and accelerations to optimize dynamic performance of components such as steering, braking, acceleration, gear shift, camera pointing, and weapon pointing, taking into consideration dynamical interaction between mass, stiffness, force, and time. Velocity and acceleration setpoints are planned every 50 milliseconds out to a planning horizon of 500 milliseconds.

Level 1—Servo level
Each node at the servo level is a unit consisting of a group of controllers that plan and execute actuator motions and forces, and generate discrete outputs. Communication message-bit streams are produced. The servo level transforms commands from component to actuator coordinates and computes motion or torque commands for each actuator. Desired forces, velocities, and discrete outputs are planned for 5 millisecond intervals out to a planning horizon of 50 milliseconds.

The existing arrangement for the concept of "commander" will be analyzed and might be reconsidered for the organizational units consisting of autonomous vehicles. Indeed, when the group of autonomous vehicles travels together, there is no mandatory need to decide which one of them is the "leader" vehicle since their knowledge is the same and the plans they compute are equivalent. As the mission progresses, their knowledge changes, yet, since they share and exchange it, their decision-making capabilities remain equivalent, and the need to consider one of them "a leader" might not emerge. If they are not able to share their knowledge, and if their position is not equally convenient for the mission continuation, the battalion command might choose one of them to fit the role of a leader. These issues are to be discussed in the future, when some experience of testing will allow us to better understand the capabilities of the autonomous vehicles.

The scout platoon serves as the eyes and ears of the battalion as part of the intelligence collection process. The scout platoon's mission is to confirm or deny the battalion commander's Intelligence Preparation of the Battlefield (IPB) and provide information as assigned in the reconnaissance and surveillance plan. In unmanned ground vehicles, platoon command and control is done via the leader vehicle.

2. Classification of Missions

A mission is a set of sequential and/or parallel tasks that the scout platoon should accomplish during a particular period of time within a particular designated space. This section describes the types of mission tasks that can be assigned to the scout platoon (consisting of both manned and/or unmanned vehicles). Each unit receives a set of commands that define the task and the goal of this task. A mission is decomposed into tasks and subtasks. Correspondingly, the mission goal is decomposed into the hierarchy of goals for the lower levels of the hierarchy of tasks and subtasks. Each goal and subgoal is the designed

final state of the accomplished task and/or subtask (like a destination point). The overall mission results are the outcome of the overall goals/subgoals hierarchy (e.g., like a detection of the enemy from the observation post). Mission plans are composed of sequential and/or parallel tasks that progress jointly, or follow each other upon the satisfaction of a "transition condition," which allows completion of the preceding task and progression to the subsequent one. Each task is decomposed into the set of subtasks that form a sequential/parallel set. The sequence of tasks presumes completion of the previous one before initiation of the next (e.g., like "crossing the bridge after approaching the river"). The parallel sub-tasks require having independent actuators for doing this (e.g., like "watching" while "moving"). This information is taken into consideration during the process of decision making within the module of Behavioral Generation (BG) [3].

The task assignments are defined and organized into hierarchical levels according to the seven levels of 4-D/RCS Architecture. The following sub-section includes a list of tasks from the level of the unit (platoon) through the level of single vehicle to the level of the main subsystems in a vehicle.

Mission Tasks Assigned to a Platoon

The Travel Task: Navigate from one point on the terrain to another. The goal of this task is to make sure that the unit (Platoon) will reach the destination point or area. The path-planning algorithm determines the trajectory of motion and thus, has the responsibility for the accomplishments of the unit mission. The commander may add check points to the task if he wants to correct and/or guide the path chosen and to be sure that the unit is on the right way to the destination point. As necessary, the platoon adjusts the route (planned trajectory), formation, and/or the movement techniques chosen in response to emerging obstacles, minefields, changing probability of the contact with enemy, and/or changes in the tactical situation. The platoon unit maintains movement security at all times taking in account a variety of issues like safe travel or stealthiness, if needed**. The designed result:** The Platoon reaches the given destination.

Establishing an Observation Post Task: This task is assigned to a platoon when reporting of information is required that will have a potential intelligence value. The OP (Observation Post) is positioned to allow the scout platoon to observe the assigned sector, likely enemy avenues of approach, and/or Named Area(s) of Interest (NAI) with required depth of observation through the sector. Based on the commander's guidance, a number of needed OP's are chosen in order to cover the area of operation. The task may include a list of reactions for events like "hide" if you are detected or "transit to track mode" if a certain type of vehicle is detected. **The designed result:** The OP observer provides early warning of enemy activity.

The task activities (sub-tasks): 1. Terrain analysis to determine OP's location and to plan the trajectories from the current location. 2. Zone reconnaissance in case the area is not clear. 3. Observation Post occupation according to the plan. 4. Recognition of a threat and battlefield organizations. 5. Reporting.

The Task of Advance/Withdraw to a Position: This is a war task when the Scout Platoon is a part of the larger fighting Unit (Parent Unit). The scout platoon is relocated when the "line of the battle" is advanced or withdrawn in a way to assist the present assignment. The vehicles can be at positions that are hidden from the enemy, or they can relocate to Observation Position or Fighting Position. A Fighting Position is a location in which the vehicles are hidden but, if necessary, could observe and fire upon enemy position. **The designed result:** cooperation with parent unit and increased safety and efficiency.

The task activities (sub-tasks): 1. Go to Fighting Position / Support by fire position. 2. Go to Hiding Position. 3. Go to Observing Position

Screen Operation Task: This task is for local security, or for self-protection. In this case, the goal of the scout platoon is to provide the security assistance to another unit. The scout force is located between a parent force unit and the enemy. The unit tasked with performing a screen operation must provide an early warning of the enemy activity to the rest of the platoon unit and to the parent unit. The scout force can be located in a hidden "observation post" around the "stationary force unit" or perform an "overwatch movement" leading a "heavy force" in an "assault operation". **The designed result:** No enemy passage through the assigned area.

Convoy Escort Operation Task: The scout platoon goal is to ensure the security of a moving Convoy. The Escort may be tasked to provide front, rear, or flank security. Another option is to integrate it within the convoy. The platoon should have enough combat power to handle the situation and it can request assistance from engineers, military police, dismount infantry, or a heavy reaction force.

The task activities (sub-tasks): 1. Tactical Road March. 2. Tactical Cross-country Movement. 3. Route reconnaissance.

Surveillance Task: This is a Security Operation that is called by the army "Reconnaissance by Fire." The scout platoon goal is to make sure that an area is clear from enemy forces. The scout vehicles conduct Area Reconnaissance, which means covering an area while under movement. In case of contact, the units react according to the Rules of Engagement. This may be Self-fire or Indirect Fire.

Reconnaissance (Reconnoitering) Task: This task is to report if Route/Area is traversable for manned vehicles. The Unit / Single Vehicle will navigate through a series of a pre-planned waypoints along the assigned route or will cover an assigned area. As necessary, the platoon adjusts the route in the same way that is employed when the traveling task is performed. In this mission, the vehicle mobility sensors are dedicated, for mapping and performing the traversability assessment for the vehicle. Additional sensors may be operated on-board for environment probing such as NBC (Nuclear, Biological, or Chemical). The plan will ensure a complete coverage of the area in an efficient way by the vehicles. On-line planning would be needed for coordinating the vehicle's movements, as they are required in real-time in order to accomplish the mission on time**. The designed result:** The platoon reports about the complete Area/zone.

The task activities (sub-tasks): 1. Route reconnaissance 2. Area/zone reconnaissance 3. NBC (Nuclear, Biological, Chemical) reconnaissance (With Radiation Monitoring).
Search for the Enemy (Reconnaissance) Task

Search for the Enemy (Reconnaissance) Task: The task goal is to detect and locate the enemy. The scout platoon is assigned to search for the enemy in a specified area. The vehicle's starting location may be at some distance from the search area so the vehicles may have to perform a travel task to the Search Area. Sometimes the task is extended to include Surveillance so that the scouts track the enemy while updating its location. The Task requires a stealthy performance and the enemy location and movements are not known initially. **The designed result:** Enemy units are detected and located in assigned area or their absence is confirmed.

Linkup with an Adjacent (nearby), Moving or Stationary Ground Unit Task: The scout platoon unit acts always with a parent unit. There are situations when the scout unit or even a single vehicle is ordered to support another parent unit. The process of traveling to another area of operation and exchanging commanders must be done with extra considerations. Autonomous vehicles can be linked up to another unit through communication without any visual contact, if necessary. **The designed result:** Linkup with another parent unit.

Coordinated Passage of Lines Forward / Rearward Task: This task is needed for the cases when a scout unit has to be active in the Enemy territory behind the front line. The Scout Unit must coordinate with its front force on the way in and out of the border. This is a complicated task for an Autonomous Unit. It requires definitions of "two-way" communication and information transfer. As in the linkup task, crossing lines of passage demands a definition of the identification process between both sides of the line. **The designed result:** The unit successfully passes the line.

Re-supply Task: This task is concerned with the refueling and other maintenance needs for the unmanned scout vehicles. It is performed always while the process of preparation is in progress for the next task. Platoon vehicles that are on duty for several days must be able to travel to an assembly area for refueling, or for the equipment replacement. This sub-task must be planned in advance or executed by field decision. **The designed result:** Vehicles have the fuel and equipment to carry on their operations.

Halt Task: The task to stop may be pre-planned or can be a part of the reactions to events. A halt task requires additional instructions about the position and the behaviors of the vehicles. Among these instructions for the unit is type of formation to use. Halt task can be a reaction to air attack, or can be due to the required plan changes. Since the vehicles exchange plans, the halt tasks help to bring the vehicles to another set

of way points to be traversed while keeping the prior formation. **The designed result:** Unit stops movement and protects itself.

Activities of the Platoon Leader

The Platoon leader performs seven steps in troop-leading procedure:
1. Receive and analyze the Set of Mission Tasks; 2. Issue a warning order - pass the information to the subordinate leaders; 3. Make a tentative plan; 4. Initiate a movement - to the new assembly area or closer to the operational area; 5. Conduct the reconnaissance - proceeding with the motion requires the routes of the plan to be verified by a preliminary watch; 6. Complete the plan - refinement of the plan and informing the parent unit commander and other platoon leaders, (this is required when an alternative of the plan is close to completion after the reconnaissance); 7. Issue the order - after walking through the rehearsal with all subordinate leaders, the platoon leader should ensure the complete understanding of the upcoming operation.

Prepare: The platoon leader prepares for a mission by converting the platoon assignment to a plan/program that includes tasks for each of the sections. Each task consists of a string of subtasks and subgoals to be achieved. Plans are updated according to the newly arrived information. The platoon leader translates the task to a sequence of subtasks. These subtasks are translated from the army tactical language (Platoon tasks) to more simple, technical terms with the particular meaning refinement.

Command, Control, and Communication: The platoon leader receives assignments from the battalion supervisor and transfers tasks to each section. Command and Control are supplemented by Communication of tasks, commands, and reports of the accomplishments.

React and re-plan: The platoon leader decides how to react to an event or to re-plan in cases when the necessary deviation from a plan must exceed some particular threshold.

Travel: Platoon leader is supposed to lead the travel subtask of the platoon assignment. This rule might undergo some corrections and/or changes for unmanned vehicles. It will be demonstrated that in some situations the role of a "leader" will become a provisional one quickly "moved" from one vehicle to another. The leader determines the suitable type of formation and adjusts his movement to allow the platoon to keep in formation.

Observe: Platoon leader coordinates the subtask of "observing" when it is a part of the platoon assignment. Typically, this is the second basic activity of a platoon.

Supervise and Monitor: The platoon leader has to supervise and monitor the activities of the platoon vehicles and the status of operation. This will require issuing a set of assessment algorithms associated with deviation from a plan, task accomplishments, and the mission results. The platoon leader uses the assessment result as an input to his decision-making procedure.

Learn: The platoon leader has the ability to learn from experience during the whole process of mission accomplishment. Learning consists of collecting experiences, categorizing them, clustering them as needed by the goal and situation and deriving the appropriate map updates and rules of action.

Tasks Assigned to a Section

Section tasks are the result of plan decomposition at the platoon level into subtasks necessary to accomplish the platoon plan. An assignment given to a platoon typically breaks down into a set of sequential/parallel actions (move to first location, move to second location, move and report, activate mission package, and so on). Subsequently, it breaks down according to tasks submitted to the subordinates of the platoon leader.

Prepare: Section leader prepares for a mission by converting the Task Assignment to the best alternative of plan that includes tasks for each of the vehicles. The task descriptions include Goals to be achieved. Plan is created by the module of Behavior Generation. Consider the examples: go to assembly area, refuel, load necessary databases, perform diagnostics, etc. In each of these cases the task decomposition with formulation of the subtasks for the vehicles is required.

Command, Control, and Communication: Components of the platoons are part of the Command and Control chain. They receive assignments from their supervisor (the platoon leader) and the assignments are transferred to each vehicle. Command and Control are supplemented by the corresponding Communication Part.

Travel: A section conducts the "travel task" in concert with the rest of the platoon. Most of the assignments include travel as their component.

Section travel is done in formation. Examples of "travel" include "overwatch movement," "traveling overwatch," "follow the leader," etc.

Observe: A section observes the environment looking for terrain features, enemy vehicles, and other objects that are required, or can be helpful for accomplishing the Task Assignment.

Learn: Sections have the ability to learn from experience during Mission Activation and Observation. Collecting the experiences, categorizing them, and performing the operation of clustering and deriving the map updates and new rules does it.

Tasks Assigned to a Single Vehicle

Lead the Platoon /Section: The meaning of the assignment to be a leader is that vehicle has to Plan for the upcoming periods of time and Command to Reaction for the real-time events. The vehicle assigned to be a leader plans for the entire section.

Move: Each vehicle performs "travel in formation," which requires constantly computing and re-computing the motion trajectory. Reactive deviations from the planned motion trajectory requires on-line computing the required short-term motion trajectories, e.g., in the case of "obstacle avoidance" for the obstacles that were not demonstrated in the map.

Sense & Scan: The vehicle senses the environment, as scheduled and assigned in the Mission Program (e.g., for type of object to observe, Azimuth, Elevation, range, Rate of Scanning, etc.). The vehicle constantly collects data that contain terrain features, obstacles, other vehicles, and more.

Detect and Locate: The vehicle has to detect other vehicles, or other objects not shown in the map. It has to estimate their Location based on data from the sensors (including the inertial navigation system).

Communicate: The vehicle will communicate with other vehicles or communication stations according to the plan and its reactive behaviors.

Tasks Assigned to a Vehicle's Subsystems

Plan: The vehicle level generates plans for all the subsystems in the vehicle. Commands to the vehicle level include: Lead, Travel, Sense & Scan, and others. Behavior Generation module performs planning [3].

Drive: Driving Plans for the next 10 minutes are generated by the vehicle-level driving planner. The Driving Sub-System Executor is activated according to the plan. Its desired motion trajectory (including the path with associated values of speed and acceleration) is provided by the vehicle-level drive planner.

Sense: The Vehicle Sensors are activated as planned by the vehicle-level attention planner. Each of the sensors is dedicated to an appropriate task such as: Searching for Obstacles, Searching for other vehicles, or probing for NBC (Nuclear, Biological, and Chemical).

Search: The Vehicle-level plans how to point or scan the activated sensors towards the environment. The vehicle level attention Executor carries out the plan.

Track: The Vehicle-level attention executor locks the sensor on a detected Object keeping it in the field of view. This provides for tracking motion of the sensor pointing sub-system.

Detect and Locate: The vehicle-level planner applies an algorithm to locate a detected object in the sensed data using data from the navigation system. This sub-task is associated intimately with the sub-task of Search.

Communicate: The communication sub-system reports status to the supervisor and receives commands from him. Received commands are routed to the appropriate level of the control hierarchy.

Data Collection and Map Update

The vehicle saves data in the database as a byproduct of some or all of its assigned tasks. The data are used for registering with the maps, initiating the map-update procedure, correcting the World Model, or to support other requirements. Data are provided from the data base as input to the other sub-systems, such as: terrain maps for the planning of motion trajectories, tactical knowledge for the platoon-level planning, model for the detection procedure, and others.

3. Invariant Elements of Mission Programs

In this Section, an effort is made to determine the Mission Vocabulary and its hierarchical organization. From the previous Sections, the taxonomy of the objects and actions becomes clear. The intention is to provide the battalion

level (Level 7) with a tool for communicating the Mission to the platoon. The Mission Order is expected to be in a form suitable to the Mission Program. Mission Order includes the mission assignments/tasks and updated information relevant to the mission as described later in this section. Most of the Mission Program is the output of the planner. The information provided by planner depends on the level of hierarchy.

Missions Programs are divided into the following classes of components:

- Movement Requirement - Task Knowledge
- Geographical Area Relations - World Model
- Relation to other Agents (Our vehicles) - World Model
- Relation to the Enemy - World Model
- Communication Requirements - Task Knowledge
- Sensing Activities - Task Knowledge
- Reaction and Re-planning Requirements - Task Knowledge
- Transition Condition to the Next Mission Task - Task Knowledge

Movement Requirement

This part of the Mission Program contains the information about movement requirements for a scout platoon during the mission. Movement Task Types (Road March, Cross - country, Follow a Vehicle (leader), Overwatch Movement, Traveling Overwatch). Movement Parameter (Assigned road route, Assigned off-road route, Assigned combination of road route and Cross - country route, Assigned Destination as point Assigned Destination as Area Way points Definition: Type (Non - Mandatory / Mandatory Way point, Check points / Not Check point, With / with out Action, With / with out Time Flag), With / without Heading Direction Point, Tolerances (Coordinate, Heading, Time,,,)

Formation Definitions

The plan includes a chosen set of definitions and parameters for the way of keeping formation from a larger set that a scout unit may be able to perform: Chosen Formation Chosen leader vehicle to be followed, Follow the leader Offset (degrees,) Spacing (Open, Close, User Define).

Relation to other Vehicles and to Parent Unit

The scout platoon is organized, equipped, and trained to conduct activities assigned by the parent unit. The Program includes a chosen status of activity of the parent unit to be related by the scout's behavior: Screen Operation, Fighting Activity, Non War Operation, Damage Report, and Ammunition)

4. Object Detection and Allocation

In a situation where an enemy unit is within the scope of the scouts, each of the scout vehicles has its own activities, like tracking, related to one, selected, enemy vehicle. This part of the plan includes a chosen method of target detection for the single scout vehicle. In addition, the plan includes instructions about allocation of vehicles to objects. For example: a section of two vehicles has detected ten enemy vehicles according to their orders, they have to track the enemy vehicles. The allocation instruction will include the priority of the object to be tracked (tank, armored vehicle, tanker, or houses with people). In cases where the objects are similar (e.g., all are tanks), the allocation can be based on geometry or leadership (e.g., lead vehicle, center vehicle). This part of the mission program is delivered from the mission order.

Geographical Area Relations

This part of the Program includes the information related to maps of the operation area. All the data of this part can be shown as a layer in a geographical (or a topographical) map.

Area Observation Mode

The chosen definitions and parameters for the Observation tasks: Cover from Static Observation Post, Cover While Moving (to protect the parent unit), Generate movement in order to cover area, and Cover while Enemy Movement

Geographical Information Database

This part is concerned with the geographical database of the vehicle. It includes general geographical maps and specific information on entities like coordinates, height, and velocity.

Sensing and Focusing Attention (SFA) Activities

Onboard sensors that allow traveling, mapping, and observing perform SFA-activities. Algorithms of the external world detection and recognition (including enemy vehicles) do it. This part of the program includes instructions and definitions for the sub-systems of sensing and Sensory Processing.

Detection and Recognition of Sensed Objects

This part of the Program includes tasks for the Image Processing subsystem to detect and track a specific target or to allocate targets between our vehicles. This part of the program is the planned sensing activity including special instructions, scheduling, and operational condition.

Sensing/Observation Acquisition

This part of the program includes tasks to acquire data from the sensors, including the navigation system, for purposes such as localizing objects. This task includes the state estimation with the subsequent apprehension and evaluation of static and moving objects or general information.

4. Summary

We have illustrated the results of extracting a set of task commands, goals, and actions from a set of behaviors for a military scout platoon. The resulting set of tasks and vocabulary for the scout platoon can be used in implementing a 4-D/RCS control hierarchy for autonomous vehicles that exhibit these required behaviors.

REFERENCES

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Assignments Translated into the Language of Accomplishment: Tasks vs. goals to be performed and expected results

Task Assignment	Task Goal	Task result
Travel	Navigate from One point to Another while adjusting route, formation or movement technique.	Reach the destination area.
Establish an Observation Post	Reach the destination points from where the assigned area can be seen.	Report from the Observation post on enemy activity within the assigned area.
Advance / Withdraw to Position	Adjust position according to Battle Location to position that allows Hiding/Fighting	Cooperation with the parent unit during battle to increase safety and efficiency.
Screen Operation: • **Convoy Escort Operation** • **Surveillance**	Provide Security assistance to another unit by Overwatch and Surveillance Action.	Allow early warning about the enemy activities.
Reconnaissance	Travel through an assigned area or a route while avoiding obstacles and detection.	Report if the Route/Area is traversable for other vehicles.
Search for the Enemy (Reconnaissance)	Cover an assigned area by traveling and observing	Detect and Locate the Enemy in an assigned area.
Linkup Nearby Unit	Travel to nearby area of operation with a coordination to change the parent unit.	Linkup to another parent unit accomplished
Coordinated Passage of lines	Travel to pass the line while coordinating with the border guards.	The unit has passed the line successfully
Re-supply	Vehicle travels to assembly area to maintenance and refuel.	The vehicles have fuel and equipment to carry on the operation
Halt	The vehicles stop the current task and get together in an assigned static formation	The Units stop traveling and gather in a static formation to allow self protection