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RAC-T-474  
MARCH 1966

RESEARCH  
ANALYSIS  
CORPORATION

Analysis of Cross-Country Surface Vehicles  
for South Vietnam

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① Analysis of Cross-Country Surface Vehicles  
for South Vietnam

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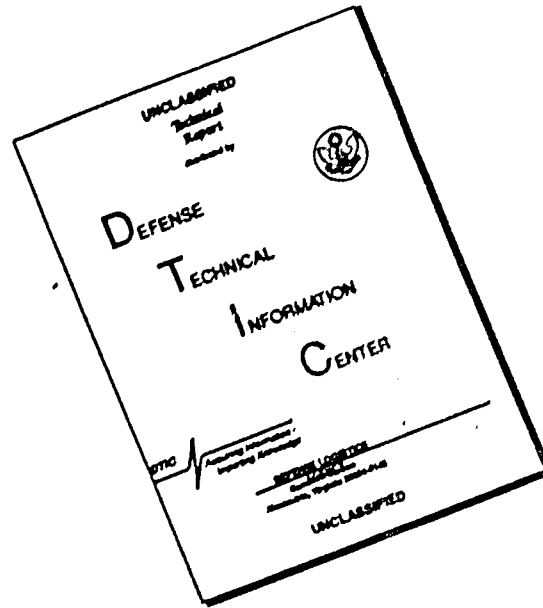
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RESEARCH ANALYSIS CORPORATION

MCLEAN, VIRGINIA

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### FOREWORD

RAC, at the request of the Advanced Research Projects Agency, Department of Defense, initiated Research Project 633.6, under contract SD-212, to analyze cross-country surface vehicles for operations in South Vietnam. The study included the analysis of the terrain, various missions, and vehicles. Aircraft and ships were not included, but shallow-draft boats for operations in the delta area were.

The objective of this study is to provide sufficient information on the capabilities of vehicles now in the military system, and those under development, to determine the type of new vehicles that would, in all probability, extend mobility for operations in South Vietnam over marginal terrain.

Members of the study group wish to acknowledge contributions made by Maj Gen Charles J. Timmes, USA, who for the past 2 years was Chief of the Military Advisory Group, and by members of his advisory staff in South Vietnam.

George A. Martinez  
Head, Unconventional Warfare Department

*[Handwritten signature]*

## CONTENTS

<b>Foreword</b>	iii
<b>Summary</b>	1
Problem—Facts—Discussion—Conclusions—Recommendations	
<b>Abbreviations</b>	8
<b>Introduction</b>	9
Background—Organization of this Memorandum	
<b>Terrain and Vehicle Requirements</b>	11
Terrain—Terrain and Vehicle Requirements	
<b>Description and Suitability of Current and Prototype Vehicles</b>	15
Nonfloating Trucks—Floating Trucks—Wheeled Amphibious Lighters—Tracked Amphibious Vehicles—Shallow-Draft Boats—Landing-Craft Boats—Unique-Concept Vehicles— Narrow-Trail Vehicles	
<b>Development of New Concept or Improved Vehicles</b>	21
General Vehicular Requirements—Specific Vehicular Proposals	
<b>Computation of Vehicular Performance</b>	30
Relation of Mobility Index to Vehicle Cone Index—Determination of VCIs for the Terraire-Tracked, XM571, and XM581—Vehicle Operation on Fine-Grained Soils—Maximum Slope Ability Comparison—Cross-Country Mobility Rating	
<b>Appendixes</b>	45
A. Mission Data	129
B. Vehicle Data	

**Reference** 341

**Figures**

1. Major Terrain Classes of South Vietnam	3
2. Area Vehicle Selection Map of South Vietnam	12
3. Narrow-Trail-Vehicle Concept	23
4. Water- or Marsh-Operations Concept	25
5. Side View of Tire-Tracked Concept	27
6. Front View of Tire-Tracked Concept	27
7. Comparison of MI with VCI	31
8-9. Trafficability in the Field	
8. For 50 Passes (Traffic)	32
9. For One Pass	33
10. Maximum Slope Ability Comparison	39
11. Mobility Rating of 30 Selected Vehicles	40

**Tables**

1. Trafficability Characteristics of Soils in the Wet Season	35
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## SUMMARY

### Problem

To identify the types of surface vehicles whose physical and performance characteristics would vastly improve the present limited capability of transporting cargo and personnel cross-country over various types of terrain in South Vietnam.

### Facts

US military surface vehicles now operating in South Vietnam are almost entirely restricted to roads, railroads, and waterways, which are relatively few, and hence easy to ambush.

Experience in counterinsurgency operations in South Vietnam has shown that capability of freely transporting cargo and personnel cross-country would (a) greatly reduce if not virtually eliminate the probability of ambush by freeing convoys from the few known routes of travel (the roads) and (b) greatly increase the probability of overtaking fleeing guerrillas if the vehicles could move cross-country faster than a man on foot.

### Discussion

Before a suitable existing cross-country vehicle can be selected or a new one invented and designed, it is necessary for the vehicle investigator specialist to know what kind of country the vehicle has to cross. Once this is known the general characteristics of a successful vehicle may be stated.

In South Vietnam the terrain is extremely varied. However, four major areas, each with predominantly similar terrain differing markedly from that of the other three, may be distinguished (Fig. 1) and the corresponding general vehicle requirements may be stated:

(a) The Saigon area, the Mekong Delta, and most of the east coast north of Saigon, which are predominantly coastal plains and flat paddy lands that cannot support much ground pressure exerted by vehicles even in the drier season and which are commonly flooded from May to December. During the wet season cross-country mobility is impossible with vehicles presently available. An amphibious vehicle exerting low ground pressure and capable of climbing steep canal banks and a shallow-draft boat are required.

## SUMMARY

(b) The western section north of Saigon and the Plateau de Darlac, which is largely plains and rolling hills covered with forests and dense scrub. There are some scattered areas of grassland, plantations, and cultivated fields. Traversing this area with present vehicles is almost impossible owing to the narrow trails in the forested sections or the soils' low resistance to shear in the cultivated sections. An articulated amphibious tracked and/or wheeled vehicle and a narrow-trail vehicle are required.

(c) The area southwest of the Mekong Delta and the Plain of Reeds, which is primarily swamps and marshes that are seasonally or perennially inundated. It is covered by mangrove, other water tolerant trees, and tall grasses. Traversing this area with present vehicles is impossible. Limited movement is now accomplished on foot during the dry season and in shallow-draft boats in a few sections during the wet season. An amphibious tracked vehicle and a shallow-draft boat are required.

(d) The northern area, which is mountainous with steep slopes and numerous fast and narrow streams. It is mainly covered by forests and dense undergrowth. The sparsely populated villages are interconnected by narrow trails. Movement is limited to vehicles that are narrow and light enough in weight to be manhandled.

The first phase of this study consisted of documenting 27 typical missions that have been performed by Army personnel in South Vietnam and determining why some of their desired missions were limited and also determining the possibility of increased effectiveness of such missions if new or improved vehicles had been available at the time. The size and weight of cargo, the number of personnel involved, and the type of terrain encountered were described and evaluated.

The second phase of this study consisted of reviewing and documenting 104 versions of 87 vehicles with inherent cross-country capabilities, including marsh- and delta-type vehicles that are presently in military inventory, prototypes at various governmental agencies or in industry, and various new concepts that have been proposed by industry or government agencies, to determine which vehicles can meet the requirements of increasing mission effectiveness as evaluated in the first phase.

Analysis of the data indicates that many vehicles are capable of operating effectively over a specific type of terrain, but typical missions have indicated the need for cross-country vehicles to traverse variable types of terrain. Present trucks are excellent for transporting cargo and personnel over roads. They have some cross-country capabilities on firm ground, but the terrain in South Vietnam is such that their movement is limited to roads only. Present boats, for movement of cargo from ship to shore, or in large clear waters, rivers, and bays, meet the requirements. Therefore missions of main interest are those that require vehicles to traverse difficult cross-country terrain that cannot now be negotiated with present vehicles. Some of these missions may require traversing vegetation-choked waters, marshes, deep ravines, canals, clay banks, jungle trails, and thick forested mountains. In order to be most

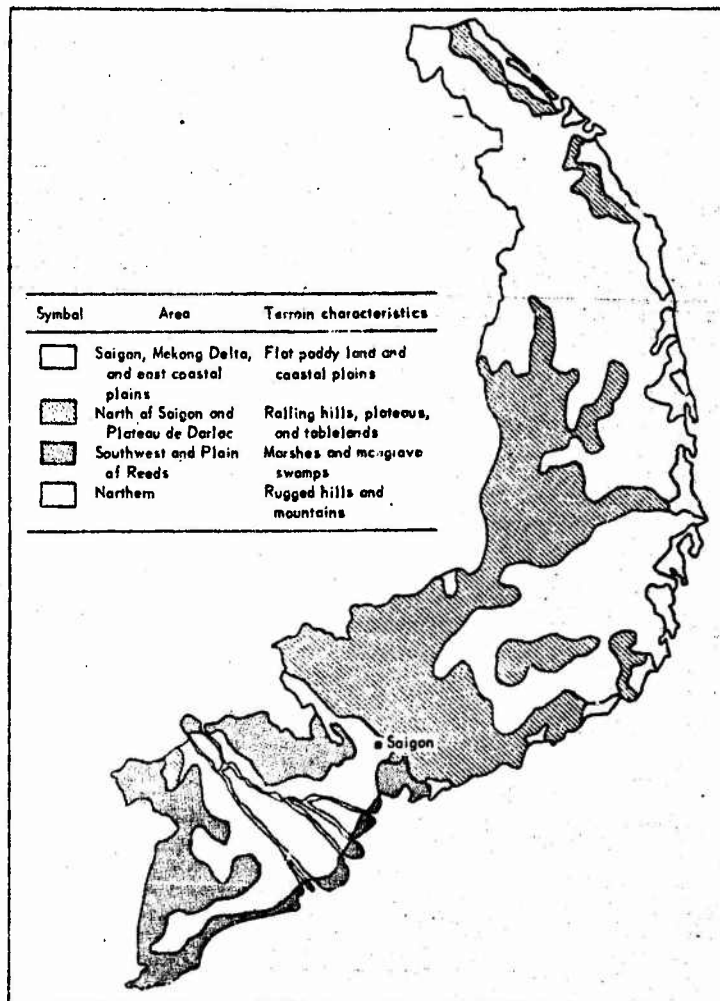


Fig. 1—Major Terrain Classes of South Vietnam

## SUMMARY

effective, more than one type of vehicle may be required to accomplish the same mission.

Engineers familiar with both the present vehicles and terrain similar to that in South Vietnam analyzed the requirements for cross-country vehicles. The conclusions and recommendations are based on the data obtained, experience with vehicle mobility, and judgment where data or test results were not available.

*A study of cross-country vehicles for operation in South Vietnam*

### Conclusions

1. Present vehicles, including those now in the military inventory, prototypes at various government agencies or in industry, and various new concepts that have been proposed by industry or government agencies are incapable of cross-country travel in South Vietnam.
2. Vehicles that are more mobile than those now available to the using forces are needed.
3. No single vehicle in existence, or in concept, is capable of operating over all types of terrain; hence, several different kinds of vehicles are required.
4. A narrow, lightweight low-ground-pressure vehicle is required to transport personnel and cargo in mountainous terrain on narrow trails.

At present, cargo is transported over narrow mountainous trails in packs carried on men's backs; improved narrow-trail vehicles possessing high mobility could transport this cargo much more effectively.

5. A shallow-draft boat powered by an air propeller is required to transport personnel and cargo over weed-choked canals and marshes in the Saigon area, Mekong Delta, and coastal plains.

At present, cargo and personnel are transported by shallow-draft boats over weed-choked canals and marshes by personnel using poles to push the boat along at slow speeds. A shallow-draft boat propelled by an air propeller would considerably increase the speed of the boat and would not become tangled with weeds as a water propeller would.

6. A lightweight amphibious terratire-tracked vehicle incorporating a suspension system with a chain and large terratires and having the inherent capability to operate in either the tired or the tracked mode is required.

This vehicle would exert the minimum practical ground pressure required to transport cargo and personnel in the Saigon area, Mekong Delta, and coastal plains. At present, cargo and personnel are transported in these areas by trucks over roads that have deteriorated because of lack of maintenance and destruction by the insurgents. Tracked vehicles such as the M113 are used for traversing the area containing rice paddles but encounter considerable difficulty, particularly when required to cross the numerous canals that are present. A lightweight vehicle, exerting extremely low ground

## SUMMARY

pressure and capable of providing sufficient buoyancy through the displacement of the tires in the suspension system, would enable the vehicle to be highly mobile over extremely fluid soils interlaced with steep-sided canals, streams, and irrigation and drainage ditches. It must be capable of crossing canals, traversing extremely fluid soils as well as hard surfaces, and negotiating 60 percent grades; in addition it should, if practical, be transportable in the Phase I mode by helicopter.

7. A lightweight amphibious tracked vehicle with an articulated hull is required to transport cargo and personnel in the Delta plains and highland area north of Saigon.

At present, cargo and personnel are transported by trucks or tracked vehicles in the highland plateau regions where the ground is fairly firm, but these vehicles encounter difficulty during the rainy season when the soil becomes saturated with water and will no longer support the vehicle. In addition, marshes, gullies, and riverbeds, which are constant hazards to vehicle mobility, are encountered along the cross-country routes, if they can be traversed at all. An articulated amphibious tracked vehicle would improve mobility in this area and would greatly shorten the time to accomplish specific missions. It must be capable of short-radius steering and exert low ground pressure for mobility in difficult terrain. It must also be transportable in the Phase I mode by helicopter.

8. A lightweight amphibious wheeled vehicle with an articulated hull is required to transport cargo and personnel on firm ground in the Delta plains and highland area north of Saigon.

At present, cargo and personnel are transported by trucks in the highland plateau regions where the terrain is firm, but this can be accomplished more effectively by articulated wheeled vehicles possessing greater mobility where the terrain becomes more difficult. It must be capable of short-radius steering and have low ground pressure for mobility in the relatively firm terrain. It must also be transportable in the Phase I mode by helicopter.

### Recommendations

1. A research, design, and development program should be initiated for a narrow-trail vehicle (NTV) that is capable of transporting personnel and cargo in mountainous terrain along narrow winding jungle trails with steep slopes, and across small marshes and shallow rivers and streams.

2. A design and development program should be initiated for a shallow-draft boat that is capable of transporting 2000 lb of cargo or 12 fully equipped troops, not including the driver, over weed-choked canals and marshes and over obstacles such as floating logs and low dikes.

3. A design and development program should be initiated for a unique terraire-tracked vehicle capable of transporting personnel and cargo in Delta areas where rivers, canals, and extremely fluid ground must be traversed.

## SUMMARY

4. A development program should be initiated for an articulated amphibious tracked vehicle capable of operating effectively in Delta and plateau regions where the ground is semifirm.

5. A development program should be initiated for an articulated amphibious wheeled vehicle capable of transporting personnel and cargo over reasonably firm terrain such as that found in highland plateau areas.

All these vehicles, with the exception of the shallow-draft boat, would have varying degrees of mobility for most types of terrain found in South Vietnam. No order of preference is given since missions require the use of all these vehicles over the varied terrain in South Vietnam.

**Analysis of Cross-Country Surface Vehicles  
for South Vietnam**

### ABBREVIATIONS

ARVN	Army of the Republic of Vietnam
dc	direct-current
ERDL	Engineer Research and Development Laboratory
MI	mobility index
NTV	narrow-trail vehicle
PATA	pneumatic all-terrain amphibian
RCI	rating-cone index
VC	Viet Cong
VCI	vehicle-cone index

## INTRODUCTION

### BACKGROUND

The objective of this study was to determine the types of surface vehicles that would improve present capability of transporting cargo and personnel cross-country over various types of terrain in South Vietnam.

Civilian personnel assigned to perform related studies in Saigon and US Army officers serving as military advisors in various parts of South Vietnam were interviewed. Information obtained from these interviews was used to support the data for the 27 missions used in this study (App A). The persons interviewed unanimously emphasized the lack of vehicles that have the ability to traverse the terrain they encountered. As a result of this inability, many of the desired missions could not be executed.

Observers recently returned from South Vietnam concur that while military requirements for tactical, logistical, or administrative transport over 80 km are infrequent, they do occur, and some have been documented. The great majority of military operations requiring terrestrial vehicular movement, however, are generally confined to distances of less than 80 km and many are far shorter.

Nearly all movement throughout the entire length of South Vietnam has been road bound owing to the types of vehicles currently available to both the US Army and the Army of the Republic of Vietnam (ARVN) forces. This condition simplifies the task of the insurgent Viet Cong (VC) forces and reduces their need for men and materiel to a minimum. Thus with an effective information-gathering organization producing timely intelligence, the insurgent leader needs only a small force equipped with unsophisticated weapons to ambush, say, an ARVN supply column, or to attack and destroy a tactical allied force moving on roads to reinforce a friendly unit under attack by VC forces.

In areas where no known vehicle can move off the roads, the tactical advantage to the commander who could move his troops over several types of terrain would be tremendous. No longer would only one route and one direction of advance be feasible. On the contrary the commander could select one of a number of routes to the objective and attack from one or more of several directions. His chances of success would thus be greatly increased, and the need for more men and more equipment by the VC might be increased to a point impossible for them to achieve.

If the types of missions considered in this study are evaluated from this standpoint, the advantages to the side possessing the ability to move cross-country at a rate greater than the enemy's become apparent, and the chance of ambush diminishes.

To relate desired vehicle characteristics to terrain to be traversed, data on a series of 27 missions are presented in App A. These are believed to cover the gamut of operations that either have been carried out or might reasonably be carried out by the South Vietnamese. These missions have been described in sufficient detail so that the following specific requirements can be analyzed and evaluated:

- Types of terrain to be traversed (actual distances are shown in kilometers);
- Obstacles likely to be encountered;
- Total troops to be transported;
- Total cargo to be transported (weights and volumes are shown where applicable);
- Requirements for armament;
- Total hours of operation per 24-hr period;
- Desirable sustained rate of movement;
- Desirable speed capability for short bursts of 2 to 6 km.

The missions documented in App A are considered realistic and vary in troop requirements from a two-man patrol to a coordinated attack in which a reinforced battalion is to be committed.

#### ORGANIZATION OF THIS MEMORANDUM

Next, the relation between terrain and vehicle requirements is discussed. Then the performance characteristics of eight current vehicle types are analyzed. Following that, improvement and development of five of the most promising vehicle types are considered. Finally a quantitative method of measuring vehicle performance is developed and described, and the performance of 30 representative new and old vehicles are compared graphically on one comprehensive chart. Appendix A presents detailed mission data; App B presents detailed physical and performance data on 104 versions of 87 different vehicles.

## TERRAIN AND VEHICLE REQUIREMENTS

Information obtained from geologists, maps, and charts indicates that the terrain in South Vietnam varies considerably from one area to another. Also, conditions of the terrain in the same area vary as the seasons change. The country may be divided into four areas having predominantly the same type of terrain (Fig. 2).

### TERRAIN

#### Saigon Area, Mekong Delta, and East Coastal Plains

The Saigon area, the Mekong Delta, and the east coastal plains, which cover approximately half the southwestern section and the eastern coastline, consist predominantly of paddy land, cut up by a network of deep steep-sided canals, streams, and irrigation and drainage ditches. Paddy fields are separated by low dikes. Soils in the paddy fields are soft, miry, and commonly flooded from May through December. During this period cross-country mobility in this area becomes impossible with equipment available at present. A moderately firm soil condition exists during the months of January through April, and cross-country movement of tracked vehicles is possible but very difficult. The most difficult obstacles for vehicles to negotiate are the steep-sided canals and streams. Deep canals and stream crossings are limited to vehicles with amphibious capabilities. Much of this area cannot be traversed at speeds faster than that of a man on foot. The climate is tropical, characterized by alternating dry and rainy seasons, and the high humidity, heat, and fungus growth greatly limit or damage mechanized equipment.

#### Area North of Saigon and Plateau de Darlac

The terrain north of Saigon in the western section consists of plains and hills mainly covered with forest or thick scrub. There are also scattered areas of open forests, grassland, plantations, and cultivated fields. Present vehicles cannot traverse much of this area owing to the close spacing of trees. Limited movement is possible in grasslands, cultivated areas, and plantations. All villages are interlaced, however, by narrow trails, and special vehicles could utilize them to some advantage.

The area north and east of Saigon consists of gently rolling elevated terrain. These moderately dissected gently sloping peneplains, however, merge

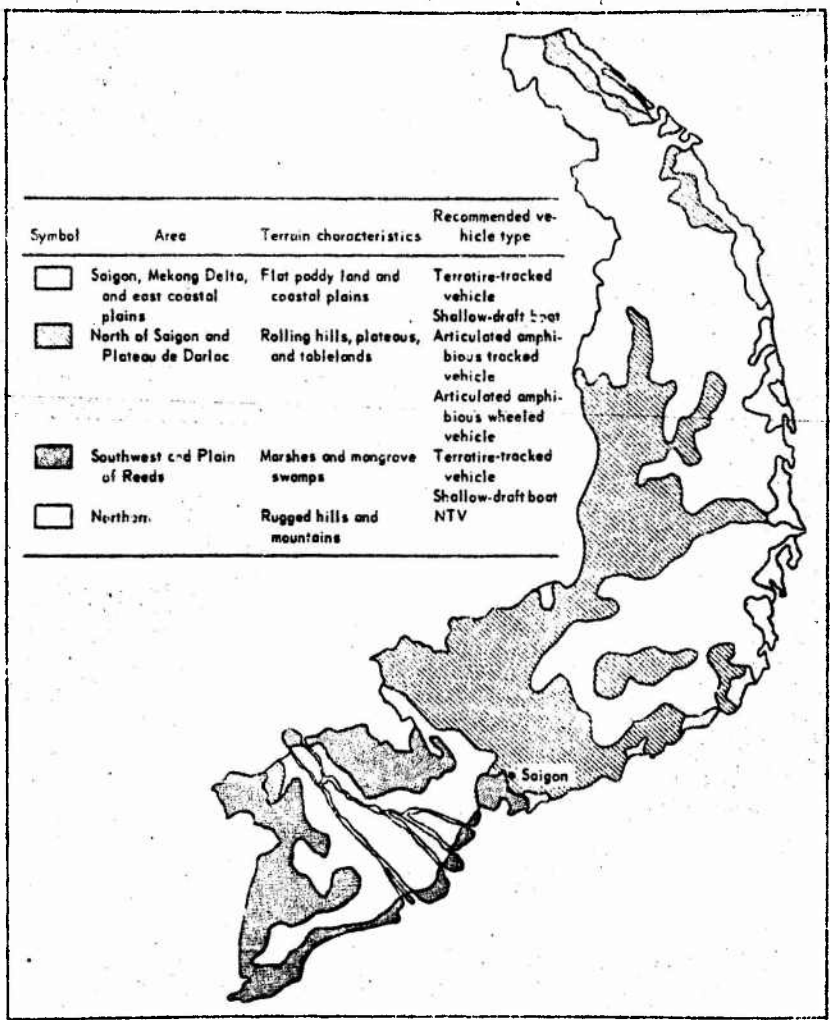


Fig. 2—Area Vehicle Selection Map of South Vietnam

further northeast and north into rolling hills and plateaus that occupy large sections of the western portion of Central South Vietnam. There are many areas of plain in addition to undulating topography, such as broad valleys, basins, and depressions occupied by lakes, swamps, marshes, and some widely scattered small paddy lands. There are also some large comparatively level tracts that are either open cultivated land or scrub jungle and grasslands (elephant grass). Most of the entire region, however, is intricately dissected with considerable local relief and is covered by dense, tall, broadleaf evergreen forests. The trees, averaging 75 to 90 ft in height, form an almost continuous dark-green canopy over dense undergrowth. The tree roots are usually shallow since the topsoil is also shallow. A number of woody vines, including spiny rattans, are intertwined with the trees. Close to populated areas the undergrowth of evergreen shrubs, vines, and herbs becomes very dense. Scattered rubber plantations are located in these areas. The spacing of the trees as well as the density of the undergrowth varies from plantation to plantation.

#### Southwest and Plain of Reeds

The area southwest of the Mekong Delta consists of numerous swamps, islands, and marshes that are seasonally or perennially inundated. Large sections along the southwest coast are occupied by flooded forests of tram trees. Along the southeast coast are dense mangrove thickets. In addition, dense bunchgrass, low vines, scattered stands of trees, isolated mangrove forests surrounded by saltwater swamps, and an intricate network of drainage ditches and canals contribute to the difficulties of mechanized cross-country movement. In many large sections only footpaths exist. Movement of present tracked vehicles is impossible. Some movement by foot troops is possible only during the dry season and in areas where the water is shallow.

#### Northern Area

The northern area of South Vietnam is mountainous with steep slopes and severely dissected land. There are numerous streams in narrow, steep-walled valleys and gorges. The area is mainly covered by forest with scattered areas of grass and scrub. Cross-country movement of vehicles is limited to small treeless and gently sloping areas. Foot movement is very slow and interrupted by steep slopes and dense undergrowth. The area is sparsely populated, and villages are interconnected by narrow trails.

The smaller streams are narrow and swift in the highlands but become wider and slower, and generally somewhat deeper, in the plateau areas and, in particular, in the foothills and peneplains. Stream and river widths vary from a few to several hundred feet. They are in many places less than 3 ft deep during the dry season, but access to fording sites is difficult because of the steep rocky banks. In the peneplains, which are made up of old alluvial deposits, many streams are sealed by clay cliffs. During high-water periods the majority of the streams are not fordable. In the mountains and hills, floods during the high-water period are confined to narrow steep-sided valleys. The bottoms of these stream beds generally consist of gravel and sand. In the lower section of the peneplains the stream beds consist mostly of clay silt.

## TERRAIN AND VEHICLE REQUIREMENTS

Aircraft are at present performing an important role in support of military operations in South Vietnam. They deliver cargo and personnel to remote areas at relatively high speeds, but movement on the ground beyond the landing areas is limited to the capabilities of a foot soldier. Vehicles that can be transported by helicopter and still move cross-country with speed are necessary to complete mission success.

The country has only 9000 miles of road system, and only 3500 miles of this is passable by wheeled vehicles during the rainy season. The remaining roads wash out and become impassable when flooded and lack the required load-bearing capacity. Very few bridges can safely handle vehicle loads, and no known bridges cross the main channel of the Mekong River. All these river crossings are made by ferry. Moreover the roads can readily be blocked and/or controlled by the insurgents.

Large-scale ground transportation of personnel, equipment, and supplies in most areas of South Vietnam is primarily by standard truck. However, truck movement is generally limited to travel on established roadways. When the roadways become narrow or impassable owing to inundation, erosion, or intentional destruction by enemy forces, truck movement is greatly impeded or ceases entirely. Except on the waterways, men must then travel on foot, and equipment and supplies must be borne by the troops themselves, by domesticated animals, or by tracked vehicles, if available.

An analysis of typical missions reveals that innumerable slopes with grades up to 60 percent must be negotiated, especially in the steep rugged hills of northern South Vietnam. Dense vegetation further restricts movement. Paths must be laboriously cut through the undergrowth, or journeys must be limited to existing trails that were created by years of travel by man on foot or animals and seldom exceed 30 in. in width. These trails, like waterways, always take the way of least resistance, and a trail connecting two villages 15 km apart may actually be 30 km long. In dry weather the surface of these trails can be firm, but, in the rainy season, slippery, muddy conditions will prevail. A few improved gravel and hard-surfaced roads do exist in these areas, but they provide only limited access to the regions to be traversed, and they can be easily controlled by the insurgents through the use of mines, demolition explosives on bridges, and ambushes.

Countless streams also curtail travel. Over a distance of only 25 km, three streams may be encountered. These streams can range up to 8 ft wide and 4 ft deep. Water speeds vary from 12 mph to almost a standstill where meanderings create wide turns or where log jams retard the rapid flow. In the latter conditions, marshy land will surround the streams.

In short, to successfully transport men and supplies and to overtake fleeing insurgents, vehicles must be able, at a rate of speed faster than that of a man on foot, to cross miry ground, marshes, canals, streams, and weed-choked waterways; climb 60 percent hillsides and steep canal banks; and operate along 30-in. trails.

## DESCRIPTION AND SUITABILITY OF CURRENT AND PROTOTYPE VEHICLES

The present state of technology does not and will not in the near future permit the development of a single cross-country all-terrain-type vehicle. Since the terrain in South Vietnam varies greatly from area to area, one vehicle may be completely acceptable for one particular type of terrain and entirely unsatisfactory in a different terrain.

Although most vehicles have certain capabilities in cross-country mobility they differ greatly in operational characteristics, which limits their effectiveness in areas such as South Vietnam. The 104 versions of the 87 vehicles analyzed were divided into the following categories:

- Nonfloating trucks
- Floating trucks
- Wheeled amphibious lighters
- Tracked amphibious vehicles
- Shallow-draft boats
- Landing-craft boats
- Unique vehicles
- Narrow-trail vehicles

Many all-wheel-drive floatable trucks, special-purpose carriers, and tracked vehicles have been developed, tested, and evaluated in regions similar to those in South Vietnam. The results of these tests point out that the wheeled amphibious vehicles and the conventional tracked vehicles lacked the mobility characteristics required for cross-country operation in the difficult terrain. These vehicles have similar difficulties in the plateau regions of South Vietnam. Conventional wheeled vehicles and half-tracked vehicles are unable to leave the roads in most areas.

### NONFLOATING TRUCKS

Standard military all-wheel-drive trucks have some cross-country capability on firm moderately dissected terrain and have some limited capability in mud. They can ford shallow lakes and streams and rivers of moderate velocity with firm bottom and are able to negotiate gently inclined firmly structured river banks. Although the wheeled trucks have a somewhat limited cross-country operating capability, the terrain in South Vietnam is such that truck movement is limited mainly to roadway travel.

Nonfloating wheeled trucks may be grouped into three categories:

- (a) Conventional nonfloating trucks
- (b) Conventional nonfloating trucks with terratires
- (c) Nonfloating articulated trucks.

Wheeled vehicles are confined to operations over firm and fairly level terrain having no severe obstacles. Conventional trucks are readily immobilized during off-road operations in rainy seasons and are limited in the dry season by the need to cross numerous rivers and canals that dissect the lowlands and plains, or by the abrupt undulations and heavy vegetation on higher plateaus.

The mobility experiments pointed out that the rigid-frame wheeled vehicles lacked the mobility required for cross-country operations. The wheeled vehicles tested included standard trucks such as the M274, M151, M37, M35, and M41. Some of these standard vehicles were also tested with special low-pressure high-floatation tires with an aggressive tread design.

Trucks incorporating large tires, such as terratires, provide a larger footprint to reduce unit ground pressure, and their greater displacement and buoyancy adds to cross-country mobility. This improvement, however, is only marginal on conventional trucks.

The articulated vehicles, owing to their ability to make their wheels maintain more uniform contact with the ground, and thus improve traction, provide additional capabilities over soft difficult terrain. Trucks with high ground clearance and all-wheel drive are required to prevent soil buildup in front of the vehicle and to provide sufficient traction to propel the vehicle. The wheeled, articulated XM561 vehicle can traverse rough terrain but cannot negotiate the rivers and their steep-sided banks. The newly developed floatable eight-wheel all-wheel-drive trucks were also tested but did not exhibit mobility characteristics much greater than the military standard production vehicles, except for their limited floating capabilities. The Goer-type vehicle did not perform as well as expected. Most of the wheeled vehicles suffered in mobility by violating some or most of the requirements of good vehicle design for high overall mobility such as low axle loading and ground pressure, high floatation tires with an aggressive self-cleaning tread design, high ground clearance, high angles of approach and departure with minimum break angle, short turning radius, positive all-wheel drive, adequate horsepower, high road and water speed, an adequate winching device, and amphibious capabilities.

#### FLOATING TRUCKS

These wheeled trucks do not offer enough advantages to warrant further consideration.

#### WHEELED AMPHIBIOUS LIGHTERS

These vehicles are generally propelled by a water screw in the water and by wheels on the land. They are designed primarily for transporting personnel and cargo from ship to shore where they may negotiate high surf and firm-surface

beaches. They cannot negotiate terrain containing marshes, other soft difficult terrain, and ravines, thus they are not suited for overland operations in South Vietnam.

#### TRACKED AMPHIBIOUS VEHICLES

Tracked amphibious vehicles may be grouped into two categories: (a) conventional vehicles and (b) articulated vehicles.

Tracked vehicles generally exhibit good cross-country capabilities. Their capabilities are generally measured by their low-unit ground pressure, soft suspension, high approach and departure angles, high hull-bottom ground clearance, and the aggressiveness of the tracks.

All tracked vehicles have difficulty, however, operating in terrain that is fluid in depth and where soil can be held in suspension. The soil can build up in front of the vehicles causing them to float. In this attitude, their tracks cannot obtain sufficient traction to propel them. Tracked vehicles are more expensive to operate than trucks and they tend to damage the surface of improved roads more rapidly.

The rigid-frame tracked vehicles such as the M113 and the lightweight wide-tracked Nodwell and Thiokol vehicles exhibit a high degree of mobility on adverse terrains, but they also lack the ability to negotiate the steep banks of the rivers and canals.

Articulated vehicles have demonstrated the best overall performance on difficult terrain because their suspension systems permit uniform contact with the ground.

#### SHALLOW-DRAFT BOATS

These boats are designed for shallow-draft operations in vegetation-choked waters and in glades and swamp areas that will not support other surface operating equipment. Their length and width are larger than those of boats with the displacement hull. They are propelled by an air propeller but may incorporate an auxiliary water screw to improve their efficiency in clear water. Combined with high operating speed over water and flat watery terrain is the ability also to penetrate bushy vegetation and areas adjacent to dry ground for loading and unloading. They are limited to operating in still water and have no capability on land.

More important is the need to carry personnel and equipment in pursuit of insurgents. The countless navigation hindrances in secondary and remote waterways must not be allowed to favor the fleeing insurgents. Rivers, streams, and canals will gradually merge into vegetation-choked swampy areas, but they must be negotiated. Floating logs, choking vegetation, marshy water-logged areas, tidal swamps, and insurgent-introduced obstacles must be overcome. At present, such areas are impassable with the existing equipment in South Vietnam. Travel is limited to that of man on foot or in pirogues. This is unsatisfactory because additional speed is required to close the gap between the pursuers and the pursued. Present shallow-draft boats do not meet these

requirements since they do not have sufficient power available through an air propeller to ride up and surmount obstacles such as floating logs, vegetation, and barrages, or a means of preventing vegetation from fouling the water screw. Small, inflatable, pneumatic boats could be manhandled over obstacles, but their speed would be limited to the ability of the personnel to paddle or to the speed obtainable from light outboard motors.

#### LANDING-CRAFT BOATS

A review of typical missions reveals the need to transport cargo and personnel from ship to shore and up the major rivers and canals to certain advanced areas and resupply depots. These operations are no problem since existing watercraft including landing-craft boats, junks, sampans, and motorboats, can easily navigate the waters. Because they have no overland capability, they are not considered further.

#### UNIQUE-CONCEPT VEHICLES

The unique-concept vehicles considered in this study are:

- Ground-effect machines
- Tire-tracked vehicle
- Archimedes screw
- Marsh screw
- Pneumatic all-terrain amphibian (PATA)
- Fisher vehicle
- Airoll vehicle

Ground-effect machines or air-cushion vehicles have received considerable attention from military and commercial enterprises both in this country and abroad. These vehicles are usually powered by a gas-turbine engine. They require a large amount of air to provide the lift and forward thrust and are quite difficult to control. They can operate over relatively calm waters and level swamp areas and do not depend on firm terrain to support them. Their capacity to carry a load is relatively small compared to the overall size and power requirements. Their design is by necessity sophisticated and in many respects resembles the design of an aircraft. Initial and maintenance costs are high. These machines cannot absorb the rough handling that may be required in cross-country military operations and cannot negotiate hilly terrain or obstacles required for normal missions. Consequently their use for cross-country operations is very limited for the present or the near future.

Tire-tracked vehicles incorporate a suspension system that rolls on terrapines. This system provides buoyancy for supporting the vehicles in water and in extremely low ground pressure of swamps. These vehicles are propelled by tires that are attached to a chain that rotates like tracks on track vehicles. Testing of prototype vehicles has demonstrated their ability to negotiate terrain that is impassable by any other land operated vehicles. These vehicles can operate up to 6 mph in water by means of the tires only and can traverse cross-country terrain at speeds up to 30 mph. These use a relatively large

number of tires that can be punctured quite readily by small-arms fire but at least 30 percent must be punctured to disable the vehicle. They can be designed and developed to any size to meet the required payload.

The Archimedes screw incorporates two cylindrical pontoons with spiral-shaped blades attached for traction and with sufficient buoyancy to support the vehicle. These vehicles have very good operating capabilities in water and swamps but do not have the ability to operate on hard-surfaced terrain. Prototype vehicles tested verify the fact that these vehicles are excellent for operations in the marsh but are difficult to transport. Therefore their use is very limited.

The marsh screw incorporates the Archimedes screw principle or spiral cylinder for propulsion. This vehicle can operate in water, semifluid soil, and loose sand, but it cannot negotiate the steep slopes of dikes, canals, streams, and irrigation ditches. Thus it would become trapped in an area such as a paddy field or an isolated swamp.

Another unique concept is the PATA, which employs a displacement truck composed of air cells fastened together with flat straps, and secured to a belt forming a continuous tread. The present status of this concept is a research test-bed being used for a feasibility study. Although it is amphibious, its water speed is extremely low and it does not have sufficient thrust to negotiate banks from the water. Therefore this concept will not be considered further at this time.

The "Fisher" vehicle utilizes terra tires for its propulsion system and has a capacity of 600 lb plus driver. This design incorporates a nonmetallic flat friction-driven belt that carries the tires on cantilevered axles. The design does not incorporate components meeting military specifications, and its concept cannot be applied to larger-sized vehicles.

Another concept, commonly referred to as the "Airoil vehicle," is a new principle of locomotion. The vehicle is rolled on a series of low pressure tires that are fastened to a set of chains so that the tires are continually being picked up from the rear of the vehicle, returned at the top, and placed under the front. When operating in swamp and deep mud, the vehicle is supported by the displacement of its lower tires. On level terrain, the speed of the vehicle is twice that of the chain. In extremely soft terrain the tires will act as cleats and will no longer roll thereby reducing the speed automatically to the speed of the chain. This is normally one-half the vehicle speed on level land.

A 1/2-ton prototype has been tested and evaluated at government test facilities and has demonstrated its ability to negotiate most difficult terrain, including bottomless swamp and weed-choked marshes. Although this vehicle suffered some mechanical difficulties, its concept is sound.

#### NARROW-TRAIL VEHICLES

Several prototypes of NTVs or burden carriers have been produced for testing and evaluation in jungle terrain but none of these meet the requirements for operating in South Vietnam. Three-wheeled vehicles such as the sidewinder, and four- and six-wheeled vehicles such as the Canadian Jiger, Husky Duck, and Economite, not only lack sufficient traction but do not

have the required flotation for negotiating marshy terrain or steep slippery slopes. They also exceed the width limitations for narrow-trail missions. Tracked vehicles such as the Mechanical Load Carrier and the Trac-Pac are designed to move cargo only and have no provisions for the driver to ride the vehicle. They are, however, sufficiently narrow to negotiate most trails but their speed is limited to the speed of a man walking.

Narrow-trail vehicles are designed not to exceed 3 ft in width and are therefore similar in configuration to present motorcycles. Many two-wheeled vehicles, such as motorcycles, have been tested and evaluated by governmental agencies in tropical areas similar to those in South Vietnam, but the results indicate that such vehicles cannot negotiate the difficult terrain encountered. They cannot maintain traction and cannot ford or swim small bodies of water. The vehicles become immobilized when the ground is so fluid as to permit the tires to sink to about one-third of their diameter. This difficulty results from the "dozing" effect in front of the tires, which produces resistance to motion greater than the tractive force. Vehicles that cannot maintain sufficient traction to overcome the "dozing" effect place exhaustive demands on the operators for holding the vehicles upright while manipulating engine controls to match output to traction capability.

The physical and performance characteristics of vehicles in these categories are given in App B. These vehicle data sheets were developed using Army technical manuals, test reports, information supplied by manufacturers, and demonstrations witnessed by the authors. In this study App B was used in the selection of the types of vehicles most suited for the best mobility in the varying terrain in South Vietnam.

## DEVELOPMENT OF NEW CONCEPT OR IMPROVED VEHICLES

### GENERAL VEHICULAR REQUIREMENTS

This study has revealed that cross-country mobility can be improved in South Vietnam if new or different types of vehicles are introduced to supplement vehicles that are currently in use. Two general categories should be considered.

#### Tracked Vehicles

A tracked vehicle to meet the mobility demands of the delta and plateau regions of South Vietnam must possess design characteristics such as light-weight but durable construction, wide self-cleaning track, low ground pressure, high ground clearance and high angles of approach and departure, high track approach angle to advance over obstacles, high inclined front-track angle, short turn radius, and an adequate winching device. It must also have good amphibious capabilities, high freeboard, good water entry and exit angles, adequate power, and high road and water speeds. In addition to the above characteristics, a vehicle that incorporates a fully articulated dual-body design would have greater mobility because all the tracks are uniformly in contact with the ground surface. This reduces ground pressure, and therefore tractive effort is increased.

The vehicle would be capable of negotiating weak soils, muddy terrain, and marshy areas. The articulated design would increase the vehicle's ability to negotiate the canal and river bank, and the winching unit and a projected anchor device would assist in extremely difficult canal exits. The vehicle should also incorporate a connector device allowing two or more vehicles to be coupled together forming a flexible trainlike assembly. It should have sufficient power to climb steep grades and maintain adequate convoy speeds on roadways. The amphibious capability, with sufficient water speed, would allow it to navigate moderately flowing streams and rivers. This vehicle should be capable of being air droppable in Phase I mode and air transportable by helicopter, allowing quick concentration of vehicles at strategic points. The limitations on this vehicle's travel would only be under the most adverse marginal terrain conditions, at which level only special-purpose limited-operation vehicles could move.

Typical uses for this vehicle would be troop movement, equipment and supply transportation, patrol and reconnaissance missions, communications, and evacuation missions. The vehicle should be adaptable to kits for mounting the various weapons systems.

### Wheeled Vehicles

A wheeled-vehicle design that would meet the mobility requirements should incorporate an articulated dual-body design with a suspension system whose vehicle wheels can conform to the geometry of the terrain surface. This vehicle should be highly mobile and capable of versatile cross-country operation. Its travel should be limited by only the most adverse terrain conditions under which only tracked vehicles could operate. This vehicle would be extremely useful for off-the-road missions where other wheeled vehicles could not penetrate, and it would still retain the advantages of the track for roadway use. Typical uses for this vehicle would be convoy escort; troop, equipment, and supply transport in remote areas; patrol and reconnaissance missions; communications; and evacuation missions in the plateau regions. The vehicle should be readily adaptable to kits for mounting various weapons systems and should be deliverable by air transport, helicopter lift, and Phase I airdrop (parachute).

### SPECIFIC VEHICULAR PROPOSALS

Specifically the following requirements must be met:

(1) Initiate a research, design, and development program for an NTV capable of transporting personnel and cargo in mountainous terrain, narrow winding jungle trails with steep slopes, small marshes, and shallow rivers and streams (Fig. 2). Its basic characteristics should include:

- (a) Net operating weight of 150 lb.
- (b) A payload capacity of two men or one man and 150 lb.
- (c) Capability of negotiating 60 percent grades.
- (d) Capability of operating on narrow trails 30 in. wide.
- (e) Minimum approach and departure angles of 80 deg.
- (f) Operating range of 10 hr at 75 percent of full power.
- (g) Capability of operating on hard level surfaces at a top speed of 15 mph.
- (h) Capability of sustained operation in hot, humid, tropical climates.
- (i) Minimum noise, smoke, and odor signal.
- (j) Incorporation of a track-type propulsion system.
- (k) Sufficient buoyancy to support itself and 150 lb of cargo in deep water with the engine operating and the operator walking or swimming alongside.
- (l) Capability of being coupled to another vehicle of the same type by a kit having a platform that is able to carry litter cases or bulk cargo over open terrain.

A concept of a two-wheeled vehicle is shown in Fig. 3. This basic concept incorporates an articulated steering system with a suspension system that has sufficient displacement to float the vehicle. The front drive incorporates a track with a series of low-pressure tires attached and the rear unit incorporates a trailing low-pressure tire. The trailing tire could be replaced by duplicating the front drive unit if additional traction should prove desirable. This requirement should be determined by testing a prototype. The utility of this vehicle concept can be further extended by connecting two units together with

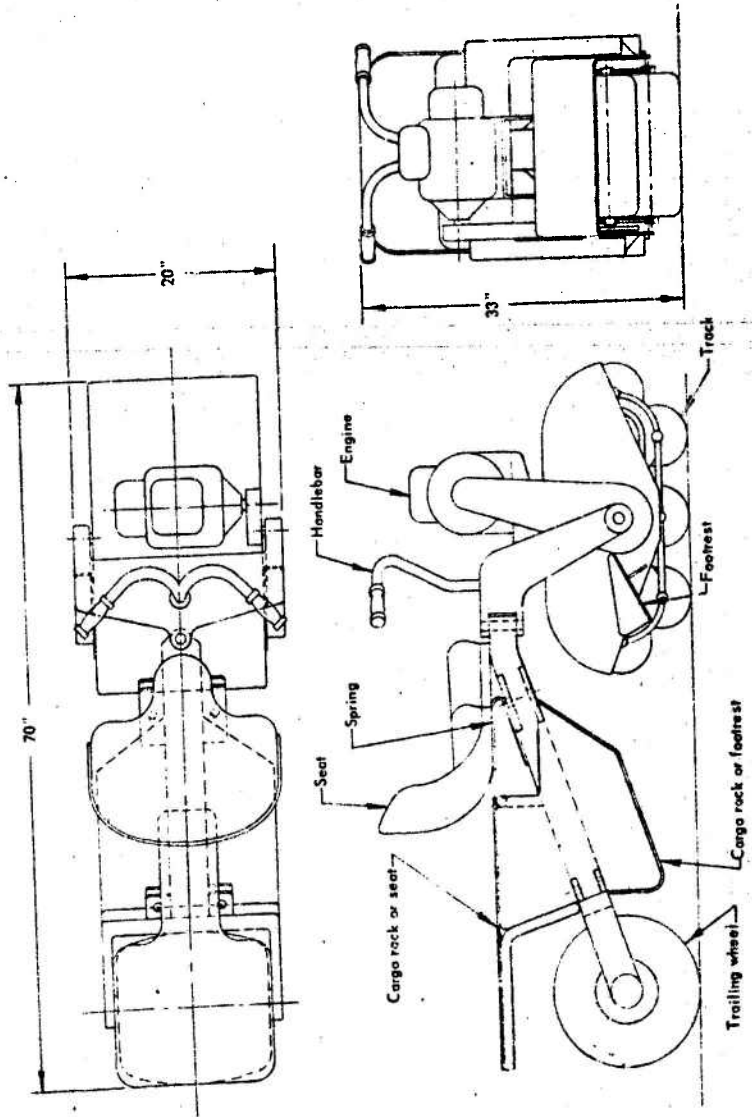


Fig. 3—Narrow-Trail Vehicle Concept

a kit as shown in Fig. 4. The two attached units would provide a means to carry additional cargo or to operate as a litter carrier over marshy terrain or in areas where trees and vegetation are sparse. To evaluate fully such a vehicle, an engineering study would be required followed by the construction of a prototype for a complete engineering test program. At the conclusion of the engineering test program, all required modifications should be incorporated into a pilot production model that should be evaluated by using forces in the appropriate locations. It is estimated that a program as described would require approximately 2 years for completion. This study has not only indicated the application for an NTV as described above but also has shown that such a vehicle can be designed to assist in transporting personnel and cargo over narrow trails in South Vietnam.

The military could use such a vehicle for patrol, reconnaissance, communications, and evacuation missions. The vehicle could also aid the government by supporting such programs as education, sanitation, policing, farm improvement, and communications.

(2) Initiate a design and development program for a shallow-draft boat capable of transporting 2000 lb of cargo or 12 combat-equipped troops, not including the driver, over weed-choked canals, marshes, and obstacles such as floating logs and low dikes (Fig. 2). Its basic characteristics should include:

- (a) Draft in clear water while fully loaded not to exceed 9 in.
- (b) An operating range of 150 miles at 75 percent of full power in clear water and 75 miles in weed-infested waters.
- (c) A top speed of 40 mph by means of an air propeller and 20 mph by means of an auxiliary water screw.
- (d) Sufficient thrust of the air propeller to permit operations over damp grassy flatlands.
- (e) Capability of being air transported, helicopter lifted, and Phase I airdropped (parachute).
- (f) Engine with multifuel capability or, if impractical, capability of operating on low-octane gasoline.
- (g) A 24-volt dc, radio-suppressed, and fungus- and corrosion-resistant electrical system.
- (h) Brush guards to be provided for protection of crew and air propeller.
- (i) Provision for attachment of litter kits, light machinegun kits, and armor kits.

In addition the shallow-draft boat should incorporate metal runners and a prow-shaped bow suitable for riding up obstacles. The center of gravity should be kept as low as possible to ensure stability. The boat could be propelled by an air propeller in marshes and weed-choked waters, and, while in deep clear water, propelled more efficiently by a water screw. The basic boat is at present being developed by a government agency.

(3) Initiate a design and development program for a unique terraire-tracked vehicle capable of transporting personnel and cargo in delta areas where rivers, canals, and extremely fluid ground must be traversed (Fig. 2). Its basic characteristics should include:

- (a) Net operating weight of 3000 lb.
- (b) A payload capacity of 3000 lb or 10 combat-equipped personnel, not including the driver and his assistant.

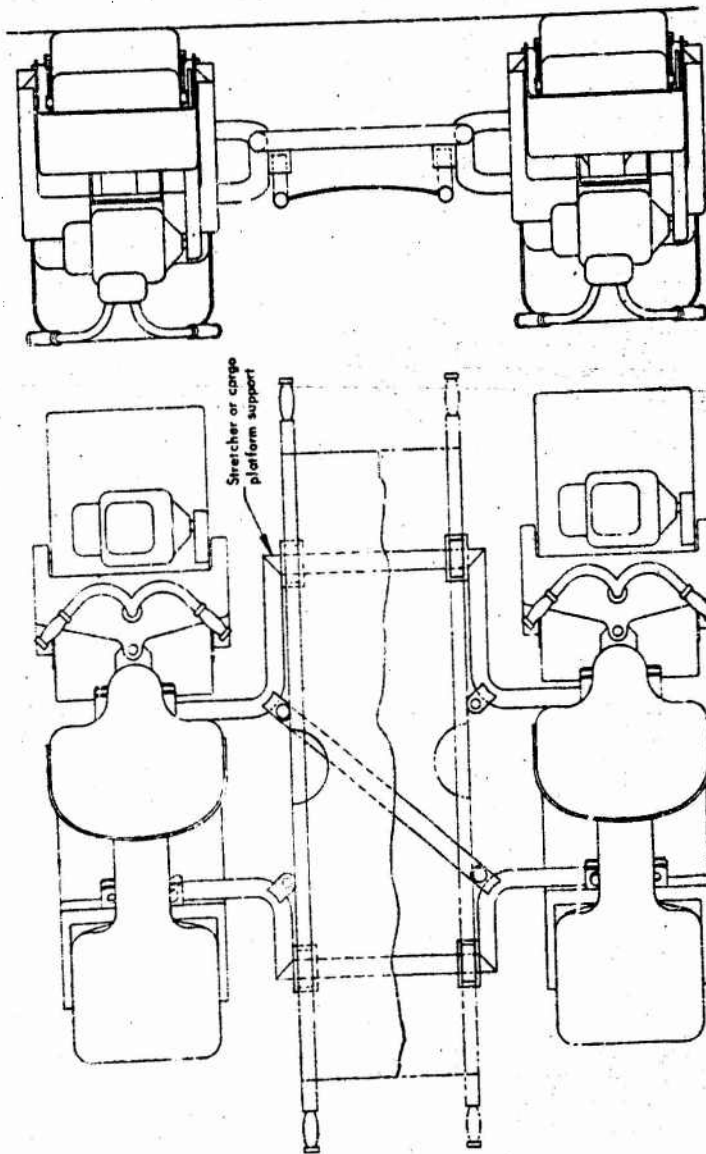


Fig. 4—Water or Marsh Operations Concept

- (c) Capability of negotiating 60 percent grades.
- (d) Capability of operating on hard level surfaces at a speed of 25 mph.
- (e) Capability of operating in the water at a speed of 4 mph minimum by track propulsion.
- (f) Capability of operating in the water at a speed of 7 mph minimum by means of an auxiliary propulsion system.
- (g) Capability of operating 15 hrs at 75 percent of full power.
- (h) Minimum approach and departure angles of 90 deg.
- (i) Minimum noise, smoke, and odor signal.
- (j) Capability of sustained operation in hot, humid, tropical climates.
- (k) Incorporation of a terraire-tracked propulsion system.
- (l) Engine with multifuel capability or, if impractical, capability of operating on low-octane gasoline.
- (m) A 24-volt dc, radio-suppressed, and fungus- and corrosion-resistant electrical system.
- (n) Incorporation of a front-mounted recessed winch.

A development program for a 1½- and 5-ton-capacity vehicle would be justified. A 1½-ton concept is shown in Figs. 5 and 6. This program should be preceded by scale-model tests in water basins to determine its basic configuration for optimum water speed.

Such a program, including contractor performance and endurance testing, could be accomplished in 16 months. At the end of this time, one or two prototypes could be ready for shipment to the using forces for field evaluation.

(4) Initiate a development program for an articulated amphibious tracked vehicle capable of operating effectively in delta and plateau regions where the ground is semifirm (Fig. 2). Its basic characteristics should include:

- (a) A net operating weight of 6000 lb.
- (b) A payload capacity of 3000 lb or 10 combat-equipped personnel, not including the driver and his assistant.
- (c) Capability of negotiating 60 percent grades.
- (d) Capability of operating in heavy brush and undergrowth.
- (e) A minimum approach angle of 80 deg and a departure angle of 65 deg.
- (f) Capability of operating on hard level surfaces at a top speed of 30 mph.
- (g) An operating range of 250 miles at 75 percent of full power.
- (h) Capability of sustained operation in hot, humid, tropical climates.
- (i) Capability of turning within a 20 ft radius.
- (j) Incorporation of an articulated steering principle.
- (k) Minimum noise, smoke, and odor signal.
- (l) Ground unit pressure of less than 2 psi.
- (m) Capability of being air transported, helicopter lifted, and Phase I airdropped (parachute).
- (n) Engine with multifuel capability or, if impractical, capability of operating on low-octane gasoline.
- (o) A 24-volt dc, radio-suppressed, and fungus- and corrosion-resistant electrical system.
- (p) Incorporation of a front mounted recessed winch.

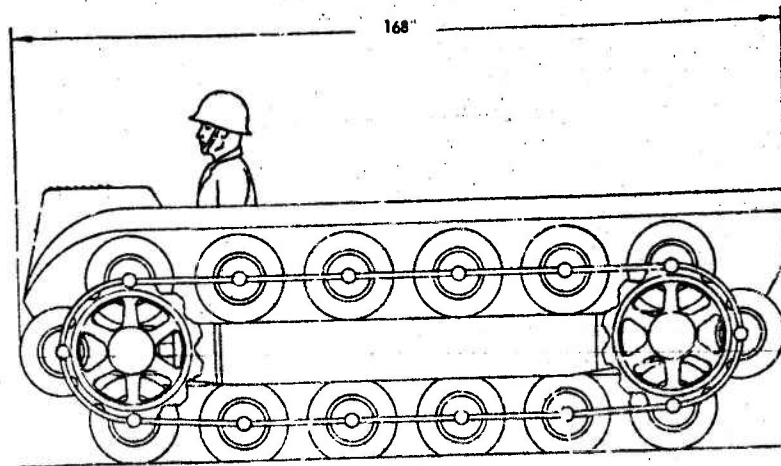


Fig. 5—Side View of Tire-Tracked Concept

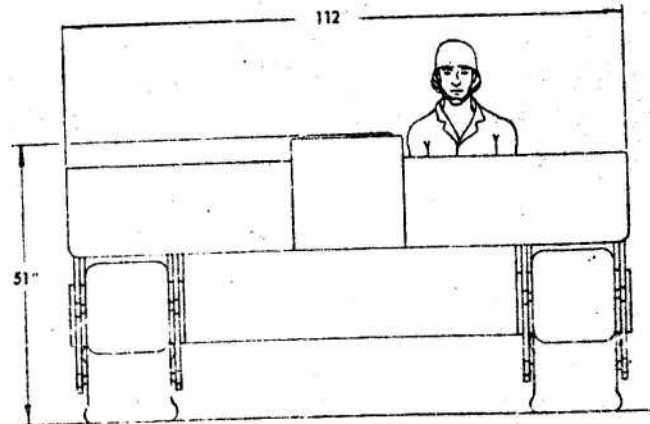


Fig. 6—Front View of Tire-Tracked Concept

The XM577 is similar and comes close to having these characteristics. This vehicle has been thoroughly tested and evaluated in the US, Canada, and other parts of the world and has repeatedly demonstrated high overall mobility characteristics that were superior to those of other tracked vehicles. It is the only tracked vehicle that is fully articulated. Although the XM571 has demonstrated excellent cross-country ability, certain areas should be improved to further increase its mobility and reliability. These areas are:

- Increased ground clearance (desirable).
- Increased freeboard.
- Improvement of water entry and exit angle.
- Increased track effective width.
- Increased track life.
- Reduced turning radius during articulated steering.
- Power articulation to assist vehicle in obstacle climbing ability and canal- and stream-exiting ability.
- Increased deep-water speed with auxiliary propulsion device.
- Incorporation of a projected anchor device to assist negotiation of canal and river banks.
- Incorporation of a connection device that would allow two or more vehicles to couple together for increased canal and river egress.
- Increased power to improve overall performance and to allow a third unit to be coupled to the vehicle.

(5) Initiate a development program for an articulated amphibious wheeled vehicle capable of transporting personnel and cargo over reasonably firm terrain as found in highland plateau areas (Fig. 2). Its basic characteristics should include:

- (a) A net operating weight of 6300 lb.
- (b) A payload capacity of 3000 lb or 10 combat-equipped personnel, not including the driver and his assistant.
- (c) Capability of negotiating 60 percent grades.
- (d) Capability of operating in fairly firm cross-country terrain and unimproved roads.
- (e) A minimum approach angle of 70 deg and a departure angle of 55 deg.
- (f) Incorporation of a front-mounted recessed winch.
- (g) Incorporation of an articulated body for pitch and roll.
- (h) Capability of operating on hard level surfaces at a speed of 50 mph.
- (i) Capability of sustained operation in hot, humid, tropical climates.
- (j) Minimum noise, smoke, and odor signal.
- (k) Capability of turning within a 20-ft radius.
- (l) Capability of operating in the water at a speed of 7 mph minimum by means of an auxiliary propulsion system.
- (m) Capability of being air transported, helicopter lifted, and Phase I aircropped (parachute).
- (n) Engine with multifuel capability or, if impractical, capability of operating on low-octane gasoline.
- (o) A 24-volt dc, radiation-suppressed, and fungus- and corrosion-resistant electrical system.

The XM561 is similar and comes close to having these characteristics. This vehicle has repeatedly demonstrated high overall mobility characteristics that were superior to those of other wheeled vehicles. Although the XM561 has demonstrated mobility characteristics that approach those of certain tracked vehicles, it has certain characteristics that could bear improvement to further increase its mobility. These items are:

- Reduced turning radius.
- Reduced steering effort.
- Increased approach angle.
- Recessed winch.
- Increased winch capacity.
- Increased ground clearance.
- Increased deep-water speed.

## COMPUTATION OF VEHICULAR PERFORMANCE

To support the conclusions and recommendations reached in this study the performance of several of the vehicles studied was determined quantitatively. This section describes the methods used and presents some of the results obtained.

### RELATION OF MOBILITY INDEX TO VEHICLE CONE INDEX

The US Army Engineer Waterways Experiment Station has developed empirical formulas for computing minimum soil strengths for support of vehicles. Computing for wheeled vehicles required one formula and computing for tracked vehicles another. However, the formulas are generally similar. Both types rely heavily on ground contact pressure and are influenced by such factors as gross vehicle weight, ground clearance, engine horsepower, and type of transmission. Results of the computations are values called "mobility indexes" (MI). The MI value is used to determine the vehicle cone index (VCI). This is a value for rating a vehicle to complete 50 passes. The soil must have a rating cone index (RCI) value that is equal to or greater than the VCI to enable the vehicle to complete 50 passes.

Figure 7 relates MI to VCI for a terratire-tracked vehicle, an M113A1 vehicle, an XM561 vehicle, an XM571 vehicle, an M60 vehicle, an LVAX1 vehicle, and an M151 vehicle. The terratire-tracked vehicles have a feature that permits the vehicles to operate automatically in either the tracked mode or the wheeled mode. These vehicles when operating in the tracked mode have a much lower soil-strength requirement than any of the other vehicles shown on the figure.

Figures 8 and 9 provide a means of applying a specific VCI to aid in determining a vehicle's trafficability and provide an estimate of the percentage of areas trafficable for a given vehicle in a temperate or tropical climate during a wet season or under high-moisture conditions. Figure 8 is a comparison of trafficability of various vehicles for 50 passes over the same area and Fig. 9 is a comparison of the trafficability of the same vehicles for a single pass. Because the data are biased toward wetter-than-average conditions, estimates of percentage of trafficable areas made from the curves will be smaller than actual, i.e., on the conservative side.

Data compiled by the US Army Engineer Waterways Experiment Station was used extensively for determining the types of vehicle that would provide the desired mobility for various areas of South Vietnam. However, other

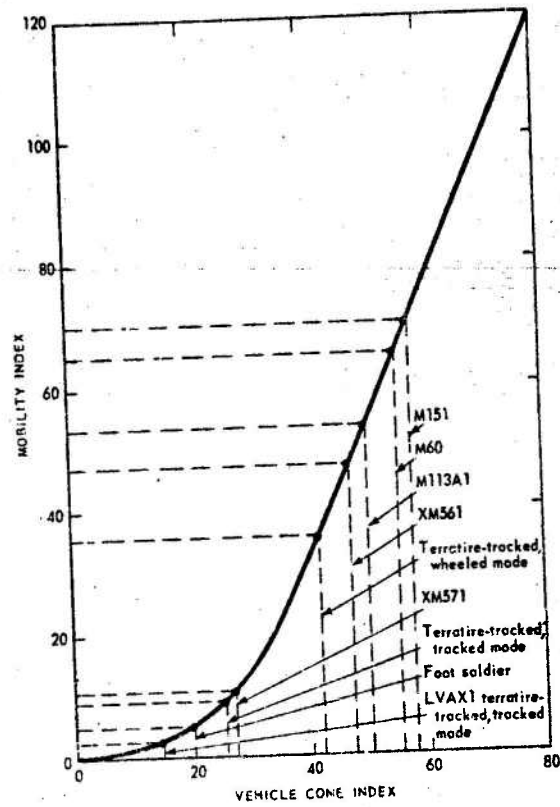
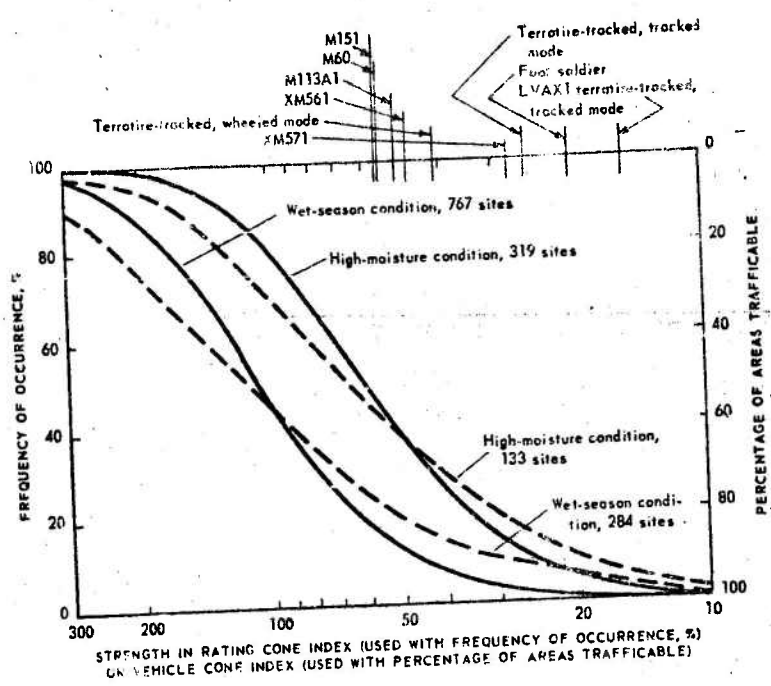


Fig. 7—Comparison of MI with VCI



**Fig. 8—Trafficability in the Field for 50 Passes (Traffic)**

Cumulative frequency of RCIs in humid-temperate and humid-tropical climates.  
 Fine-grained soil, 6- to 12-in. layer.

- Temperate climate: US.
- - - Tropical climate: Puerto Rico, Panama, Hawaii, Thailand, Costa Rica.

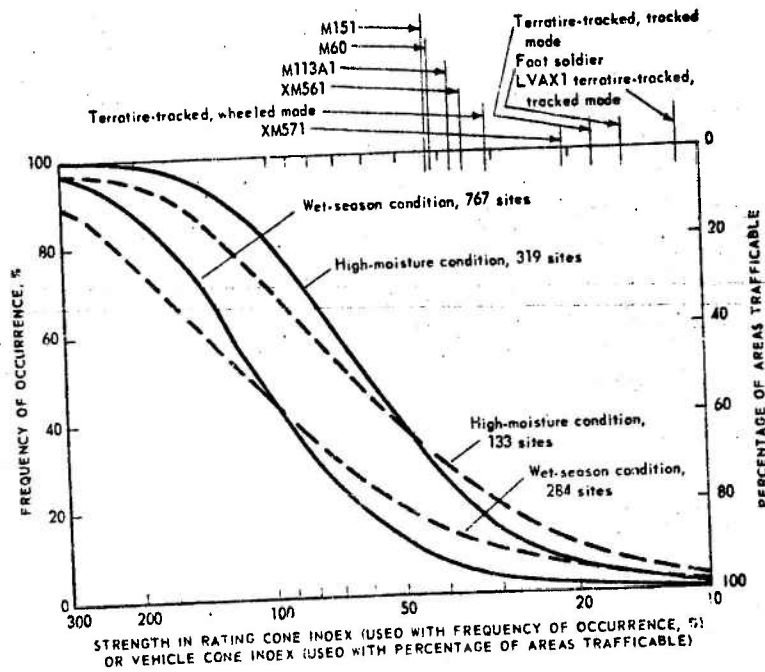


Fig. 9--Trafficability in the Field for One Pass

Cumulative frequency of RCIs in humid-temperate and humid-tropical climates.  
 Fine-grained soil, 6. to 12-in. layer.

- Temperate climate: US.
- - Tropical climate: Puerto Rico, Panama, Hawaii, Thailand, Costa Rica.

factors were considered such as airlift capability, narrow trails, and desired mission over terrain where soil strength varied greatly.

Soil values for calculations and the preparation of trafficability charts were obtained from Table 1 for trafficability characteristics of soils in the wet season as prepared by the Waterways Experiment Station. The table contains a summary of the four groups of soils, the soils included in each, estimates of cone index, remolding index, RCI, slipperiness and stickiness effects, and general comments on trafficability for the wet season.

**DETERMINATION OF VCIs FOR THE TERRITIRE-TRACKED, XM571, AND XM561 VEHICLE OPERATION ON FINE-GRAINED SOILS**

The following paragraphs illustrate the procedures for calculating the MI for the terraire-tracked, XM571, and XM561 vehicles. With this dimensionless number the VCI number can be obtained from Fig. 7.

**Terraire-Tracked Vehicle**

**MI.** Since the terraire-tracked system can operate by either rolling-wheel or stationary-wheel-tracked action, both its wheeled and tracked mobility indexes have been computed. Because of certain unconventional characteristics of the terraire-tracked system, the formulas cannot be applied unless certain assumptions are made; these assumptions are mentioned as necessary.

**Formula for Self-Propelled Wheeled Vehicles.** The terraire-tracked system is assumed to be operating as a conventional wheeled vehicle, and all tires in contact with the ground are assumed to be powered. The basic MI formula is:

$$MI = 0.6 \left[ \frac{\left( \frac{\text{contact-pressure factor}}{\text{tire factor}} \right) \left( \frac{\text{weight factor}}{\text{gross factor}} \right) \left( \frac{\text{wheel load factor}}{\text{clearance factor}} \right)}{\text{engine factor} \cdot \text{transmission factor}} \right]^{20}$$

Vehicle Factors			Value
Contact-pressure factor	$\frac{\text{gross vehicle weight, lb}}{\text{tire width, in.} \times \text{rim diameter, in.} \times \text{No. of tires}}$		$\frac{10,000}{18 \times 6 \times 14^2} = 6.61^*$
	Weight factor:	$\begin{matrix} 35,000 \text{ lb} & \times & 1.1 \\ 15,000 \text{ to } 35,000 \text{ lb} & \times & 1.0 \\ 15,000 \text{ lb} & \times & 0.9 \end{matrix}$	
Tire factor	$\frac{1.25 \times \text{tire width, in.}}{100}$	$\frac{1.25 \times 18}{100}$	= 0.22

\* In this expression it was assumed that 14 tires are in contact with the ground. At times only 12 tires may be in contact with the ground.

TABLE I  
Trafficability Characteristics of Soils in the Wet Season<sup>a</sup>

Group	Soils	Unified soil classification system	Probable cone index range	Probable remolding index range	Probable RCI range	Slipperiness effects	Stickiness effects	Comments
A	Coarse-grained cohesionless sands and gravels	GR, GP, SW, SP	80-300	1	80-300	Slight to none	None	Will support continuous traffic of military vehicles with tracks or high-flotation tires; moist sands are good, dry sands only fair; wheel-d vehicles with standard tires may be immobilized in dry sands.
B	Inorganic clays of high plasticity, fat clays	CH	55-165	0.55-1.35	65-140	Severe to slight	Severe to slight	Usually will support more than 50 passes of military vehicles, going will be difficult at times.
C	Clayey gravels, gravel-sand-clay mixtures Clayey sands, sand-clay mixtures Gravelly clays, sandy clays, inorganic clays of low to medium plasticity, lean clays, silty clays	GC, SC, CL	85-175	0.45-0.75	45-125	Severe to slight	Moderate to slight	Often will not support 40 to 50 passes of military vehicles, but usually will support limited traffic; going will be difficult in most cases.
D	Silty gravels, gravel-sand-silt mixtures Silty sands, sand-silt mixtures Inorganic silts and very fine sands, silt flour, silty or clayey fine sands or clayey silts with slight plasticity Inorganic silts, micaceous or discontinuous fine sandy or silty silts, plastic silts Organic silts and organic silty clays of low plasticity Organic clays of medium to high plasticity, organic silts	GM, SM, MI, and CL-MI, MH, OH, OI, OII	85-180	0.25-0.85	25-120	Average to slight	Slight	Usually will not support 40 to 50 passes of military vehicles; often will not permit even a single pass; going will be difficult in most cases.

<sup>a</sup>Prepared by the U.S. Army Engineer Waterways Experiment Station.

	Grouser factor: without chains = 1.00			
	with chains = 1.25	*		1.00
Wheel-load factor =	$\frac{\text{gross weight, kips}}{\text{No. of wheels}}$	$\frac{18.0}{14}$	=	0.71
Clearance factor =	$\frac{\text{ground clearance, in.}}{10}$	$\frac{16}{10}$	=	1.60
Engine factor:	10 hp/ton = 1.00	$\left( \frac{100 \text{ hp}}{5.0 \text{ ton}} \text{ or } \frac{20 \text{ hp}}{1 \text{ ton}} \right)$	=	1.00
	10 hp/ton = 1.05			
Transmission factor:	hydraulic = 1.00	=	1.00	
	mechanical = 1.05			
MI = 0.5	$\left[ \frac{6.61 \times 0.00}{0.22 \times 1.00} + 0.71 + 1.60 \right] \cdot 1.00 \cdot 1.60$			= 20 35.7

**Formula for Self-Propelled Tracked Vehicle.** In determining the MI of the terraire-tracked system as a tracked vehicle it was assumed that the track length is the distance between centers of idler and drive sprockets and that the track width is the nominal width of the tires. It is also assumed that the tires act as grousers and bogies, and that the area of one track shoe is the area of one tire, determined from the tire length and width as given in the tire size. The basic MI formula is:

$$MI = 0.5 \left( \frac{\text{contact-pressure factor} \times \text{weight factor}}{\text{track factor} \times \text{grouser factor}} + \frac{\text{bogie factor} \times \text{clearance factor}}{\text{factor}} \right) \times \text{engine factor} \times \text{transmission factor}$$

		Vehicle Factors	Value
Contact-pressure factor	=	$\frac{\text{gross vehicle weight, lb.}}{\text{area of tracks, sq in.}}$	$\frac{10,000}{130^2 \times 18 \times 2}$ = 2.14
		Weight factor: < 50,000 lb	= 1.00
		Track factor = $\frac{\text{track width, in.}}{100}$	$\frac{18}{130}$ = 0.18
		Grouser factor: < 1.5 in.	= 1.10
Bogie factor	=	$\frac{\text{gross vehicle weight lb divided by 10}}{\text{total No. of bogies in contact with ground} \times \text{area of one (1) track shoe, in.}^2}$	$\frac{10,000 \div 10}{14 \times 16 \times 18}$ = 0.25
		Clearance factor = $\frac{\text{ground clearance, in.}}{10}$	$\frac{16}{10}$ = 1.60
		Engine factor: < 10 hp/ton = 1.00	$\left( \frac{100 \text{ hp}}{5.0 \text{ ton}} \text{ or } \frac{20 \text{ hp}}{1 \text{ ton}} \right)$ = 1.00
		> 10 hp/ton = 1.05	
		Transmission factor: hydraulic = 1.00	= 1.00
		mechanical = 1.05	
MI	=	$\left( \frac{2.14 \times 1.00}{0.18 \times 1.10} + 0.25 + 1.60 \right) \cdot 1.00 \cdot 1.00$ = 9.3	

\* Assumed that track length is distance between idler sprockets.

### XM571 Vehicle

The basic MI formula for the XM571 self-propelled tracked vehicles is:

$$MI = \left( \frac{\text{contact-pressure factor} \times \text{weight factor}}{\text{track factor} \times \text{grouser factor}} \times \frac{\text{bogie factor} \times \text{clearance factor}}{\text{engine factor} \times \text{transmission factor}} \right)$$

Vehicle Factors		Value
Contact-pressure factor	$\frac{\text{gross vehicle weight, lb}}{\text{area of tracks in contact with ground, sq in.}}$	$\frac{7395}{18 \times 52 \times 4} = 1.98$
Weight factor:	< 50,000 lb	1.0
	50,000 to 69,999 lb	1.2
	70,000 to 99,999 lb	1.4
	> 100,000 lb	1.8
Track factor	$\frac{\text{track width, in.}}{100}$	$\frac{18}{100} = 0.18$
Grouser factor:	< 1.5 in. high	1.00
	> 1.5 in. high	1.10
Bogie factor	$\frac{\text{gross vehicle weight, lb} \div 10}{(\text{total No. of bogies in contact with ground}) \times (\text{area of one track shoe, in}^2)}$	$\frac{7395 \div 10}{16 \times 18 \times 4.25} = 0.61$
Clearance factor	$\frac{\text{ground clearance, in.}}{10}$	$\frac{12}{10} = 1.20$
Engine factor:	10 hp/ton = 1.00 10 hp/ton = 1.05	$\left( \frac{80 \text{ hp}}{3.7 \text{ ton}} \text{ or } \frac{21.7 \text{ hp}}{1 \text{ ton}} \right) = 1.00$
Transmission factor:	hydraulic = 1.00 mechanical = 1.05	1.05
MI	$\left( \frac{1.98 \times 1.0}{0.18 \times 1.0} \times 0.61 \div 1.20 \right) \times 1.00 \div 1.05$	10.9

### XM561 Vehicle

The basic MI formula for the XM561 self-propelled wheeled vehicles is:

$$MI = 0.6 \left[ \frac{\text{contact-pressure factor} \times \text{weight factor}}{\text{tire factor} \times \text{grouser factor}} \times \frac{\text{wheel-load factor} \times \text{clearance factor}}{\text{engine factor} \times \text{transmission factor}} \right] \times 20$$

Vehicle Factors		Value
Contact-pressure factor	$\frac{\text{gross vehicle weight, lb}}{\text{tire width, in.} \times \text{rim diameter, in.} \times \text{No. of tires}}$	$\frac{9210}{12 \times 18 \times 6} = 7.11$

Wheel-load factor	Weight factor:	$\begin{matrix} > 35,000 \text{ lb} & = & 1.10 \\ 15,000 \text{ to } 35,000 \text{ lb} & = & 1.00 \\ < 15,000 \text{ lb} & = & 0.90 \end{matrix}$	= 0.90
	Tire factor:	$\frac{1.25 \times \text{tire width, in.}}{100} = \frac{1.25 \times 12}{100} = 0.15$	
	Grouser factor:	$\begin{matrix} \text{with chains} & = & 1.05 \\ \text{without chains} & = & 1.00 \end{matrix}$	= 1.00
		$\frac{\text{gross vehicle weight, kips}}{\text{No. of wheels (may be single or dual)}} = \frac{9.21}{6} = 1.53$	
	Clearance factor:	$\frac{\text{ground clearance, in.}}{10} = \frac{15}{10} = 1.50$	
	Engine factor:	$\begin{matrix} > 10 \text{ hp/ton} = 1.00 \\ < 10 \text{ hp/ton} = 1.05 \end{matrix} \quad \left( \frac{103 \text{ hp}}{4.6} \text{ or } \frac{22.2 \text{ hp}}{1 \text{ ton}} \right)$	= 1.00
	Transmission factor:	$\begin{matrix} \text{hydraulic} & = & 1.00 \\ \text{mechanical} & = & 1.05 \end{matrix}$	= 1.05
	VI	$0.6 \left[ \left( \frac{7.11 \times 0.90}{0.15 \times 1.00} + 1.53 + 1.50 \right) \times 1.06 \times 1.05 \right] + 20 = 46.9$	

#### MAXIMUM SLOPE ABILITY COMPARISON

Figure 10 illustrates the maximum slope that can be negotiated by any particular vehicle. For slope operation, the VCI over and above that required for operation on level ground is equal to the RCI minus the VCI.

#### Example

What is the maximum slope the terraire-tracked, the XM571, and the XM561 vehicles can climb in a fine-grained soil or sands with fines, poorly drained, with a VCI of 84 and a remolding index (from Table 1) of 0.75 in the critical layer?

<u>Terraire-tracked vehicle</u>	<u>XM571 vehicle</u>	<u>XM561 vehicle</u>
RCI - 84 × 0.75 = 63	RCI - 81 × 0.75 = 63	RCI - 84 × 0.75 = 63
RCI - VCI = 63 - 25 = 38	RCI - VCI = 63 - 28 = 35	RCI - VCI = 63 - 47 = 16

Then from the graph the maximum slope the terraire-tracked vehicle can be expected to climb under the given conditions is 59 percent, the maximum slope the XM571 vehicle can climb is 52 percent, and the maximum slope the XM561 can climb is 25 percent.

#### CROSS-COUNTRY MOBILITY RATING

Figure 11 depicts graphically a composite evaluation rating of cross-country vehicles for transporting cargo or personnel over terrain like that

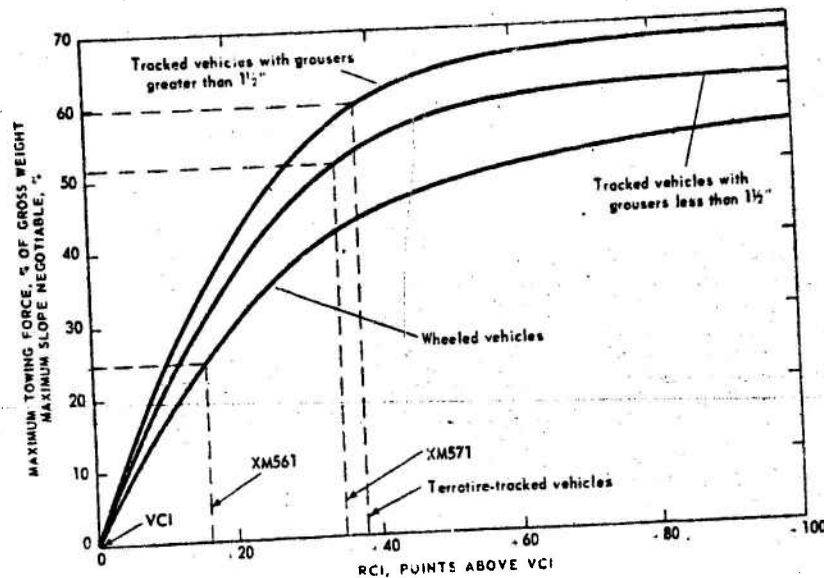


Fig. 10—Maximum Slope Ability Comparison

Criteria for self-propelled vehicles on fine-grained soils and sands with fines, poorly drained. Maximum towing force that can be developed on level ground and maximum slope that can be climbed.

prevalent in South Vietnam. Many factors were considered in determining evaluation ratings in this analysis. The major factors are listed below:

- (a) Ability to sustain speeds over specific terrain.
- (b) Ability to traverse most adverse terrain for a short distance.
- (c) Ratio of vehicle weight to payload.
- (d) Ratio of vehicle size to payload and the ability to transport the vehicle readily.
- (e) Vehicle capabilities to transport cargo or personnel.
- (f) Vehicle's initial cost.
- (g) Vehicle's operating cost. Reliability of the vehicle to complete a mission and the vehicle's operational life.
- (h) The destructive effect of vehicles operating on roads.

Many of the vehicles have been subjected to comparative performance tests over specific terrain peculiar or similar to South Vietnam. There are, however, many vehicles that were not subjected to comparative tests. Some of these vehicles may be prototype or no more than concepts. The ratings are therefore based on judgment from available data, knowledge, and experience in the field.

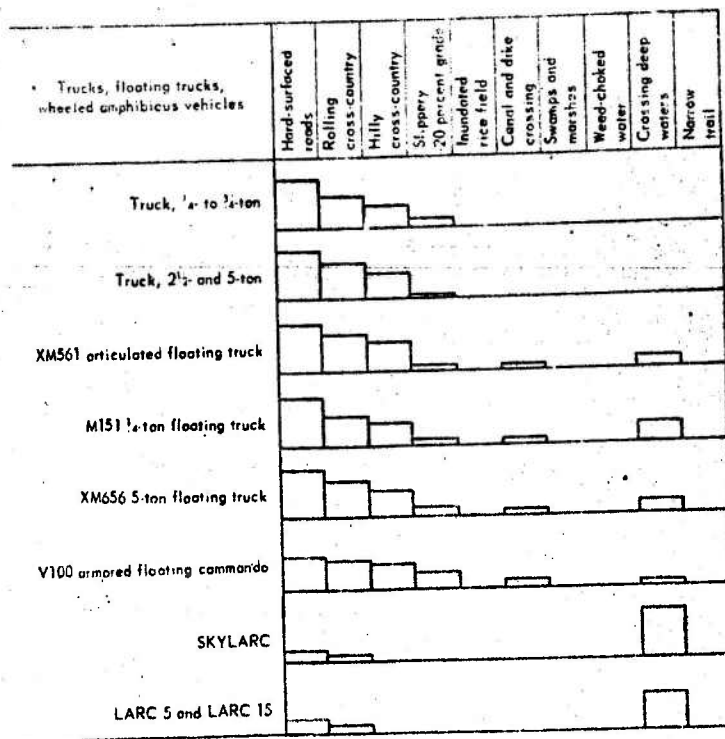


Fig. 11—Mobility Rating of 30 Selected Vehicles

Boats, shallow-draft boats, landing craft	Hard-surfaced roads	Rolling cross-country	Hilly cross-country	Slippery 20 percent grade	Inundated rice field	Canal and dike crossing	Swamps and marshes	Weed-choked water	Crossing deep waters	Narrow trail
Recommended shallow-draft boat					■	■	■	■	■	■
ERDL shallow-draft boat					■	■	■	■	■	
LCVP and LCM									■	
Boston Whaler (outboard)							■	■	■	
US Navy pneumatic boat							■	■	■	

Fig. 11—Continued

Narrow rail vehicles (NTV), wheeled burden carriers	Hard-surfaced roads	Rolling cross-country	Hilly cross-country	Slippery 20 percent grade	Inundated rice field	Canal and dike crossing	Swamps and marshes	Wood-choked water	Crossing deep waters	Narrow trail
Recommended NTV	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dual NTV	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Motorcycle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Iron Pony motor scooter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sidewinder, three-wheel burden carrier	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canadian Jiger, six-wheel burden carrier	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Husky Duck, six-wheel burden carrier	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Terrogator, six-wheel burden carrier	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Fig. 11—Continued

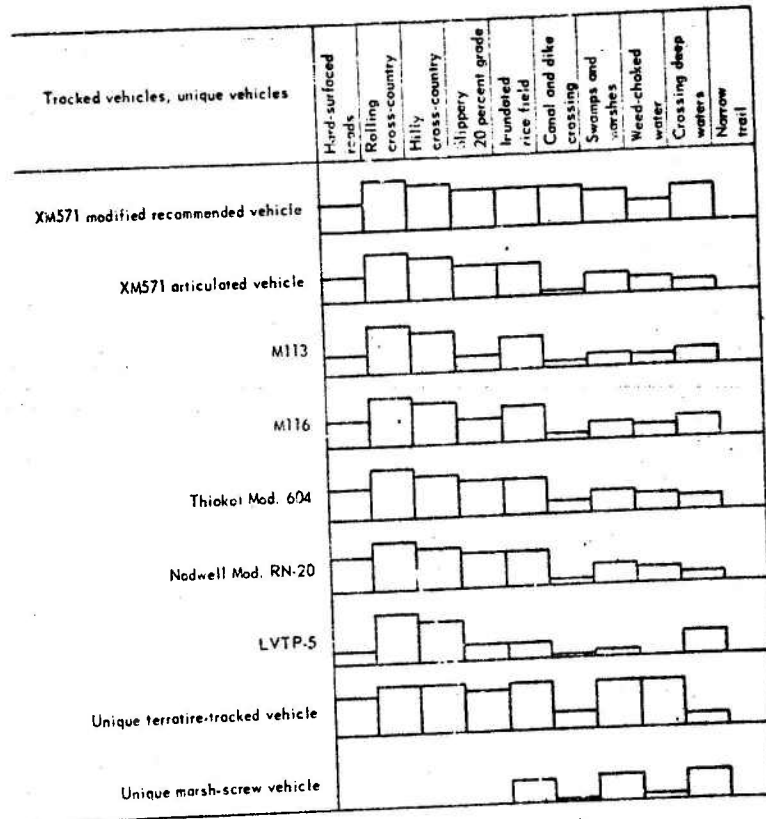


Fig. 11—Continued

Since a vehicle in a typical mission may encounter various types of cross-country terrain, the chart indicates the type of terrain where the vehicle has superior capabilities and where it is most deficient. The shaded portion is a percentage estimate of the vehicle's capability to traverse the type of terrain indicated.

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APPENDIXES

A. Mission Data

46

B. Vehicle Data

129

Appendix A

MISSION DATA

This appendix presents detailed data on missions\* that have been or might have been executed if suitable vehicles were available for operations in all parts of South Vietnam. The missions are arranged in numerical order by mission number, which was arbitrarily assigned as the report of each mission was received by the RAC investigators. Missions 22, 25, and 27 are not available.

\*Abbreviations used in this appendix include the following:

APC	armored personnel carrier
ATK	attack
AW	automatic weapon
HE	high explosive
MG	machinegun
N/A	not applicable
OP	observation post
OVM	on-vehicle mounted
RCN	reconnaissance
RD	road
R/L	rocket launcher
RR (gun)	recoilless rifle
RR (mission)	railroad
S/A	small arms
SVN	South Vietnam
VN	Vietnamese
XC	cross country

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 1
2. Category of Terrain Delta
3. Total Distance to Be Covered 55 km
4. Troops to Move 32
5. Cargo to Be Carried:
  - a. General description Individual Equipment, 1 flame thrower,  
portable, 2 mine detectors.
  - b. Total weight 1200<sup>#</sup>
  - c. Weight, heaviest item 70<sup>#</sup>
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 20 km per hr
7. Detailed Description of Route to Be Followed:

All weather, 2-lane hard surface. All adjacent terrain consists of paddies, marshes, streams and canals. Small villages dot the main highway at intervals of from 5 to 10 km.

8. Obstacles to Movement:

On highway, craters, abatis, mines and cuts may be encountered.  
Cross-country dikes, streams, canals and paddies are in profusion.

9. Probability of Enemy Contact:

Ambush likely

10. Armor Protection Required:

Turn caliber .30 AP at ranges less than 200 yards.

11. Vehicular Armament Required:

Cal .30 or similar MG  
Multiple rocket launcher aimed and fired from within vehicle.

12. Special Requirements for This Mission:

At least some of the vehicles in this convoy should be able to  
move cross-country over all obstacles listed in para 8, above,  
at a rate faster than on foot or via sampan.

STATEMENT OF MISSION  
(1) MAP: Indochina & Thailand 1:250,000 Sheet NC 48-6  
Series 1509

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Route RCH	32	Long XOYEN 548148	CHAU IHU 513184	55 km (RD) 55 km (XC)	2-Indiv Equip 3-M13.0VM 3-Mine Detector Portable	All highway 2-lane hard surface, major River parallels road on NE. Entire terrain consists of rice fields, canals, small streams. Small villages dot the highway every 5-10 km.

NOTE:

This strip of highway has recently been the scene of small ambushes. The purpose of this mission is to precede a column of 20 2 1/2-ton trucks moving troops and supplies from LONG XOYEN to CHAU IHU and provide escort.

One or more vehicles might be required to leave main highway to check secondary roads, villages, and move thru paddies to check suspected VC positions.

Highway movement is approximately 55 km over 2-lane, hard surface all weather road. Where vehicles must leave road to search for possible enemy locations, a few secondary loose surface or dirt roads and trails are available. Movement cross-country would be entirely through rice paddies and across streams and canals. Troops and cargo could easily be moved from origin to destination by boat via BASSAC River.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 2
2. Category of Terrain Delta, mostly flat, some hills to 700 meters.
3. Total Distance to Be Covered 55 km (road) 48 km (cross-country)
4. Troops to Move 180 total
5. Cargo to Be Carried:
  - a. General description Individual equipment, 3-81 mm mortars, complete  
63.5 R/L, 5 PRC 20 radios, 300 rds mortar HE, 30 3.5" R/L rds.
  - b. Total weight 6500#
  - c. Weight, heaviest item 60#
  - d. Total cubeage 300 cu ft
  - e. Cubeage, largest item 15 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 20 km per hr
7. Detailed Description of Route to Be Followed:

Via Roads: 13 km 2-lane, hard surface, all weather, 42 km of loose surface graded all weather road.

Cross-country: Entire trip through paddies, streams and canals.  
Villages are clustered near the primary and secondary roads.

8. Obstacles to Movement:

Highway: Mines, roadblocks, abatis, craters.

Cross-country: Paddies, dikes, streams, canals, occasional mangrove  
(easily avoidable).

9. Probability of Enemy Contact:

High en route and certain on arrival at objective area.

10. Armor Protection Required:

Turn cal .30 AP

11. Vehicular Armament Required:

Cal .30 MG: Multiple rocket launcher.

12. Special Requirements for This Mission:

Vehicle should be able to move over terrain described above to insure success of mission. Vehicles should transport troops as close as possible to the two hills in the objective area.

STATEMENT OF MISSION  
(2)  
MAP: Indochina & Thailand 1:250,000 Sheet RC 48-6

Mission	Troops	Origin	Destination	Mileage	Carro	Route and Terrain
Route PCM Area Search	180	Long Xuyen 548148	Triton 500152 Hill at 500160 & 494159	55 km (rd) 48 km (X - C)	ALL OWN. 200 Indiv Equipment. 3-81 mm Mortars. 5-PRC 10 Radios 6-Bazookas	Two-lane, hard surface road, for 10 km, then loose surface, graded, all weather. Runs thru rice fields for 50 km. Troops dismount VIC TRITON, then sweep thru hill masses north and northwest of TRITON where VC's are reported holed up.

Infiltrators reported crossing from Cambodia and establishing bases in two cited hill areas. Task force, supported by air, is to launch sweep at day break. This area reconnaissance will be mortar and air supported, and conducted as a dismounted operation. Military Movement Is: 13 km via 2-lane paved road; 42 km via loose surface, graded, all weather road.

Cross-Country Movement: If appropriate vehicles were available, direct cross country movement would be approximately 48 km through rice paddies, swamps and streams, with an occasional growth of mangrove. In this area, villages are located close to roads and highways. There is no firm footing anywhere in the area of operations excepting the hill masses north and south of TRITON which rise to approximately 600 meters.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 3
2. Category of Terrain Delta (plain of reeds)
3. Total Distance to Be Covered Road, 134 km; cross-country 68 km.
4. Troops to Move 160 total, one rifle company
5. Cargo to Be Carried:
  - a. General description All individual equipment, 3 days rations,  
1,250 gal water TLR, 100 5 gal cans, 20,000 rds small arms  
ammunition.
  - b. Total weight 5000#
  - c. Weight, heaviest item 60#
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 12-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 20 km per hr
7. Detailed Description of Route to Be Followed:

Route passes through "Plain of Reeds" area, which is entirely flooded in rainy season. In the dry season, a cross-country route would pass through approximately 25 km of paddies and through 48 km of marsh and swampland and over innumerable streams and canals.

8. Obstacles to Movement:

If by road, all usual road blocks used by Viet Cong, including mines, craters and the like. If cross-country in wet season, entire area is inundated. If in dry season, obstacles are paddy walls, dikes, streams (especially stream banks) and canals.

9. Probability of Enemy Contact:

During road movement, high.  
If move is cross-country, low.  
At objective area, high.

10. Armor Protection Required:

Cal .30 AP fired from ranges less than 200 meters.

11. Vehicular Armament Required:

Cal .30 MG.

12. Special Requirements for This Mission:

In dry season, vehicles must traverse all obstacles listed in para 8 above. In rainy season, requirement is for a vehicle which performs best in water but must be able to move on roads or dry land for limited distances.

STATEMENT OF MISSION  
(3) MEA: Indochina & Thailand, 1:250,000 Sheet NC 48-7

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Reinforce & Secure AFLE	1 Inf Co (161)	BINH DONG (682185)	MOC HOA (602192)	134 km (RA) 80 km (X-C)	ALL OVN All indiv. Wpn & Equip. 3 days ration and ammo.	Terrain which must be traversed is flat and consists largely of rice paddies interlaced with numerous streams and canals. Numerous swamps, patches of woods and dikes present added obstacles to cross-country movement. Small villages dot the landscape. The road net is good to the south and southwest, but only secondary roads lead to the objective area. Road ground columns must traverse a round-about route, must cross critical bridges, and must depend entirely on successful highway movement to arrive at the objective area.

The local force securing the airfield at MOCHOA has radioed higher Hq that following several small exploratory raids, a VC attack to seize the airfield appears imminent. Because of the importance of this airfield, the local commander has ordered one mechanized rifle company to reinforce the airfield. Reports of recent VC activity along the proposed route of advance and the ease of blocking or ambushing a truck column have caused the commander to decide on the use of APC's to move the reinforcing troops. Weather has eliminated the obvious choice of moving the reinforcing unit by air. Highway-road movement to objective covers roads as follows: Origin-South: 3.5 km 2-lane all weather paved highway, thence 7 km loose surface all weather road, thence 48 km 2-lane paved highway, thence 25 km 2-lane paved highway, west, thence 15 km north on loose surface graded all weather road, thence 35 km on loose surface, dry weather or dirt road. Two major bridges, easily destroyed.

Cross country movement: Direct cross-country movement would involve total distance of 90 km. Vehicles capable of such movement would have to traverse rice paddies, streams, canals and flat, soft terrain as well as move along various classes of roads.

### VEHICULAR MISSION REQUIREMENTS

1. Mission No. 4
2. Category of Terrain Delta - Jungle and plantation
3. Total Distance to Be Covered 90 km
4. Troops to Move Inf Bn reinforced (600 total)
5. Cargo to Be Carried:
  - a. General description Individual & organizational equipment for one Bn., 3 days supply of fuel, ammunition and rations.
  - b. Total weight 8000#
  - c. Weight, heaviest item 100#
  - d. Total cubeage 260 cu ft
  - e. Cubeage, largest item 12 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained N/A
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

Entire distance is on hard surface highway less than two lanes wide. Of the 90 km, 15 pass through paddies, 20 pass through plantations, and the remaining 55 are through thickly wooded and slightly rolling terrain. The road skirts a dense, tangled mangrove jungle for 35 km.

8. Obstacles to Movement:

Usual man-made obstacles employed by Viet Cong. Dense forest precludes any off-road vehicular movement except for some form of 2-wheel vehicle along local trails. There are a few streams in the area.

9. Probability of Enemy Contact:

Nearly certain at objective area. Probable at one or more points along route of march.

10. Armor Protection Required:

Cal .30 AP at ranges less than 200 meters.

11. Vehicular Armament Required:

Rapid fire MG  
Multiple rocket or grenade launcher.

12. Special Requirements for This Mission:

Column must be so organized that a single ambush could not destroy or immobilize the entire column; hence some cross-country capability is desirable.

## STATEMENT OF MISSION

(4)

MAP: I/C - 1:250,000, Sheet NC 48-7, 48-8

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Reinforce Garrison under attack	1 Inf Bn., Armor Escort (600 men)	BIEN HOA (700 212)	BINH GIA (748178)	90 km	All organ & indiv equip; plus 4 flame throwers & mine detectors.	This mission is over 90 km of hard surface, all weather highway less than two lanes wide. The route runs generally through heavily wooded terrain with dense underbrush and deciduous trees up to 60' in height. Villages are numerous along the route and numerous secondary roads and trails branch out from the main routes (15 km). The route also passes through several rice paddies and rubber plantations. The route skirts a vast mangrove jungle to the west of the highway and also passes around three or four small hills. The route abounds in sites ideal for ambush. There are no major bridges but the route passes over at least a dozen small streams. Cross-country movement is possible only for 2-wheel vehicles capable of moving on narrow (less than 30") trails.

NOTE: The locale for this operation was actually the scene of heavy fighting in December 1964. In the latter case, reinforcing troops were flown in by mass helicopter lift. In this case it is assumed that weather precludes use of air. Since the garrison to be reinforced is already under attack, speed is of the utmost importance. The constant threat of ambush, the terrain through which the route passes and the reported presence of VC groups in the area dictate the necessity for an armored escort to accompany this convoy. Should the road be mined or blocked, there are very few spots around which any of the vehicles in the convoy could move cross-country.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 5
2. Category of Terrain Delta- Mangrove jungle with interlacing streams
3. Total Distance to Be Covered 100 km
4. Troops to Move 157
5. Cargo to Be Carried:
  - a. General description Indiv Eqipt, 4 light MG, 4-3.5" R/L,  
25 hand grenades, 1 ration, 15,000 rds S/A ammo; 200# composition C.
  - b. Total weight 1800#
  - c. Weight, heaviest item 30#
  - d. Total cubeage 110 cu ft
  - e. Cubeage, largest item 6"
6. Desirable Speed:
  - a. ~~XXXXXXXXXXXX~~ Rivers and Streams:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 50 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained N/A
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

Entire distance is over water and includes the LONG TAO River used for the approach as well as the mass of rivers, streams and tributaries within the jungle mass itself.

6. Obstacles to Movement:

Extremely shallow draft, tangled root masses. In some cases overhanging vegetation is impenetrable. Viet Cong may well have placed mines or water barriers so as to better secure their many caches of arms and ammunition hidden in the jungle area.

9. Probability of Enemy Contact:

High

10. Armor Protection Required:

Small plate above waterline of craft capable of turning cal .30 at ranges less than 200 meters.

11. Vehicular Armament Required:

Rapid fire MG  
Smoke ejector

12. Special Requirements for This Mission:

Vehicle must be fast so as to achieve surprise and must be able to penetrate the jungle on as small and shallow a stream as can the enemy hand propelled sampan-type craft.

STATEMENT OF MISSION

(5)

MAP: 1/T 1:250,000 Sheet WC 48-7

Mission Area	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Search	1 Inf Co. (157)	RHA EE (693180)	Area SW Corner (700160 - NE 720170)	100 Km (Incl search)	Individual and organization equip.	River approach to mangrove jungle. Tangled, dense, heavily-rooted swampy tangle, interlaced with streams and rivers, heavy growth with limited overhead clearance.

NOTE:

Reports show that the area indicated is being used as a supply base for VC forces. These supplies are infiltrated into the area by off-loading coastal shipping onto various types of small craft which disappear into the jungle area. ARVN craft have been able to follow only on main waterways and have been wholly unable to navigate the small streams followed by the VC in their sampans.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 6
2. Category of Terrain Extremely mountainous
3. Total Distance to Be Covered 25 km
4. Troops to Move 4
5. Cargo to Be Carried:
  - a. General description 18 rations @ 6.5 lbs per ration, 40 lbs of radio replacement sets, 50 lbs small arm. ammo and grenades.
  - b. Total weight 207
  - c. Weight, heaviest item 20
  - d. Total cubeage 8 cu ft
  - e. Cubeage, largest item 1.5 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 15-20 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 30 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 6-10 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15-20 km per hr
7. Detailed Description of Route to Be Followed:

In order to resupply three small outposts with rations, a detail will have to move 207 lbs of cargo over nearly 25 km. 7 km is loose surface, graded, all weather road, 18 km is all trail, averaging 30" in width, and with slopes up to 50% at certain points. There are three small streams which will have to be crossed.

8. Obstacles to Movement:

Dense vegetation and abrupt mountainous terrain restrict cross-country movement for the most part to walking and cutting a path through the vegetation. There are slopes up to 50% and the trails average only 30" in width. Small streams present another obstacle.

9. Probability of Enemy Contact:

Remote

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

Vehicle must be able to negotiate 30" wide trails at a reasonable speed and should carry a payload of approximately 300 lbs including the driver. Vehicle should also have stream crossing ability--either float singly or jointed as a catamaran to support litters or cargo.

STATEMENT OF MISSION

MPA: I/C & T 1:250,000 Sheet HC 40-1

(6)

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Supply Run	4	DALAY (221322)	Routes: 221316 - 213317 221322	25 km	2 - Indiv Equip	Resupply route: 7 km loose surface, Graded, all weather road, 18 km trail. The entire patrol route is through heavily wooded, rugged, hilly country.

This route resupply mission encompasses some 25 km, 18 km of which will be over a crude, narrow trail through dense woods and steep slopes. There is no vehicle currently available in SW which could effectively negotiate this trail. This area is now considered a secure area and no ambushes have occurred during recent months.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 7
2. Category of Terrain Delta, jungle, plateau, extremely mountainous.
3. Total Distance to Be Covered 330 km
4. Troops to Move 100
5. Cargo to Be Carried:
  - a. General description 112 tons - G.I.V  
21 tons - weapons  
40 tons - signal equipment
  - b. Total weight 173 tons
  - c. Weight, heaviest item 4000#
  - d. Total cubeage N/A - weight is determining factor.
  - e. Cubeage, largest item 240 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60
  - b. Cross-country (including paths and trails):
    - (1) Sustained N/A
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

Hard surface road, all weather, more than 2 lanes, extends through 74 km of paddies streams, plantations, and dense woods. The next, rolling, wooded terrain rising to over 700 meters. Then, for 120 km, through steep hills rising to more than 1500 meters with heavy vegetation and many streams. The final 6 km are on loose surface all weather road through a plateau, thickly wooded, but with occasional dry crops.

8. Obstacles to Movement:

Possible ambushes, mines, craters, abatis, barriers. This operation is entirely road bound.

9. Probability of Enemy Contact:

Likely

10. Armor Protection Required:

Cabs of trucks for cal .30 at ranges of less than 200 meters.

11. Vehicular Armament Required:

Cal .30 MG's - multiple grenade or rocket launcher. Smoke ejector.

12. Special Requirements for This Mission:

Resch destination with cargo and cargo intact. Involves passage through many wooded defiles, mountain passes, with most of the route being canalized. Slopes not over 15%. Ambushes quite possible in nearly the whole length of the trip.

MC-49-1  
 MC-48-4  
 ND-49-13  
 ND-48-16

STATEMENT OF MISSION  
 (7)

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Log: Haul ammo, weapons, signal equipment to destination	100	Saigon	BAHNE THUOT (ND 49-13) (178403)	330 km	112 T CI V 21 T wpns 40 T signal Equipment	Entire route is 2-lane, hard surface, all weather road. Starts in rice paddies, rivers and streams N & NE Saigon, then proceeds thru wooded foot hills to mountainous area at GIA NGHIA, and the NHOANG Plateau. The remaining 110 km is along plateaus at approximately 4-5000 ft. elevation to destination. The greater part of the route passes through heavily wooded areas.

NOTE: The cargo carried and route of the convoy is based on an actual mission which was ambushed with considerable loss in 1962.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 8
2. Category of Terrain Delta, jungle, plateau, rugged mountains.
3. Total Distance to Be Covered 261 km
4. Troops to Move Infantry Battalion (625)
5. Cargo to Be Carried:
  - a. General description Individual and organizational equipment plus 2 days rations and small arms ammunition. Pioneer engineer equipment including demolitions.
  - b. Total weight 10 tons
  - c. Weight, heaviest item 95#
  - d. Total cubeage N/A weight
  - e. Cubeage, largest item N/A weight
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained N/A
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

From lowlands of Saigon through jungle, through mountain passes to rugged mountainous areas near DALAT.  
20 km hard surface all weather more than two lanes.  
30 km hard surface all weather less than two lanes.  
115 km hard surface all weather less than two lanes.  
87 km loose surface, all weather less than two lanes.

8. Obstacles to Movement:

Roads: Craters, road blocks mines, ambushes.  
Cross-country: dense forestation, ground slope, and stream crossings.  
Stream banks 2-4 in height at 45% or less.

9. Probability of Enemy Contact:

High

10. Armor Protection Required:

Against cal .30 for cabs and passenger compartment.

11. Vehicular Armament Required:

Cal .30 MG, smoke ejector, multiple rocket or grenade launcher.

12. Special Requirements for This Mission:

Security. Column must be prepared for ambush or surprise attack in defiles. Must be able to fill road craters or remove obstacles.

STATEMENT OF MISSION (8)  
 MAP: IC/T, 1:250,000, Sheets  
 AC 487  
 MC 49-1  
 MC 48-5

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Convey troops to new location, admin support.	625	Saigon (685194)	DALAT (222321)	26 km	625 Inf & Equip 2 days rations & ammo.	From delta to foot hills to plateaus to densely forested rugged terrain with elevations over 1500 meters.

Mission is administrative in nature and consists of rotating one battalion from Saigon to Dalat. Column is almost entirely road-bound and subject to ambush or flanking attacks by small VC elements.

The road itself (Route 20) consists of the following:

- 20 km hard surface, all weather, more than two lanes, leading through delta region.
- 30 km hard surface, all weather, less than two lanes, passing through dense woods, plantations, and finally leading into the foothill areas.
- 115 km hard surface, all weather, two lanes, all through dense woods, mountain passes at elevations near 1000 meter.
- 67 km loose surface, all weather, less than two lanes, through mountainous, wooded areas. Elevations in excess of 1500 meters. About 10 km of this segment run through rice paddies.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 9
2. Category of Terrain Delta
3. Total Distance to Be Covered 50 km (road), 40 km (cross-country) oneway
4. Troops to Move 157
5. Cargo to Be Carried:
  - a. General description Individual and organizational equipment,  
2 - 57 mm RR, 4 cal. .50 MG with mounts and ammunition.
  - b. Total weight 2000 lbs
  - c. Weight, heaviest item 50 lbs
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 30-40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 50-60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 20-25 km per hr
7. Detailed Description of Route to Be Followed:

Road: 30 km on all weather, hard surface, 2-lane.  
17 km on all weather, loose surface less than 2-lane.  
3 km on trail.

Cross-country: Area is laced with canals and streams, paddies, swamps or marshes. 15 streams or canals would have to be crossed on a direct route.

8. Obstacles to Movement:

Road: Usual VC mines, craters, etc.  
Cross-country: Canal and stream banks primary obstacle - height 4-5'.  
Entire area is inundated during rainy season.

9. Probability of Enemy Contact:

High - VC may reach downed helicopter first.

10. Armor Protection Required:

Cal .30 less than 200 meters for drivers and passengers.

11. Vehicular Armament Required:

Cal .30 or cal .50 MG.  
Multiple grenade or rocket launcher.

12. Special Requirements for This Mission:

Speed, either on road or across country is essential to successful completion of this mission. Unit must be prepared to repulse VC from site of downed helicopter and to evacuate the injured or wounded.

STATEMENT OF MISSION  
(9)

MAP: I/C & T 1:250,000 Sheet WC 48-7

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Rescue	1 Rifle Co (157 PS&L)	RV THO (650145)	621168	100 km (round trip on road) 80 km cross- country)	Indiv and organi equipt. 2-57 mm RR 4-cal .50 MG and mounts.	30 km on hard surface, all weather highway. 17 km on loose surface, graded, all weather road. 3 km trail. The on-road application would pass through paddy fields and a few wooded areas. Villages are clustered along the highway and secondary roads. Swamps, streams and canals abound throughout the entire area.

NOTE:

A downed US helicopter is reported by a local security force in the general area near 621168. VC elements have been reported in the immediate area but not in greater than platoon strength. A direct cross-country route would be some 10 km shorter, but would have to be negotiated over some 10 km of paddy fields, swamps and canals. In any case, the final 3 km leg of the mission must be conducted either along a trail (which might not support an APC) or through swamp and paddy field. Tactically, the force should fan out in order to cover the entire area surrounding the downed aircraft. Movement to the target area cross-country with currently available vehicles would not be feasible because of the necessity to arrive at the rescue site with the greatest speed. Hence, movement on roads is mandatory to get as close as possible to the objective. Also mandatory is the requirement for a vehicle to move through paddies and across canals at a rate greater than that which could be achieved on foot.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 00
2. Category of Terrain Delta
3. Total Distance to Be Covered 54 km (road); 20 km (cross-country)
4. Troops to Move 750 (one Inf. Bn. 1-105 How Btry)
5. Cargo to Be Carried:
  - a. General description Individual & Unit Equipment, 200 rds 105 mm  
How. 500 rds 81 mm mortar, 20,000 small arms rds.
  - b. Total weight 25,000 lbs
  - c. Weight, heaviest item 200 lbs
  - d. Total cubeage 500 cu ft
  - e. Cubeage, largest item 12 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 50 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 8-12 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15-20 km per hr
7. Detailed Description of Route to Be Followed:

Road: 15 km - hard surface, all weather, 2-lane.  
24 km - hard surface, all weather, 1-lane.  
15 km - loose surface, all weather, 1-lane.

Cross-country: 18 km - paddies and swamps, 1 canal.  
2 km - plantation.

8. Obstacles to Movement:

Road: Cuts, craters, blocks, mines.  
Cross-country: Canal, paddies, dikes, marshes. Canal banks 4' high  
at low water.

9. Probability of Enemy Contact:

Extremely high

10. Armor Protection Required:

Protect from cal .30 at less than 200 meters during approach.

11. Vehicular Armament Required:

Cal .50 MG

12. Special Requirements for This Mission:

Vehicles must be able to negotiate swamps, paddies and canals at  
rate faster than walking. If mission is entirely road bound,  
chances for success will be greatly diminished.

STATEMENT OF MISSION  
(10) MAP: I/C & T 1:250,000 Sheet WC 48-7

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Attack, pursue & destroy	1 Inf Bn 1 Arty Bty 750 total	CUCHI (663214)	323 km area (645207)	20 km (cross c) 54 km (road)	Individual Equip. 3-81mm Mort 4-105 How	Total mileage through paddies, swamps, streams 15 km - 2-lane hard surface. 24 km - 1-lane hard surface. 15 km - loose surface all weath Cross-country: 9 km - swamps 9 km - paddies 2 km - rubber plantation.

VC forces are known to have infiltrated, largely by river craft, approximately 200 troops into a rubber plantation near APTON HOA (644206). This force, still believed to be building up, is equipped with rifles, carbines, light machine guns and possibly two or three 81 mm mortars and one 57 mm recoilless rifle. ARVN has been ordered to attack this force, pursue it, and destroy as many VC as possible. One mechanized infantry battalion supported by one 105 mm howitzer battery has been given the mission. Following close on the heels of an air strike, the BN CO plans to launch a coordinated attack with one company attacking from the NE, one from the SE, and the 3rd company initially in mobile reserve. The plan is to encircle the VC, cut off land and water escape routes and sweep through the plantation. The artillery battery will go into position within 6000 meters of the objective to provide close fire support.

### VEHICULAR MISSION REQUIREMENTS

1. Mission No. 11
2. Category of Terrain Coast line, Central SWN
3. Total Distance to Be Covered 66 km (round trip)
4. Troops to Move 40
5. Cargo to Be Carried:
  - a. General description Normal individual equipment, pioneer engineering equipment, portable flame thrower, 2-81 mm mortars and 100 rounds ammo, 5000 rounds small arms ammo.
  - b. Total weight 2000#
  - c. Weight, heaviest item 45#
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hour
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hour
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-15 km per hour
    - (2) Maximum (bursts of 2 to 5 km) 15-20 km per hour
7. Detailed Description of Route to Be Followed:

Route is along national highway, all weather, hard surface, less than two lanes in width. Road passes through scattered paddies, through dense woods and a few mangrove growths. The coastal area is extremely hilly and nearly devoid of secondary roads and trails.

8. Obstacles to Movement:

Mines, craters, abatis, cuts along roadway. Movement off highway possible in areas through rice paddies, but is restricted in most areas due to vegetation and slope.

9. Probability of Enemy Contact:

Likely

10. Armor Protection Required:

VC Small Arms

11. Vehicular Armament Required:

Cal .30 or .50 MG

12. Special Requirements for This Mission:

No special requirements exist for this mission since its purpose is to patrol the road and rail line along the coastal highway.

STATEMENT OF MISSION  
(11)

MAPS: I/C & T 1:250,000 Sheet ND 49-13

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Patrol Road and Rail Line	One Rifle Platoon (40 men)	HNO Trang (304355)	Ninh Hoa (297382)	66 (Round Trip)	Individual OWN	Total (66 km) is over all weather, hard surface, national highway. Road parallels rail line and both run along coast line. Terrain immediately west of highway is hilly and wooded through 14 km and through paddies for 19 km.

### VEHICULAR MISSION REQUIREMENTS

1. Mission No. 12
2. Category of Terrain Central Plateau, wooded, open in part, elevation to 1000 meters.
3. Total Distance to Be Covered 94 km
4. Troops to Move 157
5. Cargo to Be Carried:
  - a. General description Individual & Organizational equipment,  
3-81 mm mortars w/300 rds., small arms ammo, 2-57 mm R/R w/50 rds.,  
2 days rations, 500 gals Mogas.
  - b. Total weight 6000
  - c. Weight, heaviest item 95 lbs
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15-20 km per hr
7. Detailed Description of Route to Be Followed:

Road is hard surface, 2-lane, all weather. Runs through dense woods, scattered plantations and paddies for 60 km, thence runs through open grasslands for 30 km. This last 30 km could be easily traversed by tracked vehicles and with difficulty by wheels. There are six small streams running across the area of operations.

8. Obstacles to Movement:

On road, VC constructed obstacles. For 60 km, dense vegetation precludes cross-country movement. For final 30 km, slopes are not severe, but area could be boggy. Streams would impede movement of conventional wheel vehicles.

9. Probability of Enemy Contact:

High

10. Armor Protection Required:

VC small arms fire.

11. Vehicular Armament Required:

Cal .30 and .50 MG.

12. Special Requirements for This Mission:

Vehicles should be able to maneuver across country during the approach to the objective area. Tactical advantage gained through mobility might be decisive in this area, although slope and forestation in the initial delaying positions preclude vehicular movement.

## STATEMENT OF MISSION

(12)

MAP: 1/C &amp; T 1:250,000 Sheet 49-13

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Covering Force	Inf Co. (157)	BAN ME THUOT (179403)	Airfield (259405)	94 km	Individual Equip. 3-81 mm Mort 2-57 mm R/R	Approach will be on Highway 21/2-lane, hard surface, all weather. Runs through heavily forested area for 65 km and through open, rolling terrain for 29 km. Final 20 km skirts around abrupt hill passes to the S&SW rising to over 1100 meters. Elevation along Highway varies from 400 to 500 meters with no critical grades.

The VC, operating from mountain hideaway, have cut Highway 21 from TRAN (274398) to 264401. For 10 days, no ARVN vehicle has been able to move along this segment of road. The immediate threat is seizure of the airfield at 259405. This garrison, warned by an understrength company, has suffered three raids during the past three days, and has taken heavy casualties as aircraft and trucks were destroyed by VC mortar and AM fire.

One ARVN company has been given the mission of moving as rapidly as possible to the threatened garrison, and to establish screening position to the south and east so as to cover the evacuation of the local garrison. If attacked, the rescuing company is under orders to delay as long as possible, or, if they can be enticed into the open, attack and destroy the VC forces west and northwest of the airfield.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 13
2. Category of Terrain Wooded foothills
3. Total Distance to Be Covered 45 km (road) 34 (cross-country)
4. Troops to Move 625 (Inf Bn)
5. Cargo to Be Carried:
  - a. General description Individual and organizational equipment,  
4-81 mm mortars, 4-mine detectors, 200 rds 81 mm mortar ammo.
  - b. Total weight 5000 lbs
  - c. Weight, heaviest item 95 lbs
  - d. Total cubeage 300 cu ft
  - e. Cubeage, largest item 8 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15-20 mph
7. Detailed Description of Route to Be Followed:

Road: 45 km of all weather, hard surface road, less than 2-lanes wide. Entire area is wooded with gentle slopes from less than 50 to more than 200 meters. Road grades less than 3%. Numerous small streams trace the small valleys and narrow trails criss-cross the area generally connecting the many small villages.

8. Obstacles to Movement:

Dense forestation restricts cross-country movement to narrow trails. Hill slopes are inconsequential, but streams present a definite obstacle. Vehicles can move within the plantation (objective) area.

9. Probability of Enemy Contact:

Unlikely short of objective area.

10. Armor Protection Required:

Cal .30 less than 200 meters

11. Vehicular Armament Required:

Cal .50 and .50 MG.

12. Special Requirements for This Mission:

None

STATEMENT OF MISSION MAP: L/C & T, 1:250,000, Sheet NC 48-b  
(13)

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Search and Clear	Inf Bn C25	CHON THANH (677262)	BINH TRI (706284) Plantation	RD-45 km XC-35 km	Inftry & Ordn Equipment 4-81 mm mortar	Terrain is densely wooded, dotted with plantations. Slopes are 10% or less and area is criss-crossed with streams. Elevations vary from less than 50 meters to over 200 meters. Road is all weather, hard surface, less than 2-lanes wide. Inter-connecting trails are existent but will not support movement of other than two-wheel vehicles

An infantry battalion has been directed to move to BINH TRI and conduct a search operation in the area. VC elements are believed to be concentrating in the area and pose the threat of cutting the highway at DONG XOI (703277). Area is believed to be clear of Viet Cong up to southern edge of plantation at BINH TRI.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 1A
2. Category of Terrain Wooded, mountainous
3. Total Distance to Be Covered 20 km.
4. Troops to Move 2
5. Cargo to Be Carried:
  - a. General description Individual equipment plus one radio.
  - b. Total weight 75<sup>#</sup>
  - c. Weight, heaviest item 25<sup>#</sup>
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 30 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 40 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15 km, per hr
7. Detailed Description of Route to Be Followed:

3 km - 2 lane, hard surface, all weather road.  
5 km - 1 lane, loose surface, dry weather or dirt road.  
12 km - trail through woods, slopes up to 20%. Three streams cut trail up to 4' in depth, banks  $\frac{1}{2}$  to 1' high.

8. Obstacles to Movement:

Streams (3) - max depth 4' (variable)  
banks -  $\frac{1}{2}$  - 1 $\frac{1}{2}$ ' high, slope variable.  
Trail slopes - max 20%.  
Possible overgrowth along trail - max width 36"

9. Probability of Enemy Contact:

Remote

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

To save man hours (walking) by relatively rapid negotiation of mountainous trails.

STATEMENT OF MISSION  
(14)

MAP: I/C & T 1:25000 Sheet TC 48-4

Mission	Hours	Origin	Destination	Mileage	Cargo	Route and Terrain
Liaison	2	BAO LOC (807277)	Hill 978 (819289)	20 km	Radio	Flats, dense forests and streams rising mountain up to 1200 meters. 3 km - 2-lane, hard surface, all weather. 5 km - loose surface, dry weather, dirt. 12 km - unimproved trail. Trail area is through forest land, crosses 3 streams, maximum slope = 15-20%.

This mission is conducted in a safe area and consists of two men with weapons and radio, making a routine visit to a remote outpost for liaison purposes.

### VEHICULAR MISSION REQUIREMENTS

1. Mission No. 15
2. Category of Terrain North Central Coastal, mountains reach coast.
3. Total Distance to Be Covered 19 km
4. Troops to Move 157 (Inf Co)
5. Cargo to Be Carried:
  - a. General description Individual and organizational equipment,  
3 days rations and ammo, 4.81 mm mortars, 200 rds mortar ammo,  
Pioneer equip, grenades, Flores.
  - b. Total weight 8000 #
  - c. Weight, heaviest item 95 #
  - d. Total cubeage 500 cu ft
  - e. Cubeage, largest item 8 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 2 to 6 km) 60 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-12 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 12-15 km per hr
7. Detailed Description of Route to Be Followed:

19 km - 2 lane, all weather, hard surface road.  
14 km runs through paddies.  
5 km runs through wooded mountain pass.

Vehicles should be able to cross LAI river, 500 meters wide - max rate of flow 8 km per hr., banks max height 4'.

8. Obstacles to Movement:

Manmade: Road craters, mines, abatis, antitanks.  
Natural: Paddies, streams, forestation at mountain pass;  
Mekong River, sandy beaches.

9. Probability of Enemy Contact:

Slight on initial move, high within 24 hours after arrival.

10. Armor Protection Required:

Cal .30 less than 200 meters.

11. Vehicular Armament Required:

Cal .30 and cal .50 MG.

12. Special Requirements for This Mission:

At least two types of vehicles are required for this mission - one that will travel through paddies and streams as well as paved roads, and one that can move over trails as part of the security echelon of the major force.

STATEMENT OF MISSION  
(15) MAP: I/C & T, 1:250,000, Sheet ND 49-5

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Secure RS & Hwy Brgs	Para Inf Co (157)	PHUC THUNG (294580)	BONG SON (287596)	RT: 19km XC:	Pioneer Engineer Equipment	Hwy - 14 km runs through paddies, and 5 km runs through a pass. Wooded hills rise to over 500 meters from a few meters above sea level. Vehicles should be able to negotiate paddies and should be able to swim the 500 meter wide river over which the two critical bridges pass. Once established, patrols should be operated along mountain trails and beaches in the vicinity.

Mission is to secure RR and Hwy bridges at BONG SON.  
Agents have reported a Viet Cong plan to blow these  
vital bridges within the next 48-72 hours.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 16
2. Category of Terrain Northern Coastal - paddies elevation to 400 meters.
3. Total Distance to Be Covered 30 km (road); 24 km (cross-country)
4. Troops to Move 16
5. Cargo to Be Carried:
  - a. General description 105 mm ammunition - 4 tons.  
57 mm R/R ammunition - 1 ton  
Assorted smaller caliber - 1 ton.
  - b. Total weight 12,000#
  - c. Weight, heaviest item 120#
  - d. Total cubeage 180 cu ft
  - e. Cubeage, largest item 4 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 30-40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

Road is 1-lane, loose surface, dry weather, generally impassable for 2½ and 5 ton trucks (30 km).

Cross-country route is:  
14 km through paddies and light vegetation, 2 small streams.  
9 km over soft rolling terrain with slopes up to 20%.

8. Obstacles to Movement:

Paddies and dikes 1-2' high.  
Streams 2-3 feet deep, banks  $\frac{1}{2}$  -  $1\frac{1}{2}$  feet high.

9. Probability of Enemy Contact:

Remote

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

Vehicle to operate both on poor secondary roads and negotiate paddies.

STATEMENT OF MISSION  
(16) MAP: 1/C & T 1:250,000, Sheet NE 47

Mission	Troops	Origin	Destination	Mileage	Cargo	Roads and Terrain
Logistical (Rear assembly)	16	TAM KY (232722)	MOI LAM (210716)	30 km	6 tons assorted ammunition	Varies from rice paddies at sea level to open rolling terrain up to 200 meters elevation, loose surface, single lane, dry weather roads run through the area, but are not passable to conventional wheel vehicles.

Moving from a railhead ammunition dump at TAM KY, a local unit must move 6 tons of ammunition varying from 105 mm to small arms over 30 km to tactical units in position vicinity of MOI LAM. Conventional wheeled vehicles (2 1/2 ton, 5 ton trucks) cannot traverse the existing roads nor move cross-country. Area is secured by friendly troops.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 17
2. Category of Terrain Plateau
3. Total Distance to Be Covered 28 km (road) 21 km (cross-country)
4. Troops to Move 157
5. Cargo to Be Carried:
  - a. General description None other than infantry company with individual and unit equipment.
  - b. Total weight N/A
  - c. Weight, heaviest item N/A
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 15 to 20 km per hr
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-12 km per hr
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

Road: Single lane, loose surface, dry weather, cut in two places, and large chuck holes.

Cross-country: Open, rolling, slopes to 20%; clayey soil.

8. Obstacles to Movement:

dry cuts, soil conditions, slopes and exposure

9. Probability of Enemy Contact:

High

10. Armor Protection Required:

Cal 30 less than 300 meters

11. Vehicular Armament Required:

Cal .30 MG

12. Special Requirements for This Mission:

None

STATEMENT OF MISSION MAP: I/C & T 1:250,000 Sheet MD 49-13  
(17)

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Search & Sweep (Area Recon.)	157	Airfield (259405)	Hill Vicinity B'KA (273418)	Rd: 28 km XC: 21 km	Individual & Orgn Equip	Hilly plateau - open terrain enclosed by sparsely forested hills; two small streams. Single lane, loose surface road is in poor condition; impassable to conventional wheeled vehicles. Elevation varies from 500 to 1000 meters. Other than on road, slopes range up to 20%.

Mission is to move company of infantry to comb wooded hillmass for VC. No cargo required other than troops with their normal equipment.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 18
2. Category of Terrain North Coast; mountainous
3. Total Distance to Be Covered Road (25 km) Cross-country (20 km)
4. Troops to Move 157
5. Cargo to Be Carried:
  - a. General description Individual and organizational equipment,  
2-47 mm RR, 2-81 mm mortars, 200 rds mortar ammo, 100 rds 57 mm RR.
  - b. Total weight 5000 lbs
  - c. Weight, heaviest item 50 lbs
  - d. Total cubeage 300 cu ft
  - e. Cubeage, largest item 8 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 50 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 15-20 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 25 km per hr
7. Detailed Description of Route to Be Followed:

Road: 25 km of loose surface, dry weather, or dirt.

Cross-country: 10 km level through paddies.  
15 km through open rolling terrain, max slope = 20%.  
Small villages scattered along roads and trails.

8. Obstacles to Movement:

Man made road blocks, mines, craters, paddies & dikes, shallow streams.

9. Probability of Enemy Contact:

Intermediate on approach.  
High at objective area.

10. Armor Protection Required:

Cal .30 less than 200 meters

11. Vehicular Armament Required:

Cal .30, cal .50 or equivalent.

12. Special Requirements for This Mission:

Vehicles moving cross-country through this open terrain would probably be able to reach final assault position prior to having troops dismount.

STATEMENT OF MISSION  
(18)

MAP: I/C & T, 1:250,000 Sheet AT 89-1

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
ATK Defended Village	Inf Co (157)	TAN-KI (232722)	Village at 210715	RD 25 XC 20	Inf & Orgn Equipment 2-57 mm M/R 2-81 mm Mort	Northern coastal area. Direct route to objective goes through lowland paddies, crosses three small streams, and proceeds into open rolling terrain for the rest of the way. By road, the entire 25 miles is via loose surface, dry weather or dirt construction.

Mission is to attack village of HOI LAM, which is in open rolling terrain nestled against the foot hills of large hill masses. Seizure of this village and surrounding terrain would cut a main approach to key coastal installations.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 19
2. Category of Terrain Coastal Flatlands
3. Total Distance to Be Covered Road (27 km), Cross-country (16 km)
4. Troops to Move 20
5. Cargo to Be Carried:
  - a. General description 4 litters, indiv & organi equipt.  
\_\_\_\_\_
  - b. Total weight 1000#
  - c. Weight, heaviest item 20#  
Total cubeage NA  
Cubeage, largest item NA
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 40 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 50 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 12-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15-20 km per hr
7. Detailed Description of Route to Be Followed:

Road: 15 km hard surface, 2-lane, all weather.  
12 km loose surface, 1-lane, dry weather.

Cross-country: 16 km paddies, soft level ground, two small streams.

8. Obstacles to Movement:

Normal potentially man-made obstacles along roads.  
Cross-Country: paddies, dikes, soft ground.

9. Probability of Enemy Contact:  
Intermediate

10. Armor Protection Required:  
Cal .30 less than 200 meters

11. Vehicular Armament Required:  
Rapid fire MG.

12. Special Requirements for This Mission:  
Vehicle or vehicles to recover 4 litter patients and remove them to  
secure area. Should have paddy and small stream crossing capability.

STATEMENT OF MISSION (19) MAP: I/C & T 1:250,000, Sheet WD 49-1

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Medical Evac.	20	CUANG NGA (264673)	LIEM QUANG (272698)	RD: 27 km X: 116 km	4 litter patients	15 km = NS less than 26, NW 12 km = IS less than 26, Dry W This coastal area is flat, filled with paddies, streams and wooded areas.

Mission is to move rapidly to area where a battle has just terminated and evacuate, by vehicle, 4 litter patients, casualties in the recent battle. Although most of the VC force has departed the immediate area, small VC groups are probably in the vicinity and may attack the medical vehicle and any escorting vehicle.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 20
2. Category of Terrain Sandspit
3. Total Distance to Be Covered 15 km
4. Troops to Move 4
5. Cargo to Be Carried:
  - a. General description None other than individual weapons and radio.  
\_\_\_\_\_  
\_\_\_\_\_
  - b. Total weight N/A
  - c. Weight, heaviest item N/A
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained N/A
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails):
    - (1) Sustained 20 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 25 km per hr
7. Detailed Description of Route to Be Followed:  
15 km of continuous level, sand-firm foreshore at low tide.

8. Obstacles to Movement:

Soft sand in some spots.

9. Probability of Enemy Contact:

Unknown

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

Vehicle to carry two men w/equipment at 15-20 km per hour for a 4 hour period.

STATEMENT OF MISSION  
(20)

MAP: I/C &amp; T 1250/000 Sheet No 42-1

Mission	Troops	Origin	Destination	Mileage	Carro	Route and Terrain
Patrol (contin- ous for 5 hours)	4	TINH THUY (235729)	PHUOC LAM (227742)	15 km (one way)	Org & Ind equipment, 1 radio	Sandy beach, trail along 10 km of route.

Mission is to conduct mobile patrol on 15 km segment of beach  
for purpose of detecting any possible VC landing from the sea.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 21
2. Category of Terrain Plateau
3. Total Distance to Be Covered 22 km
4. Troops to Move 300
5. Cargo to Be Carried:
  - a. General description None other than individual and organizational equipment.
  - b. Total weight N/A
  - c. Weight, heaviest item N/A
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speeds:
  - a. Road or highway:
    - (1) Sustained N/A
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails):
    - (1) Sustained 12-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 20 km per hr
7. Detailed Description of Route to Be Followed:

Open hilly grasslands with several small streams fordable by tracked vehicles only. Elevations from less than 500 meters to over 1000 meters. Maximum slope 30%.

8. Obstacles to Movement:

Streams 6'-8' wide, 2'-3' deep banks variable  $\frac{1}{2}$ ' to 1 $\frac{1}{2}$ ' high, slopes. clayey slick soil conditions when wet.

9. Probability of Enemy Contact:

High

10. Armor Protection Required:

Cal .30 less than 200 meters

11. Vehicular Armament Required:

Cal .30, cal .50 MG or equivalent.

12. Special Requirements for This Mission:

Maximum cross-country speed and ability to deliver heavy volume of AW fire.

STATEMENT OF MISSION

(21)

MAP: I/C & T 1:250,000 Sheet ND 49-13

Mission	Troops	Origin	Destination	Mileage	Carry	Route and Terrain
Pursuit	200	Airfield (260405)	Hill 1048 (255422)	2 km	Individual & organization only.	Generally open and rolling with hill masses up to 1100 meters surrounding a bowl at less than 500 meters. Villages, primitive trails and dry crops characterize the area. Fordable streams are present and should present no obstacle to cross-country movement except for wheeled vehicles.

An enemy force has been caught in the open and pounded by an ARVN regiment protecting Highway 21 near the airfield at 260405. Having taken severe casualties, the VC, now about 100 strong, have abandoned the attempt to crack the ARVN defenses and are moving on foot toward the heavily wooded hills surrounding Hill 1048 (255422). The Corps armored Cav Sqn has been ordered to pursue and destroy the withdrawing VC force. Key to successful operation is for pursuing force to catch VC troops before they reach the wooded area surrounding Hill 1048.

### VEHICULAR MISSION REQUIREMENTS

1. Mission No. 29
2. Category of Terrain Delta
3. Total Distance to Be Covered 21 km
4. Troops to Move 9 men
5. Cargo to Be Carried:
  - a. General description Individual equipment only. 100 rds S/A  
ammunition per man, total 30 lbs per man.
  - b. Total weight 270 lbs
  - c. Weight, heaviest item 14.5 lbs
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 30 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 40 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 15 km per hr
7. Detailed Description of Route to Be Followed:

The loose surface, graded road might be used but has been cratered in two places by the Viet Cong. To succeed in this small scale operation, VN troops must have a vehicle capable of crossing streams, canals, dikes and paddies at an appreciably greater rate than that achieved by the fleeing Viet Cong.

8. Obstacles to Movement:

Road craters (50 man hours to fill).  
Paddies, dikes, streams and canals.

9. Probability of Enemy Contact:

Only exists in probability of overtaking the three enemy soldiers.

10. Armor Protection Required:

Cal .30 less than 200 meters.

11. Vehicular Armament Required:

Rapid fire MG, 223 cal or .30.

12. Special Requirements for This Mission:

These pertain entirely to cross-country capability.

STATEMENT OF MISSION (23) MAP: Indochina & Thailand 1:500,000 Sheet HC 48-11

Mission	Troops	Origin	Destination	Mileage	Cargo	Route
Rescue	9 E Men	PHU YINH (647097)	Tieu Can (631085)	21	Only individual weapons and eqpt.	Delta - Entirely flat streams and canals, paddies throughout entire area.

NOTE: A small VC force has attempted a bold but disastrous daylight raid on the airfield at PHU YINH and the ARVN force has surprised the intruders and killed all but three of the raiding party. The escapees are now seeking desperately to flee and are now about 800 meters southwest of the airfield. The local commander has ordered a small mounted detachment to pursue and capture the VCs.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 24
2. Category of Terrain Delta
3. Total Distance to Be Covered 67 km (road); 26 km (cross-country)
4. Troops to Move 4
5. Cargo to Be Carried:
  - a. General description Ammunition: 500#  
Rations: 130#
  - b. Total weight 630#
  - c. Weight, heaviest item 30#
  - d. Total cubeage 20 cu ft
  - e. Cubeage, largest item 2 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 20 - 25 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 30 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 8-12 km per hr
    - (2) Maximum (bursts of 2 to 5 km) NA
7. Detailed Description of Route to Be Followed:
  1. Road: 40 km via loose surface, graded, all weather.  
13 km via hard surface, all weather.  
32 km via loose surface, dry weather.
  2. Cross-Country: 26 km through swamps and paddies and  
across 2 canals.

8. Obstacles to Movement: (Area inundated)

Canal banks - 1-2' above water level  
Paddies  
Marshes

9. Probability of Enemy Contact:

Remote

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

Travel by road impossible during this season.  
Must traverse flooded canals and paddies.  
Tide must be considered.

STATEMENT OF MISSION (24) MAP: I/C & T, 1:250,000, Sheet NC 48-6

Mission	Troop	Origin	Destination	Mileage	Cargo	Route and Terrain
Unit Resupply	4	Triton (500152)	Hill 221 (517133)	26 (XC) 85 (road)	20 rations, ammunition	Delta, dotted with swamps, paddies, jungle, grasses, canals, streams. Now flooded in rainy season.

NOTE: Purpose of mission is to resupply personnel manning OP at Hill 221.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 26
2. Category of Terrain Mountainous, wooded
3. Total Distance to Be Covered 22 km
4. Troops to Move 2 men
5. Cargo to Be Carried:
  - a. General description Two men with 25 lbs of individual equipment each.
  - b. Total weight 275
  - c. Weight, heaviest item N/A
  - d. Total cubeage N/A
  - e. Cubeage, largest item N/A
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 20 km per hr
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-12 km per hr
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

22 km of unimproved trail, all of which is through wooded, extremely hilly area with elevations from 500 to 1750 meters. Slope is from 0-60%. Plastic clay soil, slippery when wet. Trail width 30-36".

3. Obstacles to Movement:

Streams: 2' - 8' wide, 1' - 4' deep. Banks 6" to 2" high.  
Soil: slippery when wet. Slopes: up to 60%.

9. Probability of Enemy Contact:

Remote

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

Vehicle must be able to ford, swim, or be floated across streams,  
pull 60% grades and be maneuvered along narrow, meandering trail  
with irregular surface.

## STATEMENT OF MISSION

(26)

MAP: I/C &amp; T Sheet 50 HQ-13

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Routine Patrol	2	TANG YANG (200376)	Hill (217380)	22 km	Individual Equipment	Mountainous, flat to 60% slopes. A few streams. Trail 22 km in length, 5 km level in woods, 17 km from 2% to 60% slope. 3 streams to cross.

MISSION: One of a number of routine patrols conducted within a "secure" area to determine the condition of the trail and to check the outpost atop Hill 1749.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 28
2. Category of Terrain Delta
3. Total Distance to Be Covered 56 km
4. Troops to Move 60 total
5. Cargo to Be Carried:
  - a. General description Individual equipment, 60 rations, 2 cal .30 MG, and 5000 rods cal .30 ammunition.
  - b. Total weight 2400#
  - c. Weight, heaviest item 28#
  - d. Total cubeage 62 cu ft
  - e. Cubeage, largest item \_\_\_\_\_
6. Desirable Speed:
  - a. ~~XXXXXXXXXXXX~~ CANAL
    - (1) Sustained 15-20 km per hr
    - (2) Maximum (bursts of 3 to 6 km) 30 km per hr
  - b. Cross-country (including paths and trails):
    - (1) Sustained 15-20 km per hr
    - (2) Maximum (bursts of 2 to 5 km) 30 km per hr
7. Detailed Description of Route to Be Followed:

Primary route is via canal, but the vehicle should be able to emerge from the canal in order to pursue and close with the enemy.

8. Obstacles to Movement:

Water barricades, mines, dams along the canal, paddies, dikes, streams and stream or canal banks in the entire zone of operation.

9. Probability of Enemy Contact:

High, but in small groups.

10. Armor Protection Required:

Turn cal .30 at ranges less than 200 meters.

11. Vehicular Armament Required:

Light, rapid fire MG, a minimum per vehicle.

12. Special Requirements for This Mission:

The need for a vehicle which can both navigate the canals and streams but emerge from same and move across paddies and swamps.

STATEMENT OF MISSION  
(28)

MAP: I/C & T 1:250,000 Sheet WC 48-6

Mission	Troops	Origin	Destination	Mileage	Carvo	Route and Terrain
Reconnaissance Patrol	60	Dong Cu (466164)	Chau Phu (513184)	56 km	Indiv. Equip 2 Cal 30 MF's 5000 rds cal 30; 4 & 1.	Entirely via canal which runs through paddies and is intersected by numerous streams.

This is a typical mission conducted via canal just south and southeast of the Cambodian border. A vehicle which could operate both on the canal and through paddies would be of great assistance in accomplishing the mission; namely, finding and capturing or killing Viet Cong infiltrators.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 99
2. Category of Terrain Tidal Swamp, paddy fields, streams.
3. Total Distance to Be Covered 13 km
4. Troops to Move 6
5. Cargo to Be Carried:
  - a. General description Rations, gasoline, engineer materials.  
\_\_\_\_\_
  - b. Total weight 1000#
  - c. Weight, heaviest item 50#
  - d. Total cubeage 40 cu ft
  - e. Cubeage, largest item 8 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 35 km per hr
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails).
    - (1) Sustained 8 - 12 km per hr
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:  
7 km: loose surface, single lane, all weather road.  
6 km: paddies, streams, swamp.

8. Obstacles to Movement:

Paddies, stream banks, swamps. At high water, entire area is flooded.

9. Probability of Enemy Contact:

Slight

10. Armor Protection Required:

None

11. Vehicular Armament Required:

None

12. Special Requirements for This Mission:

Vehicle to travel on road as well as negotiate paddies, dikes and streams. Not a combat vehicle.

STATEMENT OF MISSION  
(29)

MAP: I/C & T 1:250,000, Sheet NG 48415

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Administrative. Inspect Outpost	5	TAN HUNG DONG (501988)	CAI BAT (491778)	Road-7km Cross-C'ty 6 km	Rations, Fuel and Engineer materials	Lower tip of peninsula, tidal marsh, paddies, streams. 7 km of loose surface, all weather road, thence through 6 km of paddies and across streams.

Mission is administrative. It is to bring Commanding Officer to village outpost and bring in limited supplies. Area is secure from VC.

VEHICULAR MISSION REQUIREMENTS

1. Mission No. 30
2. Category of Terrain Coastal, flat, paddies, streams, sand beaches.
3. Total Distance to Be Covered 56
4. Troops to Move 32
5. Cargo to Be Carried:
  - a. General description Medical supplies, tentage, water.  
\_\_\_\_\_  
\_\_\_\_\_
  - b. Total weight 8 tons
  - c. Weight, heaviest item 100 lbs
  - d. Total cubeage 400 cu ft
  - e. Cubeage, largest item 24 cu ft
6. Desirable Speed:
  - a. Road or highway:
    - (1) Sustained 30-35 km per hr
    - (2) Maximum (bursts of 3 to 6 km) N/A
  - b. Cross-country (including paths and trails):
    - (1) Sustained 10-15 km per hr
    - (2) Maximum (bursts of 2 to 5 km) N/A
7. Detailed Description of Route to Be Followed:

Road: 56 km - single lane, paved, all weather.  
50 km - through paddies and across streams.  
6 km - through sandy beaches.  
Rivers: 1 - 500 meters wide.  
1 - 200 meters wide.  
Current Variable: 4 km per hr to 10 km per hr  
Banks: 3'- 5' high - slopes variable.

8. Obstacles to Movement:

Road: craters, mines, barriers, blown bridges.  
Streams and rivers.  
Sand beaches.

9. Probability of Enemy Contact:

Possible with small groups.

10. Armor Protection Required:

Cal .30 less than 200 m

11. Vehicular Armament Required:

Cal .30 MG

12. Special Requirements for This Mission:

Vehicles must be able to move on highway and make reasonable progress thru paddies for short distances if forced off road, negotiate rivers as specified on reverse side, and move across soft sand.

STATEMENT OF MISSION MAP: I/C & T, 1:250,000, Sheet ND 49-1  
(30)

Mission	Troops	Origin	Destination	Mileage	Cargo	Route and Terrain
Emergency Resupply	32	Tam Ky (231722)	Hoi An (215757)	56 km	Medical Supplies, Tentage	Flat coastal area, sandy beaches, paddies, rivers and tributary streams.

**Mission:** To transport emergency medical supplies, water, and food to troops isolated at Hoi An. This area has been under heavy attack by VC ground forces. The latter have withdrawn but only after causing heavy casualties in the destroyed town. All aircraft are committed elsewhere and these critically needed supplies must be moved overland. To complicate matters, two highway bridges along the route have been destroyed. Vehicles carrying these supplies must be able to move on highways, traverse paddies, swim rivers and traverse sandy beaches.

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**Appendix B**

**VEHICLE DATA**

**NONFLOATING TRUCKS**

	132
M151	132
M151 Modified	134
M151 Modified	136
Trespasser	138
M274	140
M274 Modified	142
M37	144
M37 Modified	146
GMC Modified	148
Powerwagon Modified	150
M34, M35	152
M34, M35 Modified	154
M704 Jumbo	156
M704 Jumbo	158
XM520	160
M41	162
M54, M55	164
M3A1	164

**AMPHIBIOUS TRUCKS**

	166
XM561 Modified (Recommended)	166
XM561	168
M151 Modified	170
M274 Modified	172
Trespasser, Military	174
Economite, 4 x 4	176
Economite, 6 x 6	178
XM531	180
XM384	182
XM410	184
XM521	186
XM434	188
XM453	190
XM656	192
Canadian Jiger	194
Terragator	196
Husky Duck	198
Trail-mate	200
Viper	202
Commando V-100	204
Alvis Stalwart	206

**WHEELED AMPHIBIOUS LIGHTERS** 208

LVBX2	208
BARC	210
LARC-5	212
LARC15	214
DUKW	216
XM157 Drake	218
SKYLARC	220
XM147 Superduck	222

**TRACKED AMPHIBIOUS VEHICLES** 224

XM571 Modified (Recommended)	224
XM571 Dynatrac	226
M116 Husky	228
LVTPX11	230
LCA	232
LVTPS	234
M76 Otter	236
CL70 Canadian Rat	238
Swamp Spryte, Model 1301	240
Tniokol Model 604	242
Marten	244
Super Marten	246
KRIST1, KT4A	248
M113 APC	250
XM548E1	252
RN10	254
RN20	256
RN75	258
RN110 DF (Floater)	260
UET	262
Borg-Trac	264
HIMO	266

**SHALLOW-DRAFT BOATS** 268

Shallow-Draft Boat (Recommended)	268
Air Sled, Rescue	270
JBX21	272
15-Ton Shallow-Draft Boat, Water Jet	274
15-Ton Shallow-Draft Boat, Paddle Wheel	276

<b>LANDING-CRAFT BOATS</b>	<b>278</b>
LCM-6	278
Mk II	280
LCM-3	282
LCM-1	284
LCVP	286
Boston Whaler	288
7-Man US Navy Pneumatic Boat	290
<b>UNIQUE VEHICLES</b>	<b>292</b>
LVA-X1 Airoil	292
1½-Ton Terratire-Tracked (Recommended)	294
5-Ton Terratire-Tracked	296
M113, Terratire-Tracked	298
PATA	300
Canadian "Fisher," Pneumatic-Tire-Tracked	302
Marsh Screw Amphibian	304
Ford ACV-1, GEM	306
Britten-Norman Cushioncraft CC-4, GEM	308
Cushioncraft, Ltd., Cushioncraft CC-2, GEM	310
Bell Aerosystem SK-3 MARK II, GEM	312
Bell Aerosystem SK-5, GEM	314
Rolligon 2251 Two-Bagger	316
Rolligon 2251 Two-Bagger with Sidecar	318
Rolligon Marsh Skeeter	320
Rolligon 4450	322
<b>NARROW-TRAIL VEHICLES</b>	<b>324</b>
Narrow-Trail Vehicle (Recommended)	324
Iron Pony, Motorcycle	326
Sidewinder, 3-Wheeler	328
Donham Toté Gots, Motor Scooter	330
Nethercutt Trail Breaker, Motorcycle	332
2423 (H-D WL), Motorcycle	334
Harley-Davidson Scat, Motorcycle	336
Cushman Trailster, Motor Scooter	338

Appendix B

VEHICLE DATA

This appendix presents detailed data on the physical and operational characteristics of the vehicles studied\* and presents other available pertinent information. The investigators studied 104 versions of 87 different vehicles broken down into nonfloating trucks, amphibious trucks, wheeled amphibious lighters, tracked amphibious vehicles, shallow-draft boats, landing-craft boats, unique vehicles, and narrow-trail vehicles.

\*Abbreviations used in this appendix include the following:

ERDL	Engineer Research and Development Laboratories
F.L.	full load
F.P.	full power
GEM	Ground Effects Machine
LCM	landing craft, mechanized

**NONFLOATING TRUCKS**

Name of Vehicle	<u>M-151</u>
Production	<u>Prototype</u> <u>Concept</u>
Type of Vehicle	<u>Truck, Utility, 1/2-Ton, 4x4</u>
Physical Size	<u>L-11', W-5'3", H-5'11"</u>
Vehicle Weight, Net	<u>2,273<sup>#</sup></u>
Capacity	
Weight	<u>800<sup>#</sup></u>
Cubage	<u>9.6 sq ft</u>
Personnel	<u>4</u>
Speed	
Improved Roads	<u>66 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 3 1/4 inch fording depth only.</u> <u>1-2 mph at 60 inch fording depth with kit only.</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>66°</u>
Angle of Departure	<u>34°</u>
Ground Clearance	<u>10.3"</u>
Range	<u>300 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured river banks.

General Remarks

Production

Average ground pressure 7-9 psi.

Manufacturer

Name of Vehicle	<u>M11 Modified</u>
Production	<u>Prototype X</u> Concept <u>    </u>
Type of Vehicle	<u>Truck, Utility, 1-ton, 4 x 4</u>
Physical Size	<u>L-11'1", W-7'3", H-6'2"</u>
Vehicle Weight, Net	<u>2420#</u>
Capacity	
Weight	<u>800#</u>
Cubage	<u>9.6 cu ft</u>
Personnel	<u>4</u>
Speed	
Improved Roads	<u>65 mph</u>
Cross-Country	<u>8 - 12 mph</u>
Water	<u>1 - 2 mph @ 36 inch fording depth only.</u> <u>1 - 2 mph @ 62 inch fording depth with kit only.</u>
Gradeability	<u>65%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>67°</u>
Angle of Departure	<u>35°</u>
Ground Clearance	<u>12.2"</u>
Range	<u>300 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

(over)

Prominent Operational Feature or Characteristic

Standard production vehicle modified, incorporating large tire (ATAC).

12 x 16.5 tire

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. This vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average Ground Pressure 4.4.8 psi

Manufacturer

Name of Vehicle	M151 Modified
Production	Prototype <u>X</u> Concept
Type of Vehicle	Truck, Utility, $\frac{1}{2}$ ton, 4 x 4
Physical Size	1-11'1", W07'3", H-6'2"
Vehicle Weight, Net	2650 <sup>#</sup>
Capacity	
Weight	800 <sup>#</sup>
Cubage	9.6 sq ft
Personnel	4
Speed	
Improved Roads	50 mph (est.)
Cross-Country	8-12 mph
Water	1-2 mph @ 3' inch fording depth only. 1-2 mph @ 6' inch fording depth with kit only.
Gradeability	60%
Side Slope	30%
Angle of Approach	70°
Angle of Departure	40°
Ground Clearance	13"
Range	275 miles
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

Standard production vehicle modified, incorporating large tires (ATAC).

36 x 20 - 14 R tire

Type of Terrain Capabilities and Limitations

The vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average Ground Pressure 2.2 - 2.8 psi

Manufacturer

RAC-T-474

Name of Vehicle	<u>Trespasser</u>
Production	Prototype <u>X</u> Concept _____
Type of Vehicle	<u>Carrier, Personnel &amp; Cargo, 1 ton, 8 x 8</u>
Physical Size	<u>L-8', W-6', H-3'6"</u>
Vehicle Weight, Net	<u>1330#</u>
Capacity	
Weight	<u>800#</u>
Cubage	<u>18 sq. ft. 50 cu ft (est.)</u>
Personnel	<u>4</u>
Speed	
Improved Roads	<u>20 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph - 18" (est.) fording depth only</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>65° (est.)</u>
Angle of Departure	<u>60° (est.)</u>
Ground Clearance	<u>12" (est.)</u>
Range	<u>250 mi</u>
Vertical Obstacle	<u>20" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity with firm bottoms. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Average Ground Pressure 3.82 psi

Manufacturer

Aerjet General Corporation

Name of Vehicle	M-274
Production	<input checked="" type="checkbox"/> X <input type="checkbox"/> Prototype <input type="checkbox"/> Concept
Type of Vehicle	Truck, Platform, Utility, $\frac{1}{2}$ -Ton, 4x4
Physical Size	L-9'10", W-4'1", H-4'1"
Vehicle Weight, Net	900 <sup>#</sup>
Capacity	
Weight	1,000 <sup>#</sup>
Cubage	25 sq ft
Personnel	One
Speed	
Improved Roads	25 mph
Cross-Country	8-12 mph
Water	1-2 mph at 18 inch fording depth only
Gradeability	60%
Side Slope	30%
Angle of Approach	40°
Angle of Departure	21°
Ground Clearance	11.5"
Range	151 miles at 5 mph, 107 miles at 25 mph
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

The vehicle can be driven dismounted.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured river banks.

General Remarks

This vehicle is not equipped with a winch.

Average ground pressure 5.1-5.6 psi.

Production

Manufacturer

RAC-T-474

Name of Vehicle	<u>M74 Modified</u>
Production	<u>Prototype X Concept</u>
Type of Vehicle	<u>Truck, Platform, Utility, 1/2-Ton, 4x4</u>
Physical Size	<u>L-9'10", W-4'1", H-4'1"</u>
Vehicle Weight, Net	<u>900#</u>
Capacity	
Weight	<u>1,000#</u>
Cubage	<u>25 sq ft</u>
Personnel	<u>One</u>
Speed	
Improved Roads	<u>25 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 18 inch fording depth only.</u>
Gradenbility	<u>66%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>15°</u>
Angle of Departure	<u>34°</u>
Ground Clearance	<u>11.8"</u>
Range	<u>151 miles at 5 mph, 107 miles at 25 mph</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

This vehicle can be driven dismounted. Standard production vehicle modified, incorporating large tires (ATAC).

24x12-IOR Tire

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

This vehicle is not equipped with a winch.

Average ground pressure 3.6-3.9 psi.

Manufacturer

RAC-T-474

143

Name of Vehicle	M-37
Production	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	Truck, Cargo, 3/4-Ton, 4x4
Physical Size	L-16'5", W-6'11", H-7'3"
Vehicle Weight, Net	5,917 <sup>#</sup>
Capacity	
Weight	1,800 <sup>#</sup>
Cubage	160 cu ft
Personnel	10
Speed	
Improved Roads	55 mph
Cross-Country	8-12 mph
Water	1-2 mph at 41 inch fording depth only. 1-2 mph at 54 inch fording depth with kit only.
Gradeability	35%
Side Slope	15°
Angle of Approach	18°
Angle of Departure	18°
Ground Clearance	19.75"
Range	200 miles
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 10.6-14.6 psi.

Production

Manufacturer

RAC-T-474

Name of Vehicle	<u>M37 Modified</u>
Production	<u>Prototype X Concept</u>
Type of Vehicle	<u>Truck, Cargo, 3/4-Ton, 4x4</u>
Physical Size	<u>L-15'5", W-6'1 1/2", H-7'4 1/2"</u>
Vehicle Weight, Net	<u>5,900#</u>
Capacity	
Weight	<u>1,900#</u>
Cubage	<u>160 cu ft</u>
Personnel	<u>10</u>
Speed	
Improved Roads	<u>55 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 43 inch fording depth only.</u> <u>1-2 mph at 85 inch fording depth with kit only.</u>
Gradeability	<u>65%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>39°</u>
Angle of Departure	<u>33°</u>
Ground Clearance	<u>12 1/2"</u>
Range	<u>225 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Standard production vehicle modified, incorporating large tires (ATAC).  
14x18 Tire

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation, on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 7-11 psi.

Manufacturer

RAC-T-474

147

Name of Vehicle	<u>GMC Modified</u>
Production	Prototype <u>X</u> Concept _____
Type of Vehicle	<u>Truck, cargo, 1 ton 2 x 4</u>
Physical Size	<u>L-18'0" W-7'0" H-7'6"</u>
Vehicle Weight, Net	<u>6200 lbs</u>
Capacity	
Weight	<u>2400 lbs</u>
Cubage	<u>60 sq. ft. (approx.)</u>
Personnel	<u>12 - 16</u>
Speed	
Improved Roads	<u>55 mph</u>
Cross-Country	<u>8 - 12 mph</u>
Water	<u>1 - 2 mph approx. 24" fording depth only</u>
Gradeability	<u>50-60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>30° (est.)</u>
Angle of Departure	<u>45° (est.)</u>
Ground Clearance	<u>1-2"</u>
Range	<u>150 mi (est.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Standard commercial truck modified, incorporating large tires. (ATAC)

46 x 18 - 16R tire  
46 x 24 - 16R tire

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average Ground Pressure 5.4 - 7.4 psi

Manufacturer

RAC-T-474

Name of Vehicle	Powerwagon Modified
Production	Prototype <u>X</u> Concept
Type of Vehicle	Truck, cargo, 1 ton, 4 x 4
Physical Size	L-17'8", W-9'0", H-7'1"
Vehicle Weight, Net	6300 lbs
Capacity	
Weight	2400 lbs
Cubage	45 sq. ft. (est.)
Personnel	10 - 12
Speed	
Improved Roads	55 mph
Cross-Country	8 - 12 mph
Water	1 - 2 mph @ approx. 24" fording depth only
Gradeability	50-60%
Side Slope	30%
Angle of Approach	60° (est.)
Angle of Departure	45° (est.)
Ground Clearance	14.5"
Range	150 mi (est.)
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

Standard production truck modified, incorporating large tires. (ATAC)

46 x 18 - 16R tire  
46 x 14 - 16R tire

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average Ground Pressure 5.1 - 7.1 psi

Manufacturer

RAC-T 474

Name of Vehicle:	<u>M35 - M35</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle:	<u>Truck, Cargo, 3 1/2-Ton, 6x6</u>
Physical Size:	<u>L-23'9", W-7'1", H-9'1"</u>
Vehicle Weight, Net:	<u>12,190<sup>#</sup></u>
Capacity	
Weight	<u>5,400<sup>#</sup></u>
Cubage	<u>408 cu ft</u>
Personnel	<u>18</u>
Speed	
Improved Roads	<u>58 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 30" fording depth only. 1-2 mph at 72" fording depth with kit only.</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>40°</u>
Angle of Departure	<u>43°</u>
Ground Clearance	<u>14"</u>
Range	<u>350 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 12.7-13.2 psi.

Production

Manufacturer

RAC-T-474

Name of Vehicle	<u>M24-M35 Modified</u>
Production	<u>Prototype</u> <u>X</u> <u>Concept</u>
Type of Vehicle	<u>Truck, Cargo, 2 1/2-Ton, 6x6</u>
Physical Size	<u>L-23'0", W-7'4", H-8'3"</u>
Vehicle Weight, Net	<u>12,657<sup>#</sup></u>
Capacity	
Weight	<u>5,400<sup>#</sup></u>
Cubage	<u>108 cu ft</u>
Personnel	<u>12</u>
Speed	
Improved Roads	<u>55 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 32 inch fording depth only.</u> <u>1-2 mph at 74 inch fording depth with kit only.</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>42°</u>
Angle of Departure	<u>15°</u>
Ground Clearance	<u>16 1/2"</u>
Range	<u>325 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Standard production vehicle modified, incorporating large tires (ATAC).  
14.75x20 NDMD Tire

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 8.8-9.2 psi.

Manufacturer

M-113

Name of Vehicle M113 JUMBO

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Truck, cargo, 3 ton 4 x 4

Physical Size L-21'10", W-8'0", H-8'2"

Vehicle Weight, Net 11,000#

Capacity

Weight 6,000#

Cubage 36 sq. ft.

Personnel 12 - 16

Speed

Improved Roads 42 mph

Cross-Country 8 - 12 mph

Water 1 - 2 mph approx. 40" fording depth only

Gradeability 50 - 60%

Side Slope 45°

Angle of Approach 15°

Angle of Departure 35°

Ground Clearance 20"

Range 150 mi (est.)

Vertical Obstacle NA

Armor Protection None

Prominent Operational Feature or Characteristic

Standard Commercial Truck Modified, incorporating large tires.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderate dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Manufacturer

Marmor - Harrington Company

RAC-T-474

Name of Vehicle	<u>XM500</u>
Production	<u>Prototype X</u> <u>Concept</u>
Type of Vehicle	<u>Truck, Cargo, 5-Ton, Lgh</u>
Physical Size	<u>L-25'3", W-8'11", H-8'3"</u>
Vehicle Weight, Net	<u>15,830<sup>#</sup></u>
Capacity	
Weight	<u>10,430<sup>#</sup></u>
Cubage	<u>9 cu ft. (approx.)</u>
Personnel	<u>14 (est.)</u>
Speed	
Improved Roads	<u>30 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 42 inch fording depth only.</u>
Gradeability	<u>60%</u>
Side Slope	<u>50%</u>
Angle of Approach	<u>31°</u>
Angle of Departure	<u>74°</u>
Ground Clearance	<u>21"</u>
Range	<u>180 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

The XM520 is a "Goer" type vehicle.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 10.6-12.5 psi.

Manufacturer

Clark Equipment Company

RAC-T-474

Name of Vehicle	M41
Production	Prototype _____ Concept _____
Type of Vehicle	Truck, Cargo, 1-Ton, 6x6
Physical Size	L-35'10", W-8'0", H-9'2"
Vehicle Weight, Net	19,835 <sup>lb</sup>
Capacity	
Weight	10,000 <sup>lb</sup>
Cubage	550 cu ft
Personnel	20
Speed	
Improved Roads	59 mph
Cross-Country	8-12 mph
Water	1-2 mph at 40 inch fording depth only. 1-2 mph at 78 inch fording depth with kit only.
Gradeability	60%
Side Slope	30%
Angle of Approach	40°
Angle of Departure	14°
Ground Clearance	13"
Range	280 miles
Vertical Obstacle	Na
Armor Protection	None

Prominent Operational Feature or Characteristic

The KM20 is a "Goer" type vehicle.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 10.6-12.5 psi.

Manufacturer

Clark Equipment Company

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 12-15 psi.

Production

Manufacturer

Name of Vehicle	M-54 - M-55
Production	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	Truck, Cargo, 5-Ton, 6x6
Physical Size	L-26'2", W-8'1", H-9'8"
Vehicle Weight, Net	19,945 <sup>#</sup>
Capacity	
Weight	10,000 <sup>#</sup>
Cubage	550 cu ft
Personnel	20
Speed	
Improved Roads	53 mph
Cross-Country	8-12 mph
Water	1-2 mph at 36 inches fording depth only. 1-2 mph at 78 inches fording depth with kit only.
Gradeability	60%
Side Slope	30%
Angle of Approach	37°
Angle of Departure	38°
Ground Clearance	13"
Range	214 miles
Vertical Obstacle	Na
Armor Protection	None

inent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 12.2-20 psi.

Production

Manufacturer

RAC-T-474

Name of Vehicle	<u>M-3A1</u>
Production	<u>X</u> Prototype _____ Concept _____
Type of Vehicle	<u>Carrier, Personnel, Half-Track</u>
Physical Size	<u>L-20'9 1/2", W-7'3 1/2", H-8'10"</u>
Vehicle Weight, Net	<u>16,500# (est.)</u>
Capacity	
Weight	<u>4,000# (est.)</u>
Cubage	<u>55 sq ft (est.)</u>
Personnel	<u>12-14</u>
Speed	
Improved Roads	<u>45 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 32 inch fording depth only</u>
Gradeability	<u>60%</u>
Side Slope	<u>30-35%</u>
Angle of Approach	<u>32°</u>
Angle of Departure	<u>35°</u>
Ground Clearance	<u>11.2"</u>
Range	<u>210 miles</u>
Vertical Obstacle	<u>Na</u>
Armor Protection	<u>Armored</u>

Prominent Operational Feature or Characteristic

A half-track armored vehicle.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation, on semi-firm terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 11.6 psi.

Manufacturer

**AMPHIBIOUS TRUCKS**

Name of Vehicle	XM-561 (Recommended)
Production	Prototype _____ Concept <u>A</u>
Type of Vehicle	Truck, Cargo, 1½-Ton, 5x6, Amphibious
Physical Size	L-19'2", W-7'0", H-7'7" (reducible to 5'2½")
Vehicle Weight, Net	6,300*
Capacity	
Weight	2,500* (plus 2-man crew)
Cubage	255 cu ft (54 sq ft)
Personnel	10
Speed	
Improved Roads	55 mph
Cross-Country	8-12 mph
Water	6 mph minimum
Gradeability	60%
Side Slope	30%
Angle of Approach	70° (over recessed winch)
Angle of Departure	60°
Ground Clearance	15" minimum
Range	300 miles cross-country
Vertical Obstacle	14-15", 20" step
Armor Protection	

Prominent Operational Feature or Characteristic

Similar to XM-561 prototype vehicles.

Type of Terrain Capabilities and Limitations

Due to the articulated, dual-body design and recommended improvements, the mobility of this vehicle over difficult terrain will be substantially better than any conventional wheeled vehicle.

General Remarks

This vehicle can be produced by modification to the XM-561 prototype vehicles.

Manufacturer

Name of Vehicle	MM61
Production	Prototype <u>X</u> Concept
Type of Vehicle	Truck, Cargo, 1 $\frac{1}{2}$ -Ton, 6x6, Amphibious
Physical Size	L-19'2", W-7'0", H-7'7" (Reducible to 5'2 $\frac{1}{2}$ " )
Vehicle Weight, Net	6,310 <sup>#</sup>
Capacity	
Weight	2,500 <sup>#</sup> (plus 2-man crew)
Cubage	255 cu ft (54 sq ft)
Personnel	10
Speed	
Improved Roads	35 mph
Cross-Country	8-12 mph
Water	1 $\frac{1}{2}$ -2 mph
Gradeability	60%
Side Slope	30%
Angle of Approach	33 <sup>o</sup>
Angle of Departure	50 <sup>o</sup>
Ground Clearance	15"
Range	520 miles highway grade, 250 miles (est.) cross-country
Vertical Obstacle	14" obstacle, 20" step
Armor Protection	None

Prominent Operational Feature or Characteristic

The XM561 is a dual-body, wheeled, 6x6 vehicle. The two bodies are connected by an articulating assembly permitting them to arch vertically (Pitch) and rotate (Roll) with respect to one another, so that each body conforms independently to all terrains. The center wheels rotate about a longitudinal axis independent of either body to seek their own ground position. Coordinated four wheel steering of the front and rear wheels is provided giving the vehicle a turning radius of 47 feet. Its oversize tires allow a low tire pressure and the vehicle has an average ground pressure of 4.3-6.9 psi.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadward and general cross-country operation, in moderately-dissected terrain. It can operate in soft terrain and soft-slippery mud (soft depth being somewhat less than its ground clearance). The vehicle is floatable and can navigate lakes, streams, and slow moving rivers, and has the ability to negotiate moderately inclined, semi-firm structured banks.

General Remarks

This vehicle is presently being developed by Ling-Temco-Vought, and approximately 18 prototypes (includes pilot production) have been built and are presently being tested and evaluated. The dual-bodied, articulated, wheeled vehicle design of the XM561 retains the advantages of a truck and while providing desired high mobility, cross-country characteristics.

While this vehicle has the highest overall mobility of the wheeled vehicles, it is felt that its mobility only approaches that of a tracked vehicle. Its turning radius, while less than other wheeled vehicles of its size, is still considered too large to negotiate the sharp turns encountered in many of the narrow jungle roadways. The approach and departure angles are marginal and should be increased. The winch should be recessed and its capacity increased. The steering effort is too great.

The vehicles powerplant is capable of multi-fuel operation. This vehicle can be delivered by air transport, helicopter lift and Phase I air drop (parachute).

Manufacturer

Ling-Temco-Vought, Inc.

Name of Vehicle	M51 Lodi Aul
Production	Prototype <u>X</u> Concept _____
Type of Vehicle	Truck, Utility, 4-Ton, Lx4, amphibious
Physical Size	L-11'9", W-5'2", H-5'11"
Vehicle Weight, Net	2,425 <sup>#</sup>
Capacity	
Weight	800 <sup>#</sup>
Cubage	9.6 sq ft
Personnel	4
Speed	
Improved Roads	65 mph
Cross-Country	8-12 mph
Water	1-2 mph
Gradeability	60%
Side Slope	30%
Angle of Approach	15°
Angle of Departure	37°
Ground Clearance	8.3"
Range	275-300 miles
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

This vehicle is floatable and is a standard production vehicle modified, incorporating a water-tight body. (ATAC)

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 8-10 psi.

Manufacturer

RAC-T-474

171

Name of Vehicle	<u>M274 Modified</u>
Production	<u>Prototype X</u> Concept
Type of Vehicle	<u>Truck, Platform, Utility, 4-Ton, 4x4, Amphibious</u>
Physical Size	<u>L-10'10", W-5'9", H-4'1"</u>
Vehicle Weight, Net	<u>1,040<sup>#</sup></u>
Capacity	
Weight	<u>1,000<sup>#</sup></u>
Cubage	<u>25 sq ft</u>
Personnel	<u>One</u>
Speed	
Improved Roads	<u>25 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>46°</u>
Angle of Departure	<u>34°</u>
Ground Clearance	<u>11.5"</u>
Range	<u>151 miles at 5 mph. 107 miles at 25 mph</u>
Vertical Obstacle	<u>Na</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

This vehicle can be driven dismounted. Standard production vehicle modified, incorporating floatation kit (ATAC).

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation, on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

This vehicle is not equipped with a winch.  
Average ground pressure 5.5-6.0 psi.

Manufacturer

Name of Vehicle	<u>Trespasser, Military</u>
Production	<u>Prototype</u> <u>Concept</u> <u>X</u>
Type of Vehicle	<u>Carrier, Personnel &amp; Cargo 1/2 ton 10 x 10 Amphibious</u>
Physical Size	<u>L-10'4", W-6', H-6'</u>
Vehicle Weight, Net	<u>1800#</u>
Capacity	
Weight	<u>1200#</u>
Cubage	<u>35 sq ft, 120 cu ft (est.)</u>
Personnel	<u>6 - 8</u>
Speed	
Improved Roads	<u>10 - 35 mph</u>
Cross-Country	<u>8 - 12 mph</u>
Water	<u>2 mph (est.)</u>
Gradeability	<u>60%</u>
Side Slope	<u>10%</u>
Angle of Approach	<u>60° (est.)</u>
Angle of Departure	<u>40° (est.)</u>
Ground Clearance	<u>12 - 14" (est.)</u>
Range	<u>200 mi</u>
Vertical Obstacle	<u>24" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Average Ground Pressure 4.14 psi

Manufacturer

Aerjet General Corporation

Name of Vehicle	ECONOMITE 4 x 4
Production	Prototype <input checked="" type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	Truck, cargo, 3 ton, 4 x 4 amphibious
Physical Size	L-8'4" W-5'0" H-5'4"
Vehicle Weight, Net	300#
Capacity	
Weight	1000#
Cubage	12 sq. ft. (est.)
Personnel	4
Speed	
Improved Roads	15 mph
Cross-Country	8 - 12 mph
Water	1 - 2 mph
Gradeability	60%
Side Slope	20%
Angle of Approach	60°
Angle of Departure	45°
Ground Clearance	11"
Range	225 mi (est.)
Vertical Obstacle	15" (est.)
Armor Protection	None

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, firm structured river-banks.

General Remarks

Manufacturer

G. L. Bowen & Company

RAC-T-474

Name of Vehicle	ECONOMITE 6 x 6
Production	Prototype X
Type of Vehicle	Truck, cart., 3 ton., 4 wheel amphibious
Physical Size	L-24", W-48", H-48"
Vehicle Weight, Net	1,100#
Capacity	
Weight	1,000#
Cubage	12 cu. ft. (est.)
Personnel	4
Speed	
Improved Roads	15 mph
Cross-Country	8-12 mph
Water	1-2 mph
Gradeability	40%
Side Slope	30%
Angle of Approach	60°
Angle of Departure	55°
Ground Clearance	14"
Range	325 mi (est.)
Vertical Obstacle	15" (est.)
Armor Protection	None

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, firm structured river banks.

General Remarks

Manufacturer

G. I. Owen & Company

RAC-T-474

179

Name of Vehicle	<u>XM551</u>
Production	<u>Prototype X</u> Concept _____
Type of Vehicle	<u>Truck, Cargo, 3/4-Ton, Lx4, Amphibious</u>
Physical Size	<u>L-12'4", W-6'10", H-6'8"</u>
Vehicle Weight, Net	<u>4,055<sup>#</sup></u>
Capacity	
Weight	<u>1,500<sup>#</sup></u>
Cubage	<u>28 sq ft</u>
Personnel	<u>7</u>
Speed	
Improved Roads	<u>60 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>2.3 mph</u>
Gradeability	<u>50%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>49°</u>
Angle of Departure	<u>43°</u>
Ground Clearance	<u>12.6"</u>
Range	<u>300-400 miles (approx.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams and slow moving rivers. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Manufacturer

American Motors Corporation

Name of Vehicle	<u>XM384</u>
Production	<u>Prototype X</u> Concept <u>      </u>
Type of Vehicle	<u>Truck, Cargo, 1-Ton, 2x6, Amphibious</u>
Physical Size	<u>L-16'3<math>\frac{1}{2}</math>" , W-6'9<math>\frac{1}{2}</math>" , H-6'3"</u>
Vehicle Weight, Net	<u>4,100<sup>#</sup></u>
Capacity	
Weight	<u>2,400<sup>#</sup></u>
Cubage	<u>33 sq ft</u>
Personnel	<u>10 (est.)</u>
Speed	
Improved Roads	<u>42 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>48°</u>
Angle of Departure	<u>33°</u>
Ground Clearance	<u>11.5"</u>
Range	<u>220 miles (approx.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and rivers of moderate velocity. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Manufacturer

AAC, Detroit Arsenal

RAC-T-474

183

Name of Vehicle	<u>XM 410</u>
Production	<u>Prototype X</u> <u>Concept</u>
Type of Vehicle	<u>Truck, Cargo, 2 1/2 ton, 8 x 2, amphibious</u>
Physical Size	<u>L-21'6", W-8'0", H-9'2"</u>
Vehicle Weight, Net	<u>11,250<sup>#</sup></u>
Capacity	
Weight	<u>5,400<sup>#</sup></u>
Cubage	<u>92 sq ft</u>
Personnel	<u>16 - 18 (est.)</u>
Speed	
Improved Roads	<u>51 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1 1/2 - 2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>50°</u>
Angle of Departure	<u>50°</u>
Ground Clearance	<u>13"</u>
Range	<u>450 mi highway - 270 mi cross-country</u>
Vertical Obstacle	<u>12"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadways and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average Ground Pressure 7 - 8 psi

Manufacturer

Chrysler Corporation Defense Engineering

RAC-T-474

185

Name of Vehicle	<u>XM21</u>
Production	<u>Prototype X</u> Concept
Type of Vehicle	<u>Truck, Cargo, 2 1/2-Ton, 8x8, 4-Wheel Drive</u>
Physical Size	<u>L-18'11", W7'2", H-7'11"</u>
Vehicle Weight, Net	<u>5,250<sup>#</sup></u>
Capacity	
Weight	<u>5,000<sup>#</sup></u>
Cubage	<u>30 sq ft</u>
Personnel	<u>16</u>
Speed	
Improved Roads	<u>55 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1 1/2-2 mph wheels - 4-5 mph propeller</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>50°</u>
Angle of Departure	<u>40°</u>
Ground Clearance	<u>13.5"</u>
Range	<u>200 miles (approx.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams and rivers of moderate velocity with propeller. The vehicle has the ability to negotiate gently inclined firm structured river banks.

General Remarks

Manufacturer

ATAC, Detroit Arsenal

Name of Vehicle	<u>XM434</u>
Production	<u>Prototype <input checked="" type="checkbox"/> Concept <input type="checkbox"/></u>
Type of Vehicle	<u>Truck, Cargo, 2½-Ton, 6x6, Amphibious</u>
Physical Size	<u>L-19'0", W-8'0", H-9'6"</u>
Vehicle Weight, Net	<u>11,000<sup>#</sup></u>
Capacity	
Weight	<u>7,400<sup>#</sup></u>
Cubage	<u>90 sq ft</u>
Personnel	<u>16</u>
Speed	
Improved Roads	<u>56 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1½-2 mph</u>
Gradesability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>49°</u>
Angle of Departure	<u>54°</u>
Ground Clearance	<u>13"</u>
Range	<u>400 miles (approx.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 10.3 psi.

Manufacturer

Ford Motor Company

Name of Vehicle	<u>78-53</u>
Production	<u>Prototype X</u> Concept
Type of Vehicle	<u>Truck, Cargo, 5-Ton, 8x8, Ambitious</u>
Physical Size	<u>L-21'0", W-8'0", H-9'6"</u>
Vehicle Weight, Net	<u>13,000<sup>#</sup></u>
Capacity	
Weight	<u>10,400<sup>#</sup></u>
Cubage	<u>103 sq ft</u>
Personnel	<u>18</u>
Speed	
Improved Roads	<u>55 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1½-2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>53°</u>
Angle of Departure	<u>56°</u>
Ground Clearance	<u>13"</u>
Range	<u>325 miles (approx.)</u>
Vertical Obstacle	<u>Nil</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 10.3 psi.

This vehicle has been superceded by XM656.

Manufacturer

General Motors Corporation	XM453 E1
Ford Motor Company	XM453 E2
Reo Division, White Motor Company	XM453 E3

Name of Vehicle	<u>XM 656</u>
Production	<u>Prototype</u> <u>X</u> <u>Concept</u>
Type of Vehicle	<u>Truck, Cargo, 5-Ton, 8x8, Amphibious</u>
Physical Size	<u>L-23'0", W-8'0", H-8'10 1/2"</u>
Vehicle Weight, Net	<u>15,600#</u>
Capacity	
Weight	<u>10,400#</u>
Cubage	<u>110 sq ft</u>
Personnel	<u>18</u>
Speed	
Improved Roads	<u>50 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>55°</u>
Angle of Departure	<u>64°</u>
Ground Clearance	<u>12"</u>
Range	<u>300-400 miles (approx.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

Average ground pressure 11-12 psi.

Manufacturer

Ford Motor Company

Name of Vehicle	<u>Canadian Jiger</u>
Production	<u>Prototype</u> <input checked="" type="checkbox"/> <u>Concept</u>
Type of Vehicle	<u>Carrier, Personnel and Cargo, 6 x 6, Amphibious</u>
Physical Size	<u>126 1/2" L, 48 1/2" W, 47 1/2" H</u>
Vehicle Weight, Net	<u>295#</u>
Capacity	
Weight	<u>300#</u>
Cubage	<u>5 sq ft (est.)</u>
Personnel	<u>2</u>
Speed	
Improved Roads	<u>15 mph</u>
Cross-Country	<u>8 - 12 mph</u>
Water	<u>5 - 7 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>11°</u>
Angle of Departure	<u>14°</u>
Ground Clearance	<u>8"</u>
Range	<u>100-125 miles (est.)</u>
Vertical Obstacle	<u>12" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, stream and rivers of moderate velocity. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Manufacturer

Jiger Corporation, Ltd.

Name of Vehicle	<u>TERRAGATOR</u>
Production <u>City</u>	Prototype <u>X</u> Concept _____
Type of Vehicle	<u>Truck, Personnel and cargo, 6 x 6, amphibious</u>
Physical Size	<u>L-6'0", W-4'0", H-2'9"</u>
Vehicle Weight, Net	<u>565<sup>#</sup></u>
Capacity	
Weight	<u>600<sup>#</sup> (est.)</u>
Cubage	<u>10 sq. ft. (est.)</u>
Personnel	<u>3</u>
Speed	
Improved Roads	<u>18 mph</u>
Cross-Country	<u>8 - 12 mph</u>
Water	<u>5 - 7 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>30 - 40° (est.)</u>
Angle of Departure	<u>50° (est.)</u>
Ground Clearance	<u>8 1/2"</u>
Range	<u>100 - 125 mi (est.)</u>
Vertical Obstacle	<u>12" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft-slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams and rivers of moderate velocity. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Manufacturer

Andy Stewart Inc.

RAC-T-474

197

Name of Vehicle	<u>husky Duck</u>
Production	<u>Prototype</u> <u>X</u> <u>Concept</u>
Type of Vehicle	<u>Carrier, Personnel and Cargo 6 x 6 Amphibious</u>
Physical Size	<u>L-8'0", W-4'0", H-2'6"</u>
Vehicle Weight, Net	<u>700<sup>#</sup></u>
Capacity	
Weight	<u>650<sup>#</sup></u>
Cubage	<u>12 sq ft (est.)</u>
Personnel	<u>4 (est.)</u>
Speed	
Improved Roads	<u>11 mph</u>
Cross-Country	<u>8 - 11 mph</u>
Water	<u>1 - 2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>30°</u>
Angle of Departure	<u>30°</u>
Ground Clearance	<u>8"</u>
Range	<u>100 miles (est.)</u>
Vertical Obstacle	<u>12" (est.)</u>
Armor Protection	<u>None</u>

Prosinent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, and in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Manufacturer

Neuman & Bennets, Inc.

Name of Vehicle Trail-wate

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Carrier, Cargo & Personnel, 8 x 6, amphibious

Physical Size L-7'10", W-4'11", H-3'2"

Vehicle Weight, Net 850#

Capacity

Weight 800#

Cubage 20 cu ft (est.)

Personnel 6 (est.)

Speed

Improved Roads 16 mph

Cross-Country 8-12 mph

Water 1-2 mph

Gradeability 50% (est.)

Side Slope 30%

Angle of Approach 12°

Angle of Departure 7 1/2°

Ground Clearance 4.5"

Range 100 miles (est.)

Vertical Obstacle 12" (est.)

Armor Protection None

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate gently inclined, semi-firm structured river banks.

General Remarks

Manufacturer

Trail-Mate Corporation of America

RAC-T-474

201

Name of Vehicle	<u>Viper</u>
Production	<u>Prototype X</u> <u>Concept</u>
Type of Vehicle	<u>Carrier, Cargo &amp; Personnel, 1/2 ton, 14 x 14 Amphibious</u>
Physical Size	<u>L-12'0", W-7'0", H-4'7"</u>
Vehicle Weight, Net	<u>3000<sup>#</sup></u>
Capacity	
Weight	<u>1000<sup>#</sup></u>
Cubage	<u>30-35 sq ft (est.)</u>
Personnel	<u>6 (est.)</u>
Speed	
Improved Road	<u>20 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>5-6 mph</u>
Gradeability	<u>50-60% (est.)</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>81°</u>
Angle of Departure	<u>60°</u>
Ground Clearance	<u>22"</u>
Range	<u>200 miles (est.)</u>
Vertical Obstacle	<u>24" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams, and rivers of moderate velocity. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Manufacturer

Jered Industries

RAC-T-474

Name of Vehicle	<u>Commando V-100</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle	<u>Carrier, Personnel, Cargo, Reconnaissance Car.</u> <u>14-Ton, 4x4, Amphibious</u>
Physical Size	<u>L-18'8", W-7'5", H-7'2", (H-6' without turret)</u>
Vehicle Weight, Net	<u>12,250<sup>#</sup> (11,150<sup>#</sup> without turret, guns, ammo.)</u>
Capacity	
Weight	<u>3,000<sup>#</sup> (3500-4000<sup>#</sup> minus above equipment)</u>
Cubage	<u>200 cu ft (est.)</u>
Personnel	<u>11-12</u>
Speed	
Improved Roads	<u>65 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4 mph</u>
Gradeability	<u>60-70%</u>
Side Slope	<u>30-35%</u>
Angle of Approach	<u>55°</u>
Angle of Departure	<u>53°</u>
Ground Clearance	<u>16"-24"</u>
Range	<u>100-550 miles</u>
Vertical Obstacle	<u>2'-4"</u>
Armor Protection	<u>Yes</u>

Prominent Operational Feature or Characteristic

The V-100 is a 4-wheeled, 4x4, floatable, armored car and personnel carrier. The armor provides protection from small arms fire and grenades. The vehicle has very high ground clearance and features tires which can be "run flat" (punctured) at speeds up to 30 mph for 50-75 miles. The vehicle has an average ground pressure of 9-10 psi.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in mud and swampy-marsh terrain with some limitations. The vehicle is floatable and can navigate lakes, streams and slow to moderate moving rivers. The vehicle has the ability to negotiate moderately inclined, firm to semi-firm structured river banks.

General Remarks

This vehicle is developed and produced by the Terra-Space Industries Division of Cadillac Gage Company. Production vehicles are being operated by various European, Asian and South American countries.

This vehicle has demonstrated the desired high mobility, cross-country characteristics while retaining the advantages of a wheeled vehicle. The vehicle has been tested in South Vietnam with generally favorable results. It encountered some difficulty in bottomless mud holes and in certain rice paddies.

While this vehicle has very high mobility for a wheeled vehicle, in fact it is one of the best; it is felt that its mobility only approaches that of tracked vehicle. Its turning radius, while low for a vehicle its size, is considered too large to negotiate the sharp turns encountered in many of the narrow jungle roadways. The vehicle is equipped with a recessed winch. The handling characteristics of this vehicle are generally considered very satisfactory.

Manufacturer

Cadillac Gage Company

Name of Vehicle	<u>ALVIN STAINARI</u>
Production <sup>Foreign</sup> <sub>Use</sub>	<u>Prototype X</u> Concept <u>      </u>
Type of Vehicle	<u>Truck, Cargo, 4-Ton, 4x6, Amphibious</u>
Physical Size	<u>L-20'5", W-8'4", H-7'7"</u>
Vehicle Weight, Net	<u>15,615<sup>#</sup></u>
Capacity	
Weight	<u>11,200<sup>#</sup></u>
Cubage	<u>9+ sq ft., 256 cu ft.</u>
Personnel	<u>35</u>
Speed	
Improved Roads	<u>25-50 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>5 3/4 mph (water-jet propulsion)</u>
Gradeability	<u>48%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>15°</u>
Angle of Departure	<u>30°</u>
Ground Clearance	<u>16"</u>
Range	<u>300-400 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None (can be provided)</u>

Prominent Operational Feature or Characteristic

Type of Terrain, Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain, in moderately-dissected terrain, in soft slippery mud (soft dipon somewhat less than its ground clearance). This vehicle is floatable and can navigate lakes, streams and rivers of moderate velocity. The vehicle has the ability to negotiate gently inclined, firm structured river banks.

General Remarks

This vehicle is not equipped with a winch.

Manufacturer

Alvis Limited, England

### WHEELED AMPHIBIOUS LIGHTERS

Name of Vehicle	<u>LVRX2</u>
Production	<u>      </u> Prototype <u>X</u> Concept <u>      </u>
Type of Vehicle	<u>Wheeled Amphibious Lighter</u>
Physical Size	<u>L-441", W-126", H-150"</u>
Vehicle Weight, Net	<u>24,000#</u>
Capacity	
Weight	<u>10,000#</u>
Cubage	<u>160"x121"x72"</u>
Personnel	<u>40</u>
Speed	
Improved Roads	<u>40 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>40.27 mph flying, 13.8 mph boating</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>50°</u>
Angle of Departure	<u>28°</u>
Ground Clearance	<u>29 7/8" (less to wheel housings)</u>
Range	<u>250 miles land, 5 hours on water</u>
Vertical Obstacle	<u>20" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

High speed, aluminum amphibian equipped with a turbine engine and hydrofoils.

Type of Terrain Capabilities and Limitations

This vehicle is capable of negotiating rough water, surf zone, firm soils and some cross-country terrain.

General Remarks

This vehicle would provide high speed transportation from ship to prepared landing areas or beaches. The mobility in South Vietnam would be limited to firm soils and moderate cross-country terrain. Several mechanical difficulties have developed in the prototype and therefore it would not be available for immediate use.

Manufacturer

Food Machinery Corporation

Name of Vehicle	<u>BARC</u>
Production <u>X</u>	Prototype _____ Concept _____
Type of Vehicle	<u>Wheeled Amphibious Lifter</u>
Physical Size	<u>L-62'6", W-26'7", H-19'5"</u>
Vehicle Weight, Net	<u>198,500<sup>#</sup></u>
Capacity	
Weight	<u>120,000<sup>#</sup></u>
Cubage	<u>38'3"x13'8"x6'2"</u>
Personnel	<u>125 plus crew of 8</u>
Speed	
Improved Roads	<u>14 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>7.0</u>
Gradeability	<u>60%</u>
Side Slope	<u>40%</u>
Angle of Approach	<u>23° (est.)</u>
Angle of Departure	<u>23° (est.)</u>
Ground Clearance	<u>36"</u>
Range	<u>75 miles water, 150 miles land</u>
Vertical Obstacle	<u>30"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Large wheeled, unarmored, cargo or personnel carrier.

Type of Terrain Capabilities and Limitations

This vehicle is limited to water, beach and limited cross-country operation.

General Remarks

This vehicle would be limited in South Vietnam to transporting cargo or personnel from ships to landing areas or readily accessible inland points.

The draft of 8'8" requires a firm beach extending into the water for a considerable distance. Its maneuverability is limited by the 75' turning radius.

Manufacturer

Western Gear Works

Name of Vehicle:	<u>LARC-5</u>
Production	<u>X</u> Prototype <u>    </u> Concept <u>    </u>
Type of Vehicle	<u>Wheeled Amphibious Lifter</u>
Physical Size	<u>L-34'11 1/2", W-20'1", H-9'4 1/2"</u>
Vehicle Weight, Net	<u>18,020<sup>#</sup></u>
Capacity	
Weight	<u>10,000<sup>#</sup></u>
Cubage	<u>17'0" x 7'0"</u>
Personnel	<u>35</u>
Speed	
Improved Roads	<u>30 mph</u>
Cross-Country	<u>NA</u>
Water	<u>9.14 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>27<sup>o</sup></u>
Angle of Departure	<u>26<sup>o</sup></u>
Ground Clearance	<u>15 3/8" to 24 1/4"</u>
Range	<u>200 miles land, (est.)</u>
Vertical Obstacle	<u>18 <del>ft</del> (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A wheeled amphibian with large diameter wheels and a welded aluminum hull, having moderate water speed and good surfing ability.

Type of Terrain Capabilities and Limitations

This vehicle is capable of negotiating hard surface roads, rough firm terrain, sand and semi-firm terrain.

General Remarks

This vehicle is superior to the DUKW, Superduck and Drake due to its higher mobility and water speed. This vehicle is not suitable for swampy, muddy terrain and would not be mobile in the rice paddies of South Vietnam. It is suitable for transporting cargo from off-shore ships to beaches or up fairly wide rivers and canals to semi-prepared landing areas.

Manufacturer

Continental Diesel Company

Name of Vehicle	<u>LARC-15</u>
Production	<u>X</u> Prototype _____    Concept _____
Type of Vehicle	<u>Wheeled Amphibious Lifter</u>
Physical Size	<u>L-45.0', W-12.0'</u>
Vehicle Weight, Net	<u>45,200# with crew and fuel</u>
Capacity	
Weight	<u>30,000#</u>
Cubage	<u>L-24', W-10'</u>
Personnel	<u>53 plus 3 crew members</u>
Speed	
Improved Roads	<u>29.9 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>9.5 mph</u>
Gradeability	<u>40%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>30°</u>
Angle of Departure	<u>22°</u>
Ground Clearance	<u>16 1/2" clearance "Cort Nozzle," 29" to hull</u>
Range	<u>200 miles land (est.)</u>
Vertical Obstacle	<u>24" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A medium weight, aluminum hull, four large terratized amphibian with propulsion in water provided by propellers.

Type of Terrain Capabilities and Limitations

This vehicle is capable of ship-to-shore landing operations in deep water, through the surf zone, and limited cross-country mobility in sand and on firm soils.

General Remarks

This vehicle has gone into limited production. The prototypes have demonstrated very good water handling characteristics and mobility on firm and semi-firm soils during cross-country operation. The large diameter tires and high ground clearance gives this vehicle more mobility than many of the other wheeled amphibians considered. In South Vietnam, this vehicle would be suitable for supply and resupply operations from off-shore ships to prepared landing areas along the river banks.

Manufacturer

Fruehauf Company

Name of Vehicle	<u>DUNK</u>
Production <input checked="" type="checkbox"/>	Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	<u>Wheeled Amphibious Lighter</u>
Physical Size	<u>L-372", W-98", H-106"</u>
Vehicle Weight, Net	<u>14,880<sup>#</sup></u>
<b>Capacity</b>	
Weight	<u>5,000<sup>#</sup></u>
Cubage	<u>149"x82"x27"</u>
Personnel	<u>20-25</u>
<b>Speed</b>	
Improved Roads	<u>50 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>6 mph</u>
<b>Gradeability</b>	<u>55%</u>
Side Slope	<u>40%</u>
Angle of Approach	<u>38°</u>
Angle of Departure	<u>25°</u>
Ground Clearance	<u>11.5"</u>
Range	<u>240 miles land, 50 miles water</u>
Vertical Obstacle	<u>12" <sup>8"</sup> (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Amphibious version of a 2½-ton, 6x6 truck, propelled in water by propellers.

Type of Terrain Capabilities and Limitations

This vehicle is capable of ship-to-shore water operations through the surf zone and limited cross-country operation.

General Remarks

This vehicle has been discontinued in favor of the LARC-5. It was slow in water, awkward to unload and difficult to maneuver through mud. This vehicle was difficult to maintain and would have very limited mobility in South Vietnam.

Manufacturer

General Motors

RAC-T-474

217

Name of Vehicle	<u>XM-157 DRAKE</u>
Production	<u>Prototype</u> <u>X</u> <u>Concept</u>
Type of Vehicle	<u>wheeled Amphibious Lighter</u>
Physical Size	<u>L-504", W-120", H-130"</u>
Vehicle Weight, Net	<u>30,000#</u>
Capacity	
Weight	<u>20,000#</u>
Cubage	<u>23'0" x 9'3" x 50"</u>
Personnel	<u>65</u>
Speed	
Improved Roads	<u>49 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>9 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>40%</u>
Angle of Approach	<u>34°</u>
Angle of Departure	<u>25°</u>
Ground Clearance	<u>15 3/4"</u>
Range	<u>900 miles land, 80 miles water</u>
Vertical Obstacle	<u>2' 9" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

An amphibious version of an 8-ton, 8x8 truck, propelled in water by propellers and utilizing a welded steel hull.

Type of Terrain Capabilities and Limitations

This vehicle is capable of ship-to-shore operations in deep water, through the surf zone and has limited cross-country mobility.

General Remarks

Development of this vehicle has been suspended since the requirement was no longer needed. This vehicle would have limited mobility due to its long wheel base, high ground pressure and bottoming effects. It is not capable of negotiating the river banks, canal banks and rice paddies found in South Vietnam.

Manufacturer

General Motors

Name of Vehicle	<u>SKYLARK</u>
Production	<u>Prototype</u> <u>Concept</u> <u>I</u>
Type of Vehicle	<u>Wheeled Amphibious Lighter</u>
Physical Size	<u>L-40', W-15'6", H-11'3"</u>
Vehicle Weight, Net	<u>25,000<sup>#</sup></u>
Capacity	
Weight	<u>10,000<sup>#</sup></u>
Cube	<u>L-20'6" x W-7'6"</u>
Personnel	<u>35 (est.)</u>
Speed	
Improved Roads	<u>20 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>25 mph loaded, 35 mph unloaded</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>18°</u>
Angle of Departure	<u>17°</u>
Ground Clearance	<u>16" (est.)</u>
Range	<u>100 miles water, 300 miles land</u>
Vertical Obstacle	<u>12 E" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A high speed amphibian with a welded aluminum hull and propeller drive.

Type of Terrain Capabilities and Limitations

This vehicle is capable of negotiating hard surface roads, rough firm terrain, sand and semi-firm terrain.

General Remarks

The vehicle would have a draft of 1'5" to 2' in the loaded condition. It is not capable of traversing the dikes and the steep banks of the canals and rivers when waterborne. Prepared landing areas would be required on the banks of the larger rivers. This vehicle is capable of high speed delivery of cargo and personnel from ocean-going ships up fairly wide and deep waterways to prepared landing areas.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle	Superduck XM147
Production	Prototype <u>X</u> Concept
Type of Vehicle	Wheeled Amphibious Lifter
Physical Size	L-403", W-108", H-112"
Vehicle Weight, Net	19,700 <sup>#</sup>
Capacity	
Weight	8,000 <sup>#</sup>
Cubage	182"x88"x57"
Personnel	34
Speed	
Improved Roads	50 mph
Cross-Country	8-12 mph
Water	6.7 mph
Gradesability	60%
Side Slope	40%
Angle of Approach	40.5°
Angle of Departure	22.5°
Ground Clearance	13"
Range	600 miles land, 70 miles water
Vertical Obstacle	12" <sup>#</sup> (est.)
Armor Protection	None

Prominent Operational Feature or Characteristic

An amphibious version of the 2½-ton, 6x6 truck. Propelled in water by propellers and utilizing a welded steel hull.

Type of Terrain Capabilities and Limitations

This vehicle is capable of ship-to-shore operations in deep water, through the surf zone and has limited cross-country mobility.

General Remarks

Development of this vehicle has been suspended in favor of the LAMC-5. It would have limited mobility in South Vietnam due to its long wheel base, high ground pressure and bottoming affects. It is not capable of negotiating the river banks, canal banks and rice paddies found in South Vietnam.

Manufacturer

General Motors

RAC-T-474

223

**TRACKED AMPHIBIOUS VEHICLES**

Name of Vehicle	<u>XM571 Modified</u>
Production	<u>Prototype</u> <u>Concept</u> <u>X</u>
Type of Vehicle	<u>Tracked Amphibian Articulated Carrier</u>
Physical Size	<u>Front Unit - L-111.5", W-64", H-72"</u> <u>Rear Unit - L-127.5", W-61", H-73"</u>
Vehicle Weight, Net	<u>Front Unit 1,165#</u> <u>Rear Unit 2,230#</u>
Capacity	
Weight	<u>Front 500#, Rear 1,500#</u>
Cubage	<u>Front 18 cu ft, Rear 60 cu ft.</u>
Personnel	<u>10 including driver</u>
Speed	
Improved Roads	<u>30 mph</u>
Cross-Country	<u>20 mph</u>
Water	<u>6-7 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>40%</u>
Angle of Approach	<u>50°</u>
Angle of Departure	<u>50°</u>
Ground Clearance	<u>12" minimum</u>
Range	<u>260 miles</u>
Vertical Obstacle	<u>18"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Similar to XM-571 prototype vehicles.

Type of Terrain Capabilities and Limitations

The mobility of this vehicle over difficult terrains will be substantially better than any conventional tracked vehicle, due to the articulated system of steering in combination with the low ground unit pressure.

The arrangement for coupling several units together in a train formation should provide a capability to cross canals with steep dikes.

General Remarks

This vehicle can be produced by modifications to the XM-571 prototype vehicles.

Manufacturer

RAC-T-474

Name of Vehicle XM-571 Dynatrac

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Tracked Amphibian Articulated Carrier

Physical Size Front Unit - L-111.5", W-64", H-72"  
Rear Unit - L-127.5", W-64", H-72"

Vehicle Weight, Net Front Unit 3,165#, Rear Unit 2,230#

Capacity

Weight Front 500#, Rear 1,500#

Cubage Front 18 cu ft, Rear 60 cu ft

Personnel 10 including driver

Speed

Improved Roads 30 mph

Cross-Country 20 mph

Water 2 mph

Gradeability 60%

Side Slope 40%

Angle of Approach 70°

Angle of Departure 92°

Ground Clearance 12"

Range 267 miles

Vertical Obstacle 18"

Armor Protection None

Prominent Operational Feature or Characteristic

The XM571 is a dual-body, articulated, tracked vehicle. The two bodies are connected by an articulating joint assembly permitting them to arch vertically (pitch), rotate (roll) and turn (yaw) with respect to one another. This action permits each body and its suspension system to conform independently to the terrain geometry. Powered articulation of the two units allows the vehicle to turn within a 20 foot radius. This method of steering allows all tracks to constantly drive. The front unit can operate independently of the rear unit and has a pivot turn capability.

Type of Terrain Capabilities and Limitations

The XM571 exhibits high mobility due to its low average ground pressure of 1.7 - 2.0 psi. This vehicle is capable of roadway and general cross-country operation in moderately-dissected terrain, in soft terrain, and soft-slippery mud. The vehicle exhibits good mobility in marsh, swamp, muskeg, and tundra. This vehicle is floatable and can navigate lakes, streams, and slow moving rivers and has the ability to negotiate moderately inclined, semi-firm structured river banks, and the bunds in the rice paddy areas.

General Remarks

Although the XM571 has superior mobility characteristics, it has certain areas which could be improved to further increase its mobility. The vehicle is limited to slow moving rivers because of its low water speed and freeboard. Water entry and exit angles are too low and should be increased. Track life should be increased.

This vehicle has been produced in limited pilot model quantities. The XM571 power plant requires use of combat gasoline. The vehicle can be delivered by air transport, helicopter lift, and Phase I air drop (parachute).

As many as three units may be coupled together to achieve greater capacity and mobility.

Manufacturer

Canadair Limited

Name of Vehicle	<u>M16 Husky</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle:	<u>Tracked Amphibian</u>
Physical Size	<u>L-15'6", W-6'10", H-6'8"</u>
Vehicle Weight, Net	<u>7,400<sup>#</sup></u>
Capacity	
Weight	<u>3,000<sup>#</sup></u>
Cubage	<u>8'x6'x4' (est.)</u>
Personnel	<u>10-13 plus driver</u>
Speed	
Improved Roads	<u>37 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>3.7 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>73°</u>
Angle of Departure	<u>67°</u>
Ground Clearance	<u>15 1/2" - 14"</u>
Range	<u>22 miles water, 300 miles land</u>
Vertical Obstacle	<u>18"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

An amphibious cargo or personnel carrier with wide band-type track and enclosed cab.

Type of Terrain Capabilities and Limitations

This vehicle is capable of negotiating rough cross-country terrain and many of the weak soils found in delta areas.

General Remarks

This vehicle was intended to replace the Weasel as a general purpose, low-ground pressure, full tracked amphibious vehicle. In South Vietnam, it would have considerable mobility in the weak soils of the delta areas due to its low-ground pressure of 1.67 psi to 2.74 psi loaded but would have limited mobility in traversing the bunds and steep river or canal banks.

Manufacturer

Name of Vehicle	<u>LV1PK11</u>	
Production	<u>Prototype</u>	<u>Concept</u>
Type of Vehicle	<u>Tracked Amphibian</u>	
Physical Size	<u>L-21'3", W-10'6", H-7'9"</u>	
Vehicle Weight, Net	<u>26,961#</u>	
Capacity		
Weight	<u>8,000#</u>	
Cubage	<u>6'3"x12'6"x5'6"</u>	<u>430 cu ft</u>
Personnel	<u>30-31</u>	
Speed		
Improved Roads	<u>40 mph</u>	
Cross-Country	<u>8-12 mph</u>	
Water	<u>6 mph</u>	
Gradenability	<u>70%</u>	
Side Slope	<u>60%</u>	
Angle of Approach	<u>73°</u>	
Angle of Departure	<u>45°</u>	
Ground Clearance	<u>18"</u>	
Range	<u>12.7 hrs water, 300 miles land</u>	
Vertical Obstacle	<u>3'</u>	
Armor Protection	<u>Lightly armored</u>	

Prominent Operational Feature or Characteristic

A light weight, tracked amphibian with moderate ground pressure designed for assault operations.

Type of Terrain Capabilities and Limitations

Capable of negotiating hilly terrain, mud, snow, sand and shallow swamps.

General Remarks

This vehicle is not capable of negotiating deep swamps or mountainous terrain. The vehicle is mobile with a ground pressure of 4.4 to 5.7 psi loaded and is capable of crossing 2' ditches. It is felt that this vehicle could negotiate the dikes and some of the river banks found in South Vietnam, but due to its moderate ground pressure, it would not be mobile over the weak soils of the delta areas.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle	<u>LCA</u>
Production	Prototype <u>X</u> Concept
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-681", W-252", H-170"</u>
Vehicle Weight, Net	<u>76,400<sup>#</sup></u>
Capacity	
Weight	<u>60,000<sup>#</sup></u>
Cubage	<u>571"x138"x96"</u>
Personnel	<u>161</u>
Speed	
Improved Roads	<u>20 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>13.8 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>19°</u>
Angle of Departure	<u>19°</u>
Ground Clearance	<u>18"</u>
Range	<u>10 hrs (8 water, 2 land)</u>
Vertical Obstacle	<u>31"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A heavy weight, tracked amphibian for ship-to-shore water operation and limited firm cross-country operation.

Type of Terrain Capabilities and Limitations

This vehicle is capable of negotiating rough water, surf zone, difficult beaches, sand dunes and some inland terrain.

General Remarks

This vehicle would have limited mobility in South Vietnam due to its physical size and heavy ground pressure of 10.1 psi loaded. This vehicle would speed supply and resupply from ship to prepared landing areas.

Manufacturer

Food Machinery Corporation

Name of Vehicle	<u>LVTP-5</u>
Production <input checked="" type="checkbox"/>	Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-29'8", W-11'8<math>\frac{1}{2}</math>", H-9'7"</u>
Vehicle Weight, Net	<u>64,200<sup>#</sup></u>
Capacity	
Weight	<u>12,000<sup>#</sup></u>
Cubage	<u>15'0"x7'3"x5'6"</u>
Personnel	<u>34</u>
Speed	
Improved Roads	<u>29 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>6.7 mph</u>
Gradeability	<u>70%</u>
Side Slope	<u>60%</u>
Angle of Approach	<u>17<sup>o</sup></u>
Angle of Departure	<u>16<sup>o</sup></u>
Ground Clearance	<u>18"</u>
Range	<u>9 hr land, 9 hr water</u>
Vertical Obstacle	<u>40"</u>
Armor Protection	<u>Yes</u>

Prominent Operational Feature or Characteristic:

Tracked, armored amphibian, assault personnel and cargo carrier.

Type of Terrain Capabilities and Limitations

This vehicle is capable of traversing cross-country terrain, semi-firm soils and is amphibious.

General Remarks

This vehicle was designed for assault operations and is capable of transporting cargo or personnel from ship to inland areas. The mobility in South Vietnam would be limited due to the ground pressure of 9.22 psi loaded. This vehicle will damage roads other than concrete due to its aggressive tread.

Manufacturer

RAC-T-474

Make of Vehicle	<u>M-76 Otter</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-199.4", W-98", H-108"</u>
Vehicle Weight, Net	<u>8,813<sup>#</sup></u>
Capacity	
Weight	<u>3,349<sup>#</sup></u>
Cubage	<u>20.8 cu ft</u>
Personnel	<u>10 including crew</u>
Speed	
Improved Roads	<u>28 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4 1/2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30% (est.)</u>
Angle of Approach	<u>40 1/4°</u>
Angle of Departure	<u>45 1/2°</u>
Ground Clearance	<u>16 3/4" loaded</u>
Range	<u>160 miles land, 5.8 hrs water</u>
Vertical Obstacle	<u>18"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A full, wide tracked amphibian with low ground pressure.

Type of Terrain Capabilities and Limitations

A highly mobile vehicle with good cross-country abilities and a low ground pressure of 2.1 psi.

General Remarks

This vehicle can pivot turn and is capable of crossing a 60" wide trench. Its mobility in South Vietnam would be limited by the physical size of the vehicle and fairly high center of gravity. It has poor track performance in sand and snow and suffers from certain minor deficiencies.

Manufacturer

Name of Vehicle	<u>W-77 Canadian Bat</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-157", W-48", H-61"</u>
Vehicle Weight, Net	<u>1,500<sup>#</sup></u>
Capacity	
Weight	<u>1,000<sup>#</sup></u>
Cubage	<u>      </u>
Personnel	<u>6 plus driver (est.)</u>
Speed	
Improved Roads	<u>23 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>2 mph</u>
Gradeability	<u>60% (est.)</u>
Side Slope	<u>30% (est.)</u>
Angle of Approach	<u>90°</u>
Angle of Departure	<u>90°</u>
Ground Clearance	<u>4.5"</u>
Range	<u>200 miles (est.)</u>
Vertical Obstacle	<u>12" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A two section, tracked carrier that incorporates a track which covers practically the entire width of the vehicle.

Type of Terrain Capabilities and Limitations

This vehicle has good mobility and is capable of movement in deep snow, marshes, swamps, muskeg and tundras.

General Remarks

This vehicle would have good mobility on the weak soils of South Vietnam but its performance suffers severely because of poor steering response and the lack of service brakes. The XM571 was developed as a successor to the CL-70 with many improvements incorporated.

Manufacturer

RAC-T-474

239

Name of Vehicle	<u>Swamp Spryte Model 1301</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-157", W-77", H-79"</u>
Vehicle Weight, Net	<u>2,850<sup>#</sup></u>
Capacity	
Weight	<u>1,000<sup>#</sup></u>
Cubage	<u>74"x70"x48"</u>
Personnel	<u>5 plus driver (est.)</u>
Speed	
Improved Roads	<u>35 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4.2 m.p.h.</u>
Gradeability	<u>60%</u>
Side Slope	<u>45%</u>
Angle of Approach	<u>60° (est.)</u>
Angle of Departure	<u>30° (est.)</u>
Ground Clearance	<u>12"</u>
Range	<u>120 miles land</u>
Vertical Obstacle	<u>8" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A light weight, low ground pressure, full tracked amphibian.

Type of Terrain Capabilities and Limitations

This vehicle can negotiate thick brush, deep snow, rough and steep mountains, and weak soils.

General Remarks

This vehicle is a light weight, cargo carrier with amphibious capabilities. A wide band type track is used which reduces the ground pressure to .78 psi empty. The original 3 ply, cotton cord, rubber covered belting was not sufficiently durable for military use. Therefore, a new 3 ply, nylon cord, rubber covered belting has been tested with no failures to date. This vehicle is easily adapted for armor protection. It has sufficient road speed to maintain its position in convoys, with excellent off-road performance. The hull would require minor modification to eliminate the shipment of water during entry and exit from river banks.

Manufacturer

Thickol Corporation

Name of Vehicle Thiokol Model 604

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Tracked / Amphibian

Physical Size L-199", W-95.5", H-91.5"

Vehicle Weight, Net 2,735<sup>#</sup>

Capacity

Weight 3,000<sup>#</sup>

Cubage 136"x88"x36" (est.)

Personnel 14 including driver

Speed

Improved Roads 25 mph

Cross-Country 8-12 mph

Water 4 mph

Gradeability 60%

Side Slope 45%

Angle of Approach 45°

Angle of Departure 45°

Ground Clearance 13"

Range 150 miles land (est.)

Vertical Obstacle 12" (est.)

Armor Protection None

Prominent Operational Feature or Characteristic

A light-weight, wide tracked, low ground pressure amphibian with excellent weak soil trafficability.

Type of Terrain Capabilities and Limitations

This vehicle can negotiate thick brush, deep snow, rough cross-country terrain and weak soils of South Vietnam.

General Remarks

This vehicle is basically a light weight, cargo carrier with amphibious capabilities. A 30" wide, drop-center, self clearing track is used with grousers of formed steel which are bolted to 3 ply nylon cord and impregnated rubber belting. These tracks have experienced 15,000 miles of operation without failure. The latest modifications include a torsion bar suspension system, polyurethane covered steel core sprocket, and 6 ply nylon cord tires with metal tread treader ply. A vehicle similar to this has been tested in Thailand and was found to have excellent mobility in the rice paddies, over the bungs and on the weak soils of the delta area. Its performance in the jungles would be somewhat limited due to the 15' steering radius and the width of the vehicle. This vehicle would have mobility on the slow moving streams and rivers but could not negotiate the fast moving rivers due to its low water speed. The entrance and exiting from river or canal tanks is limited due to the low body profile.

Manufacturer

Thiokol Corporation

Name of Vehicle	<u>FAHTEP</u>
Production	<u>      </u> Prototype <u>      </u> Concept <u>X</u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-120", W-66", H-42"</u>
Vehicle Weight	<u>1,250<sup>#</sup></u>
Capacity	
Weight	<u>1,250<sup>#</sup></u>
Cubage	<u>6'x5'x3' (est.)</u>
Personnel	<u>6 (est.)</u>
Speed	
Improved Roads	<u>35 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4 mph (est.)</u>
Gradeability	<u>60%</u>
Side Slope	<u>30% (est.)</u>
Angle of Approach	<u>90° (est.)</u>
Angle of Departure	<u>90° (est.)</u>
Ground Clearance	<u>9" (est.)</u>
Range	<u>200 miles land</u>
Vertical Obstacle	<u>9" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A full tracked, air droppable, amphibious vehicle with low ground pressure and solid bogie wheels.

Type of Terrain Capabilities and Limitations

This vehicle should be capable of negotiating rough cross-country terrain and marshy, muddy areas.

General Remarks

This concept is intended to provide a general purpose, unarmored, low-ground pressure, amphibious, full tracked vehicle. It has an estimated ground pressure of 1.25 psi utilizing a sand type track. The estimated ground clearance is too low and the vehicle would become immobile in the weak soils of South Vietnam.

Manufacturer

Name of Vehicle Super Martin

Production \_\_\_\_\_ Prototype \_\_\_\_\_ Concept Y

Type of Vehicle Tracked Amphibian

Physical Size L-144", W-70", H-45"

Vehicle Weight, Net 3,500#

Capacity

Weight 3,500#

Cubage NA

Personnel 12 (est.)

Speed

Improved Roads 35 mph

Cross-Country 8-12 mph

Water 4 mph (est.)

Gradeability 60%

Side Slope 40% (est.)

Angle of Approach 90° (est.)

Angle of Departure 90° (est.)

Ground Clearance 12" (est.)

Range 325 miles land

Vertical Obstacle 12" (est.)

Armor Protection None

Prominent Operational Feature or Characteristic

A full tracked, amphibious vehicle concept with fairly low ground pressure. A larger version of the "Fartin."

Type of Terrain Capabilities and Limitations

This vehicle concept should be capable of negotiating rough cross-country terrain and marshy, muddy areas.

General Remarks

The low ground pressure of 2 psi would enable this vehicle to cross much of the weak soils of South Vietnam. Its low ground clearance would prove to be an obstacle to mobility. The horse power to weight ratio is high and the vehicle would suffer in performance from low horsepower.

Manufacturer

Name of Vehicle	<u>KRISTE KT-4A</u>
Production	<u>Prototype X</u> <u>Concept</u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-210 3/4", W-114 3/4", H-85 1/2"</u>
Vehicle Weight, Net	<u>3,080<sup>#</sup></u>
Capacity	
Weight	<u>1,500<sup>#</sup></u>
Cubage	<u>NA</u>
Personnel	<u>6-8</u>
Speed	
Improved Roads	<u>25 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4 mph (est.)</u>
Gradeability	<u>50% (est.)</u>
Side Slope	<u>30% (est.)</u>
Angle of Approach	<u>90° (est.)</u>
Angle of Departure	<u>90° (est.)</u>
Ground Clearance	<u>4 3/4"</u>
Range	<u>100 miles (est.)</u>
Vertical Obstacle	<u>18" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A marginal terrain, flotation block, full tracked, amphibious vehicle.

Type of Terrain Capabilities and Limitations

This vehicle is capable of traversing marshy, muddy terrain and would have limited cross-country mobility.

General Remarks

This vehicle is not suitable for use in South Vietnam due to the fragile nature of the flotation block, tracks and the mechanical difficulties encountered during testing.

Manufacturer

Jered Industries

Name of Vehicle M113 APC

Production X Prototype \_\_\_\_\_ Concept \_\_\_\_\_

Type of Vehicle Tracked Amphibian

Physical Size L-191", W-10" 3/4", H-72"

Vehicle Weight, Net 20,310#

Capacity

Weight 3,210#

Cubage 110"x96"x62"

Personnel 13

Speed

Improved Roads 40 mph

Cross-Country 8-12 mph

Water 3.1 mph

Gradeability 60%

Side Slope 30%

Angle of Approach 70°

Angle of Departure 40°

Ground Clearance 16"

Range 200 miles

Vertical Obstacle 4"

Armor Protection Aluminum - Small arms

Prominent Operational Feature or Characteristic

A light weight, armored, air droppable, full-tracked amphibious vehicle for relatively difficult, but firm and semi-firm cross-country terrain.

Type of Terrain Capabilities and Limitations

This vehicle is capable of limited water operation, cross-country operation over rough terrain and high speed operation over improved roads.

General Remarks

This vehicle has limited mobility in marshy terrain. The water operation is presently limited by its inability to negotiate the river and canal banks without aid. A capstan device for mounting on the drive sprockets has enabled the vehicle to negotiate some of the banks. A machine gun cupola has recently been adapted for use on the vehicle. The vehicle has a trench crossing capability of 66" and a turning radius 22'. The ground pressure is moderate, developing 7.5 psi loaded.

Manufacturer

Food Machinery Corporation

Name of Vehicle	<u>XM-54CE1</u>
Production	<u>Prototype X Concept</u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-17'11 7/8", W-8'10", H-6'7"</u>
Vehicle Weight, Net	<u>16,450<sup>#</sup></u>
Capacity	
Weight	<u>10,000<sup>#</sup></u>
Cubage	<u>130 5/8"x96 1/2"x72"</u>
Personnel	<u>14 including crew</u>
Speed	
Improved Roads	<u>40 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>2.6 mph</u>
Gradeability	<u>40%</u>
Side Slope	<u>35%</u>
Angle of Approach	<u>57°</u>
Angle of Departure	<u>35°</u>
Ground Clearance	<u>16"</u>
Range	<u>300 miles</u>
Vertical Obstacle	<u>24"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A light weight, unarmored, air droppable, full-tracked amphibious vehicle for relatively difficult but firm and semi-firm cross-country terrain.

Type of Terrain Capabilities and Limitations

This vehicle is capable of limited water operation, cross-country operation over rough terrain and high speed operations over improved roads.

General Remarks

This vehicle is the same as the M113A1 except for the open cargo deck. It has limited mobility in marshy areas. The water operation is presently limited by its inability to negotiate the river and canal banks without aid.

Manufacturer

Food Machinery Corporation

Name of Vehicle	<u>EN-10</u>
Production	<u>Civ.</u>
Prototype	<u>X</u>
Concept	<u>        </u>
Type of Vehicle	<u>Carrier, Tracked, Cargo, 1/2-Ton, Floatable</u>
Physical Size	<u>L-10'5", W-5'6", H-4'11"</u>
Vehicle Weight, Net	<u>2,600<sup>#</sup></u>
Capacity	
Weight	<u>1,000<sup>#</sup></u>
Cubage	<u>27 sq ft - 61 cu ft (approx.)</u>
Personnel	<u>6-8</u>
Speed	
Improved Roads	<u>18-24 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30-40%</u>
Angle of Approach	<u>50°</u>
Angle of Departure	<u>45°</u>
Ground Clearance	<u>8"</u>
Range	<u>100 miles (approx.)</u>
Vertical Obstacle	<u>10-13" (est.)</u>
Ambor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A light weight, full tracked, open top cargo carrier with band type tracks.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (depth somewhat less than its ground clearance), in swampy-marsh terrain. This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

This vehicle incorporates 24" wide rubber and steel tracks with ground pressure of 1.03 psi loaded. It is highly mobile but driver and passengers are quite exposed due to lack of a cab. The vehicle's mobility in South Vietnam would be limited by the low ground clearance and the low approach and departure angles. While it is fully capable of traversing the weak soils of the delta area, its ability to negotiate the river and canal banks would be limited. The RN-10 has a turn radius of 84 feet.

Manufacturer

Nodwell Corporation

Name of Vehicle	RF-20
Production	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	Carrier, Tracked, Cargo, 1-Ton, Flexible
Physical Size	L-15'10", W-8'6", H-8'1"
Volume Weight, Net	6,500 <sup>#</sup>
Capacity	
Weight	2,000 <sup>#</sup>
Cubage	64 sq ft, 320 cu ft
Personnel	12-18
Speed	
Improved Roads	22-25 mph
Cross-Country	8-12 mph
Water	2 mph
Gradeability	60%
Side Slope	30-40%
Angle of Approach	47°
Angle of Departure	35½°
Ground Clearance	14"
Range	150-175 miles
Vertical Obstacle	204"
Armor Protection	None

Prominent Operational Feature or Characteristic

This vehicle operates on wide, flat belt-type tracks equipped with steel cross-bars (grousers). The vehicle has an average ground pressure of 1.4 psi. The RM-20 has a turn radius of 8 $\frac{1}{2}$ -9 feet.

Type of Terrain Capabilities and Limitations

The vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain in soft slippery mud (soft depth somewhat less than its ground clearance), in swampy-marsh terrain. This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

A prototype of this vehicle is presently under construction. The suspension system of this vehicle does have a high approach front track return idler wheel.

Manufacturer

Food Machinery Corporation  
Robin-Nodwell Mfg. Ltd.

Name of Vehicle	<u>RN-75</u>
Production	<u>Prototype <input checked="" type="checkbox"/> Concept</u>
Type of Vehicle	<u>Carrier, Tracked, Cargo, 2 1/2-Ton</u>
Physical Size	<u>L-16'1", W-9'1", H-8'10"</u>
Vehicle Weight, Net	<u>9,930<sup>#</sup></u>
Capacity	
Weight	<u>7,500<sup>#</sup></u>
Cubage	<u>72 sq ft, 300 cu ft (approx.)</u>
Personnel	<u>14-16</u>
Speed	
Improved Roads	<u>12-14 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-2 mph at 36 inch fording depth only</u>
Gradeability	<u>60%</u>
Side Slope	<u>30-40%</u>
Angle of Approach	<u>34°</u>
Angle of Departure	<u>78°</u>
Ground Clearance	<u>16"</u>
Range	<u>100 miles (approx.)</u>
Vertical Obstacle	<u>14-16"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

This vehicle operates on wide, flat belt-type tracks equipped with steel cross-bars (grousers). The vehicle has a low average ground pressure of 2.3 psi. The RM-75 has a turn radius of 8½-9 feet.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance), in swampy-marsh terrain. This vehicle is not floatable, but can ford shallow lakes, streams, and rivers of moderate velocity, with firm bottoms. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

This vehicle is not floatable. The obstacle, vertical bank, and water egress ability of this vehicle is limited as it does not have a high approach front track return idler wheel. However, a front idler could easily be incorporated.

Manufacturer

Food Machinery Corporation  
Robin-McDowell Mfg. Ltd.

Name of Vehicle	<u>RM-110 DF (Floater)</u>
Production	<u>Prototype X Concept</u>
Type of Vehicle	<u>Carrier, Tracked, Carry, 1-Ton, Floatable</u>
Physical Size	<u>L-19'6", W-9'4", H-5'10"</u>
Vehicle Weight, Net	<u>20,620<sup>#</sup></u>
Capacity	
Weight	<u>8,000<sup>#</sup></u>
Cubage	<u>26 sq ft - 380 cu ft</u>
Personnel	<u>18-22</u>
Speed	
Improved Roads	<u>19 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>1-1 1/2 mph</u>
Gradeability	<u>60%</u>
Side Slope	<u>30-40%</u>
Angle of Approach	<u>34°</u>
Angle of Departure	<u>78°</u>
Ground Clearance	<u>16"</u>
Range	<u>100 miles (approx.)</u>
Vertical Obstacle	<u>15-18" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

This vehicle operates on wide, flat, belt-type tracks equipped with steel cross-bars (grousers). The vehicle has an average ground pressure of 2.4-2.7 psi. The RN-110EF has a turn radius of 84-9 feet.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft, slippery mud (depth somewhat less than its ground clearance), in swampy-marsh terrain. This vehicle is floatable and can navigate lakes, streams, and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

The obstacle, vertical bank, and water egress ability of this vehicle is limited as it does not have a high approach front track return idler wheel. Two prototypes have been built for the US military. These vehicles have exceeded their original weight goals and are several thousand pounds overweight.

Manufacturer

Food Machinery Corporation  
Robin-Rodwell Mfg. Ltd.

Name of Vehicle	UET
Production	Prototype <u>X</u> Concept
Type of Vehicle	Universal Engineering Tractor & Tracked Amphibian
Physical Size	L-220", W-110", H-87"
Vehicle Weight, Net	21,000#
Capacity	
Weight	24,000#
Cubage	200 cu ft
Personnel	10
Speed	
Improved Roads	40 mph
Cross-Country	5-12 mph
Water	4-4.5 mph
Gradeability	60%
Side Slope	30% (est.)
Angle of Approach	25°
Angle of Departure	33°
Ground Clearance	13.7" reduces to -6"
Range	200 miles
Vertical Obstacle	15'
Armor Protection	Yes

Prominent Operational Feature or Characteristic

A multipurpose, air droppable vehicle which can be used as a bulldozer, earth mover, cargo transporter, personnel transporter and prime mover.

Type of Terrain Capabilities and Limitations

This vehicle can negotiate rough cross-country terrain but can not negotiate rough water due to its limited freeboard.

General Remarks

Special purpose vehicle, steering radius 30' and ground pressure 7.54 to 12.89 psi loaded. The payload to net weight ratio is approximately .8. It has the ability to improve roads or to create temporary roads through thick jungle by virtue of its bulldozer blade. The vehicle's amphibious capability is increased considerably by the fact that it can doze itself a path when entering or leaving the water depending on the depth of the streams and whether traction can be obtained. This vehicle is capable of approximately the same mobility as the M113 APC, but has considerably more use. It would have little mobility on the weak soils of South Vietnam, but should be operable in the jungles.

Manufacturer

International Harvester

Name of Vehicle	<u>Borg-Trac</u>
Production	<u>Prototype</u> <u>Concept</u> <u>X</u>
Type of Vehicle	<u>Carrier, Tracked, Cargo &amp; Personnel, Floatable</u>
Physical Size	<u>L-11'6", W-5'4", H-4'10 1/2"</u>
Vehicle Weight, Net	<u>1,900#</u>
Capacity	
Weight	<u>1,800# land, 900# water</u>
Cubage	<u>33 sq ft</u>
Personnel	<u>7-8</u>
Speed	
Improved Roads	<u>30 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>2-3 mph, 10 mph with outboard</u>
Gradeability	<u>70-80%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>80°</u>
Angle of Departure	<u>80°</u>
Ground Clearance	<u>10"-14"</u>
Range	<u>200 miles or 10 hours</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Vehicle is articulated and has extremely low ground pressure.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance), in swampy-marsh terrain. The vehicle is floatable and can navigate lakes, streams, and swift moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river bank-

General Remarks

Average ground pressure 0.49 psi.

Manufacturer

Ingersoll Kalamazoo Division, Borg-Warner Corporation

RAC-T-474

Name of Vehicle	<u>HIMO</u>
Production	<u>          </u>
Prototype	<u>          </u>
Concept	<u>X</u>
Type of Vehicle	<u>Carrier, Cargo &amp; Personnel, 2<sup>1/2</sup>-3-Ton, 6x6, Amphibious</u>
Physical Size	<u>L-27'0", W-6'0", H-8'0"</u>
Vehicle Weight, Net	<u>5,000#</u>
Capacity	
Weight	<u>5,000-6,000#</u>
Cubage	<u>114 sq ft</u>
Personnel	<u>25-30</u>
Speed	
Improved Roads	<u>25 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>10-12 mph</u>
Gradeability	<u>50-70%</u>
Side Slope	<u>35%</u>
Angle of Approach	<u>24°</u>
Angle of Departure	<u>22°</u>
Ground Clearance	<u>18"</u>
Range	<u>200-300 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Very low ground pressure-wheeled. Extremely low ground pressure-wheel-belt track. Vehicle can be converted wheel-to-track.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance), in swampy-marsh terrain. This vehicle is floatable and can navigate lakes, streams, and swift moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average ground pressure--wheeled 5.8 psi and wheel-belt-track 3.6 psi.

Manufacturer

ERDL, Marine Branch, Military Dept.

SHALLOW-DRAFT BOATS

Name of Vehicle	S.D.B. (Recommended)
Production	Prototype _____ Concept <u>X</u>
Type of Vehicle	Shallow Draft Boat
Physical Size	123'10", W-9'5"
Vehicle Weight, Net	2,450# without crew
Capacity	
Weight	2,000#
Cubage	11'0" x 7'0" x 6'0"
Personnel	12 plus driver
Speed	
Improved Roads	NA
Cross-Country	NA
Water	40 knots unloaded, 30 knots loaded
Gradeability	NA
Side Flope	NA
Angle of Approach	NA
Angle of Departure	NA
Ground Clearance	NA
Range	150 miles (Water Screw), 75 miles (Air Screw)
Vertical Obstacle	20"
Armor Protection	Provisions for quick attachment of light armor.

Prominent Operational Feature or Characteristic

A flat bottom shallow draft boat with a scow shaped bow. This craft is propelled both by an air screw and an auxiliary water screw for operation on inland waters or swampy terrain.

Type of Terrain Capabilities and Limitations

This craft would be capable of traversing inland waterways, fairly level grass and weed covered terrain, marshes, swamps and limited operation on dry land.

General Remarks

This craft would be capable of high speed water operation with reduced speed operation over the swamps and marshes. The scow shaped bow would enable the craft to surmount obstacles up to 24" to 30" high depending on the consistency of the obstacle. A firm object such as a tree stump would undoubtedly puncture the hull if encountered at high speed. The auxiliary water screw would give the craft more maneuverability on the inland waterways, greater efficiency and reduced engine operating noise.

Manufacturer

Name of Vehicle	<u>Air Sled</u>
Production	<u>Prototype <input checked="" type="checkbox"/> Concept <input type="checkbox"/></u>
Type of Vehicle	<u>19' Rescue Boat</u>
Physical Size	<u>L-20'11" W-7'11 3/4"</u>
Vehicle Weight, Rec	<u>2400<sup>#</sup></u>
Capacity	
Weight	<u>1425<sup>#</sup></u>
Cubage	<u></u>
Personnel	<u>2</u>
Speed	
Improved Roads	<u>NA</u>
Cross-Country	<u>NA</u>
Water	<u>27 knots full load</u>
Gradeability	<u>NA</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>NA</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>NA</u>
Range	<u>50 nautical miles at F.P. and F.L.</u>
Vertical Obstacle	<u>NA</u>
Air Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A flat bottomed, fiberglass reinforced, plastic craft. This boat was designed to perform shallow water rescue operations.

Type of Terrain Capabilities and Limitations

This craft is suitable for water operation on fairly calm waters and on some vegetation choked streams.

General Remarks

The craft is severely underpowered and with a draft of 6" would lack performance in the canals and rivers of South Vietnam. Further development of this craft has been discontinued.

Manufacturer

Ray Green

Name of Vehicle	<u>JBX 21</u>
Production	<u>Prototype <input checked="" type="checkbox"/> Concept</u>
Type of Vehicle	<u>Air Propelled Watercraft</u>
Physical Size	<u>L-23'10", W-9'5"</u>
Vehicle Weight, Net	<u>2650# without crew of one</u>
Capacity	
Weight	<u>2000#</u>
Cubage	<u>11'0"x7'0"x6'0"</u>
Personnel	<u>12 plus driver</u>
Speed	
Improved Roads	<u>NA</u>
Cross-Country	<u>NA</u>
Water	<u>43 knots unloaded, 34 knots loaded</u>
Gradeability	<u>NA</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>NA</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>NA</u>
Range	<u>60 miles</u>
Vertical Obstacle	<u>18"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Air propelled, flat bottom, shallow draft boat for inland water and marsh operation.

Type of Terrain Capabilities and Limitations

Heavy, swampy vegetation, canals, rivers, and limited operation on grass and dry land.

General Remarks

Draft 9" loaded, 8" unloaded. Thrust 1300<sup>#</sup> produced by a 400 H.P. Lycoming engine. This craft is capable of negotiating heavy swampy vegetation, mud, shallow rivers, and canals and muddy flats. It is also capable of high speed operation and can surmount obstacles up to 24" to 30" high depending on the consistency of the obstacle. A firm object such as a tree stump would puncture the hull in most cases. This craft has the capacity for limited operation on dry, hard surfaced roads, crushed rock roads and in areas where the grass and small sterna may stand 3' high. Continued operation on hard surface roads would reduce the life of the hull. This craft would have mobility in South Vietnam in areas where other boats cannot operate. The operating noise level of the craft is very high.

Manufacturer

ERDL, Marine Branch

Name of Vehicle 15-Ton Shallow-Draft Boat

Production \_\_\_\_\_ Prototype \_\_\_\_\_ Concept X

Type of Vehicle Shallow Draft Boat - Water Jet

Physical Size L-55', W-14' H-4.5'-9.5'

Vehicle Weight, Net 24,000<sup>#</sup>

Capacity

Weight 30,000<sup>#</sup>

Cubage 33'10"x9'x6'

Personnel 42 (est.)

Speed

Improved Roads 0

Cross-Country 0

Water 15 knots loaded

Gradeability NA

Side Slope NA

Angle of Approach 16<sup>o</sup>

Angle of Departure NA

Ground Clearance NA

Range 100 miles

Vertical Obstacle NA

Armor Protection None

Prominent Operational Feature or Characteristic

Shallow draft craft with a draft of 18" loaded and 10" unloaded.  
Constructed of aluminum, propelled by two water jets.

Type of Terrain Capabilities and Limitations

Deep water and shallow weed infested water operation.

General Remarks

This concept was designed to be capable of negotiating waterways heavily infested with marine growth, shallow jungle rivers, and inland waterways in temperate, tropic and near Arctic climates.

This boat would not be capable of negotiating the dikes found in South Vietnam and it is too heavy for portage. Therefore, the boat would be limited in its operation.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle	<u>15-Ton Shallow-Draft Boat</u>
Production	<u>          </u> Prototype <u>          </u> Concept <u>X</u>
Type of Vehicle	<u>Shallow Draft Boat-Paddle Wheel</u>
Physical Size	<u>L-55', W-14', H-4'6" to 9'6"</u>
Vehicle Weight, Net	<u>30,000<sup>#</sup></u>
Capacity	
Weight	<u>30,000<sup>#</sup></u>
Cubage	<u>33'10"x9'x6'</u>
Personnel	<u>42 (est.)</u>
Speed	
Improved Roads	<u>0</u>
Cross-Country	<u>0</u>
Water	<u>10 knots loaded</u>
Gradeability	<u>NA</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>16°</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>NA</u>
Range	<u>100 miles water (est.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Shallow draft craft with a draft of 19½" loaded and 10½" unloaded, propelled with paddle wheels.

Type of Terrain Capabilities and Limitations

Deep water and shallow weed infested water operation.

General Remarks

This concept was designed to be capable of negotiating waterways heavily infested with marine growth, shallow jungle rivers, and inland waterways in temperate, tropic and arctic climates.

This boat would not be capable of negotiating the dikes found in South Vietnam and it is too heavy for portage. Therefore, the boat would be limited in its operation.

Manufacturer

Ingersoll Rand Corp Division

### LANDING-CRAFT BOATS

Name of Vehicle	LCM-6
Production	<input checked="" type="checkbox"/>
Prototype	<input type="checkbox"/>
Concept	<input type="checkbox"/>
Type of Vehicle	Non-amphibious Landing Craft
Physical Size	L-56.0', W-14.0'
Vehicle Weight, Net	56,000 <sup>#</sup>
Capacity	
Weight	34.0 tons
Cubage	37.5'x9.5'
Personnel	107-120
Speed	
Improved Roads	NA
Cross-Country	NA
Water	10.9 mph full load
Gradeability	NA
Side Slope	NA
Angle of Approach	NA
Angle of Departure	NA
Ground Clearance	NA
Range	110 nautical miles at full power and full load
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

A semi-flat bottom, welded, steel craft with tunnel stern and beaching capabilities.

Type of Terrain Capabilities and Limitations

This craft is capable of negotiating deep water, fairly shallow water and beaches.

General Remarks

This craft would be limited to carrying cargo or personnel from off-shore ships or from depots to suitable staging areas along the shore of large rivers. Due to the craft's length and draft of 3'10" loaded, a fairly deep and wide river would be required. Its mobility up the rivers and canals of South Vietnam would be very limited.

Manufacturer

Name of Vehicle	<u>MK II</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle	<u>Swimmer Support Craft</u>
Physical Size	<u>L-14'7<math>\frac{1}{2}</math>" , W-6'11" , H-24"</u>
Vehicle Weight, Net	<u>550<sup>#</sup></u>
Capacity	
Weight	<u>1650<sup>#</sup></u>
Cubage	<u>NA</u>
Personnel	<u>6</u>
Speed	
Improved Roads	<u>NA</u>
Cross-Country	<u>NA</u>
Water	<u>23.5 mph no load, 7 mph loaded</u>
Gradeability	<u>NA</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>NA</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>NA</u>
Range	<u>50 miles (est.)</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

This craft is constructed of bonded polystyrofoam planks covered with fiberglass impregnated with resin.

Type of Terrain Capabilities and Limitations

This craft can operate in moderately rough and vegetated waters.

General Remarks

Insufficient freeboard allows the craft to take on water when in a slight chop. The polystyrofoam material is subject to damage and rots due to action of fuels in the transom area. This craft can be manhandled by six men during difficult portage operations. This craft would have limited capabilities in South Vietnam.

Manufacturer

Name of Vehicle	LCM-3
Production <input checked="" type="checkbox"/>	Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	Non-amphibious Landing Craft
Physical Size	L-50'0", W 14'
Vehicle Weight, Net	52,075#
Capacity	
Weight	60,000#
Cubage	31'6"x9'5"x6'3"
Personnel	100
Speed	
Improved Roads	NA
Cross-Country	NA
Water	8.0 mph
Gradeability	NA
Side Slope	NA
Angle of Approach	NA
Angle of Departure	NA
Ground Clearance	NA
Range	130 nautical miles at F.P. & F.L.
Vertical Obstacle	NA
Armor Protection	

Prominent Operational Feature or Characteristic

A semi-flat bottom, welded, steel craft with tunnel stern and beaching capabilities.

Type of Terrain Capabilities and Limitations

This craft is capable of negotiating deep water, fairly shallow water and beaches.

General Remarks

This craft would be limited to carrying cargo or personnel from off-shore ships or depots to suitable staging areas along the larger canals and rivers. Due to this craft's length, a wide turning radius would be required. Its draft of 4' loaded requires a fairly deep river.

Manufacturer

Name of Vehicle	LCM-8
Production	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	Non-amphibious Landing Craft
Physical Size	L-73'6", W-21'0"
Vehicle Weight, Net	121,000#
Capacity	
Weight	120,000#
Cubage	45'3" x 14'9" x 4'25"
Personnel	200
Speed	
Improved Roads	NA
Cross-Country	NA
Water	10.4 mph
Gradeability	NA
Side Slope	NA
Angle of Approach	NA
Angle of Departure	NA
Ground Clearance	NA
Range	190 nautical miles F.P. & P.L.
Vertical Obstacle	NA
Armor Protection	None

Prominent Operational Feature or Characteristic

A semi-flat bottom, welded, steel hull landing craft for supply and resupply purposes.

Type of Terrain Capabilities and Limitations

Fairly deep water operations only.

General Remarks

This craft would be suitable for operation from ship-to-shore only. The physical size of the craft and the draft of 5'2" loaded precludes its use in some rivers and canals. This craft is propeller driven and is suitable for transporting tanks or larger vehicles during amphibious operations.

Manufacturer

Base of Vehicle	<u>LCVP</u>
Production <input checked="" type="checkbox"/>	Prototype <input type="checkbox"/> Concept <input type="checkbox"/>
Type of Vehicle	<u>36' Landing Craft</u>
Physical Size	<u>L-35'0", W-10'6"</u>
Vehicle Weight, Net	<u>18,500#</u>
Capacity	
Weight	<u>8000#</u>
Cubage	<u>17'4"x6'4"</u>
Personnel	<u>33-36</u>
Speed	
Improved Roads	<u>NA</u>
Cross-Country	<u>NA</u>
Water	<u>10.4 mph</u>
Gradeability	<u>NA</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>NA</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>NA</u>
Range	<u>110 nautical miles at F.P. &amp; F.L.</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>1/4" armor, steel</u>

Prominent Operational Feature or Characteristic

This craft is constructed of wood with armor, has a V bottom and is capable of transporting supplies and personnel from ship-to-shore.

Type of Terrain Capabilities and Limitations

Deep water and fairly shallow water operations.

General Remarks

The craft has a draft of 3'5" loaded and is propeller driven. The characteristics of this craft are similar to the LCM-3. This craft would be more maneuverable than the LCM-3 and with its armor protection, is more suitable for use in South Vietnam. Production of this craft has been discontinued and the steel LCM(6) will fill these requirements.

Manufacturer

Name of Vehicle	<u>Boston Whaler</u>
Production	<u>X</u> Prototype _____ Concept _____
Type of Vehicle	<u>Landing Craft</u>
Physical Size	<u>L-16'7", W-6'2", H-21"</u>
Vehicle Weight, Net	<u>650<sup>#</sup></u>
Capacity	
Weight	<u>1750<sup>#</sup></u>
Storage	<u>15'x5'6"x24" (est.)</u>
Personnel	<u>10 (est.)</u>
Used	
Improved Roads	<u>0</u>
Cross-Country	<u>0</u>
Water	<u>8.4 knots loaded, 40 H.P. motor</u>
Gradeability	<u>NA</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>NA</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>NA</u>
Range	<u>8 hr</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A marine, light-weight, man handable craft capable of operating in shallow, moderately vegetation-clogged streams.

Type of Terrain Capabilities and Limitations

Deep water and shallow water operations with moderate weed infestation.

General Remarks

The Whaler consists of two fiberglass hulls with hardened plastic foam "sandwiched" in between. This craft is fairly capable of operating in shallow, vegetation-clogged streams. The propeller will become fouled but the hull is strong enough to resist the abrasion and punctures which occur in beaching operations. This craft is recommended for use with a 40 H.P. outboard motor and a 10" diameter, 11 inch pitch, 3 blade bronze propeller. The maximum motor capacity is 80 H.P.

Manufacturer

Name of Vehicle 7-Man U.S. Navy Pneumatic Boat

Production X Prototype \_\_\_\_\_ Concept \_\_\_\_\_

Type of Vehicle Pneumatic Boat

Physical Size L-12', W-6', H-1'5"

Vehicle Weight, Net 128#

Capacity

Weight 1500# (est.)

Cubage 11'x5'x2' (est.)

Personnel 7

Speed

Improved Roads NA

Cross-Country NA

Water Idle speed or higher towed speed.

Gradeability NA

Side Slope NA

Angle of Approach NA

Angle of Departure NA

Ground Clearance NA

Range NA

Vertical Obstacle NA

Armor Protection None

Prominent Operational Feature or Characteristic

An inflatable, pneumatic boat for quiet river crossing.

Type of Terrain Capabilities and Limitations

Calm water and river crossing capabilities.

General Remarks

This pneumatic boat has the best characteristics of all the pneumatic boats tested. The steering and maneuvering capabilities are good. The boat is well compartmented and has a non-inflatable, rubberized canvas bottom. This craft is suitable for use in South Vietnam during silent river operations and against low speed river currents.

Manufacturer

**UNIQUE VEHICLES**

Name of Vehicle	<u>LVA-X1 ATROLL</u>
Production	<u>Prototype <input checked="" type="checkbox"/> Concept <input type="checkbox"/></u>
Type of Vehicle	<u>Tire-Tracked Amphibian</u>
Physical Size	<u>L-16'2", W-8', H-6'7 1/2"</u>
Vehicle Weight, Net	<u>5,900#</u>
Capacity	
Weight	<u>1,000#</u>
Cubage	<u>.6'x2'x4' (est.)</u>
Personnel	<u>5 to 7</u>
Speed	
Improved Roads	<u>25 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>5 mph</u>
Gradeability	<u>50%</u>
Side Slope	<u>4%</u>
Angle of Approach	<u>30°</u>
Angle of Departure	<u>42°</u>
Ground Clearance	<u>30"</u>
Range	<u>75 miles at 20 mph</u>
Vertical Obstacle	<u>30" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A marginal terrain, pneumatic tread, full tracked vehicle utilizing the "Tire-Track" principle.

Type of Terrain Capabilities and Limitations

Good cross-country performance except in heavy-current streams or rough waters. Excellent mobility over bottomless mud, vegetation choked marsh and inundated rice paddies.

General Remarks

This vehicle would have excellent mobility over the weak soils found in the delta areas of South Vietnam. Its mobility over the canals and across the river banks would be excellent due to its high approach angle, vertical obstacle crossing ability and high ground clearance. Mechanical and maintenance deficiencies were encountered during testing of the pilot models. The mobility of this vehicle in mountainous terrain and in jungles is highly limited due to its gradeability and side slope characteristics. Damage to the pneumatic tires may occur when operating in the thick brush and small tree infested areas.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle 1 1/2-Ton Terra-Tire-Track (Recommended)

Production \_\_\_\_\_ Prototype \_\_\_\_\_ Concept X

Type of Vehicle Tire-Tracked Amphibian

Physical Size L-15'2", W-9'0", H-4'2"

Vehicle Weight, Net 7000<sup>#</sup>

**Capacity**

Weight 3000<sup>#</sup>

Cubage 126"x108"x60' (est.)

Personnel 16

**Speed**

Improved Roads 30 mph

Cross-Country 8-12 mph

Water 3-4 mph (6-7 mph with propulsion aid)

Gradeability 60%

Side Slope 40%

Angle of Approach 60°

Angle of Departure 60°

Ground Clearance 14"

Range 150 miles land (est.)

Vertical Obstacle 24"

Armor Protection Optional

Prominent Operational Feature or Characteristic

A marginal terrain, pneumatic tread, full tracked vehicle utilizing the "Tire-Track" principle.

Type of Terrain Capabilities and Limitations

Good cross-country performance except in heavy-current streams and rough waters. Excellent mobility over bottomless mud, vegetation choked marsh land and inundated rice paddies.

General Remarks

This concept vehicle should have excellent mobility on all types of terrain encountered in South Vietnam except for the jungle and mountain regions. Because of its gradeability and side slope characteristics, its mobility would be limited in mountainous regions. This vehicle is not capable of mobility through thick stands of brush and small trees as encountered in the jungle.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle	<u>5-Ton Terra-Tire-Track</u>
Production	<u>      </u> Prototype <u>      </u> Concept <u>X</u>
Type of Vehicle	<u>Tire-Track / Amphibian</u>
Physical Size	<u>L-17', W-8'4", H-7'6"</u>
Vehicle Weight, Net	<u>10,000<sup>#</sup></u>
Capacity	
Weight	<u>10,000<sup>#</sup></u>
Cubage	<u>12'x6'x6' (est.)</u>
Personnel	<u>22</u>
Speed	
Improved Roads	<u>40 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>4-5 mph</u>
Gradesability	<u>5%</u>
Side Slope	<u>35%</u>
Angle of Approach	<u>60°</u>
Angle of Departure	<u>70°</u>
Ground Clearance	<u>14"</u>
Range	<u>700 miles</u>
Vertical Obstacle	<u>26"</u>
Armor Protection	<u>Optional</u>

Prominent Operational Feature or Characteristic

A marginal terrain, pneumatic tread, full tracked vehicle utilizing the "Tire-Track" principle.

Type of Terrain Capabilities and Limitations

Good cross-country performance except in heavy-current streams and rough waters. Excellent mobility over bottomless mud, vegetation choked marsh land and inundated rice paddies.

General Remarks

This concept vehicle should have excellent mobility on all types of terrain encountered in South Vietnam except for the jungle and mountain regions. Because of its gradeability and side slope characteristics, its mobility would be limited in mountainous regions. This vehicle is not capable of mobility through thick stands of brush and small trees as encountered in the jungle.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle	<u>M113 Terra-Tire-Track</u>
Production	<u>Prototype</u> <u>Concept</u> <u>X</u>
Type of Vehicle	<u>M113 with Airoll Tires</u>
Physical Size	<u>L-102", W- 8", H-95 1/8"</u>
Vehicle Weight, Net	<u>18,942<sup>#</sup></u>
Capacity	
Weight	<u>3,210<sup>#</sup></u>
Cubage	<u>110"x96 1/2"x62"</u>
Personnel	<u>13</u>
Speed	
Improved Roads	<u>38 mph</u>
Cross-Country	<u>NA</u>
Water	<u>4.5 mph (est.)</u>
Gradeability	<u>60%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>Not determined</u>
Angle of Departure	<u>Not determined</u>
Ground Clearance	<u>24 3/4"</u>
Range	<u>Land 200 miles</u>
Vertical Obstacle	<u>21"</u>
Armor Protection	<u>Aluminum - small arms</u>

Prominent Operational Feature or Characteristic

A light weight, armored, air droppable, full tracked amphibian utilizing the wire-track principle of large tires.

Type of Terrain Capabilities and Limitations

This vehicle would be capable of limited cross-country over rough terrain and would be more mobile than the M113 on the weak soils of South Vietnam.

General Remarks

Ground pressure 5 to 7 psi. Trench crossing 66".

This vehicle concept was intended to have more mobility than the M113 because of its greater ground clearance and slightly less ground pressure of 8 psi loaded. In South Vietnam, this vehicle would be subjected to the same limitations as the M113-AFC.

Manufacturer

Ingersoll Kalamazoo Division

Name of Vehicle	<u>PATA</u>
Production	<u>Prototype X</u> <u>Concept</u>
Type of Vehicle	<u>Tracked Amphibian</u>
Physical Size	<u>L-216", W-118", H-118"</u>
Vehicle Weight, Net	<u>6,569<sup>#</sup></u>
Capacity	
Weight	<u>2500<sup>#</sup> including crew</u>
Cubage	<u>119"x46"x47"</u>
Personnel	<u>20 (approx.)</u>
Speed	
Improved Roads	<u>35 mph</u>
Cross-Country	<u>8-12 mph</u>
Water	<u>7 mph</u>
Gradeability	<u>45% (est.)</u>
Side Slope	<u>25% (est.)</u>
Angle of Approach	<u>60°</u>
Angle of Departure	<u>61°</u>
Ground Clearance	<u>30"</u>
Range	<u>150 miles land (est.)</u>
Vertical Obstacle	<u>14" (est.)</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A marginal terrain, pneumatic tread, full tracked, amphibious vehicle.

Type of Terrain Capabilities and Limitations

This vehicle is capable of traversing marshy, muddy terrain.

General Remarks

The vehicle operates on an inflated pneumatic tread system and therefore is vulnerable to sharp objects. The interconnected air cells are susceptible to damage at the fastening points. The center of gravity is quite high which would cause the vehicle to become unstable on side slopes and on grades. It would have sufficient mobility in South Vietnam due to its low ground pressure of 1.2 psi, but the complexity of the track would cause the track to have a short life and require high maintenance.

Manufacturer

L.T.V. Michigan Division

Name of Vehicle	<u>Canadair "Fisher"</u>
Production	<u>      </u> Prototype <u>X</u> Concept <u>      </u>
Type of Vehicle	<u>Pneumatic Tired Full Tracked Amphibian</u>
Physical Size	<u>L-8', W-5'6", H-3'</u>
Vehicle Weight, Net	<u>800#</u>
Capacity	
Weight	<u>600# (includes driver)</u>
Cubage	<u>2'x2'x3' (est.)</u>
Personnel	<u>3 including driver</u>
Speed	
Improved Roads	<u>12 mph</u>
Cross-Country	<u>5 mph</u>
Water	<u>2.5 mph</u>
Gradeability	<u>40%</u>
Side Slope	<u>30%</u>
Angle of Approach	<u>65°</u>
Angle of Departure	<u>90°</u>
Ground Clearance	<u>10"-12"</u>
Range	<u>30-50 miles land, 120 with reserve tanks</u>
Vertical Obstacle	<u>18"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

A marginal terrain, pneumatic tread, full tracked amphibious vehicle.

Very light weight and air transportable.

Type of Terrain Capabilities and Limitations

This vehicle is capable of negotiating rough, cross-country terrain, muskeg, snow, bottomless mud, and navigating in very slow moving rivers and canals.

General Remarks

This vehicle is currently in a durability test program. The pneumatic tread consists of low pressure, wide tires secured to a  $\frac{1}{2}$ " thick 7" wide canvas belt. The belt is driven by friction from a revolving drum. This vehicle would have extreme mobility in the rice paddies and canals of South Vietnam. Its mobility on the jungle trails would be limited only by the width of the trails. A cab to protect the driver and passengers would be required. The mobility in the mountainous terrain would be reduced due to its lower gradeability and side slope characteristics.

Manufacturer

Canadair Ltd.

Name of Vehicle Marsh Screw Amphibian

Production	Prototype	Concept
Type of Vehicle	<u>Carrier, Personnel &amp; Cargo, Amphibious</u>	
Physical Size	<u>L-13'8", W-8'2", H-5'0" (est.)</u>	
Vehicle Weight, Net	<u>2825<sup>#</sup></u>	
Capacity		
Weight	<u>1050<sup>#</sup></u>	
Cubage	<u>110-120 cu ft (est.)</u>	
Personnel	<u>7 - 8</u>	
Speed		
Improved Roads	<u>Crossing ability only: Vehicle cannot operate on roads.</u>	
Cross-Country	<u>8-12 mph avg. (Marsh operation)</u>	
Water	<u>10-14 mph</u>	
Gradeability	<u>60-70%</u>	
Side Slope	<u>30%</u>	
Angle of Approach	<u>45° (approx.)</u>	
Angle of Departure	<u>25° (approx.)</u>	
Ground Clearance	<u>20"</u>	
Range	<u>125 miles (est.)</u>	
Vertical Obstacle	<u>12"</u>	
Armor Protection	<u>None</u>	

Prominent Operational Feature or Characteristic

This vehicle rides on two large diameter screw-type Pontoons.

Type of Terrain Capabilities and Limitations

This vehicle can travel at significant speeds over deep swamps, and marshes, rice paddies, mud banks, and bogs. The vehicle can operate well in water and wet environments. Its high water speed enables the vehicle to navigate swift rivers. The vehicle has the ability to negotiate moderately inclined, soft structured banks. It is limited in obstacle climbing ability and cannot travel on hard ground, but is capable of crossing roadways and dikes or bunds.

General Remarks

Because this vehicle cannot travel on hard or firm surfaced roads, or on cross-country terrain, it must be transported to the areas where it is to be used. The screw rotors of this vehicle are exceedingly vulnerable to damage. This vehicle is not equipped with a winch.

Average Ground Pressure @ 2.5 inch penetration - .9 psi

Manufacturer

Chrysler Corporation  
Defense Engineering



Prominent Operational Feature or Characteristic

The Ground Effects Machine operates (floats) on a cushion of air generated by large fans and operation is not dependent upon actual ground contact.

Type of Terrain Capabilities and Limitations

The Ground Effects Machine is capable of roadway and general cross-country operation on any reasonably level hard to fluid terrain. The GEM vehicle can navigate rivers of any velocity provided sufficient width exists and passage is not obstructed beyond its obstacle climbing ability.

General Remarks

The GEM vehicle has the ability to negotiate gently inclined banks, within the grade limits of its slow speed gradeability and can negotiate moderately inclined banks provided it can develop sufficient entry speed. The vehicle can negotiate near-vertical banks, provided their heights are within its obstacle climbing ability. Bank structure has no effect on its climbing ability, provided they are not severely-dissected.

Generally the Ground Effects Machine is limited in mobility only by obstacle height and gradients beyond its capability and by high velocity winds.

Manufacturer

Ford Motor Company  
GEM activity has been dropped at present by Ford.

Name of Vehicle Britter-Norman Cushioncraft CC-4, GEM

Production Prototype X Concept       

Type of Vehicle Ground Effects Machine (Plex-Skirt)

Physical Size L-20', W-10', H-8 (est.)

Vehicle Weight, Net 2300#

Capacity

Weight 1200#

Cubage       

Personnel 6

Speed

Improved Roads 45 mph @ 14" daylight clearance

Cross-Country 10-20 mph

Water 40 mph

Gradeability 6-12% (est.)

Side Slope       

Angle of Approach       

Angle of Departure       

Ground Clearance 4.5" daylight @ gross (See vert. obst.)

Range 100 mi (approx.)

Vertical Obstacle Vertical obstruction 2'6" earth bank 2'6" (est.)

Armor Protection

Prominent Operational Feature or Characteristic

The Ground Effect Machine operates (floats) on a cushion of air generated by large fans and operation is not dependent upon actual ground contact.

Type of Terrain Capabilities and Limitations

The Ground Effects Machine is capable of roadway and general cross-country operation on any reasonably level, hard to fluid terrain. The GEM vehicle can navigate rivers of any velocity provided sufficient width exists and passage is not obstructed beyond its obstacle climbing ability.

General Remarks

The GEM vehicle has the ability to negotiate gently inclined banks, within the grade limits of its slow speed gradeability and can negotiate moderately inclined banks provided it can develop sufficient entry speed. The vehicle can negotiate near-vertical banks, provided their heights are within its obstacle climbing ability. Bank structure has no effect on its climbing ability, provided they are not severely dissected.

Generally the Ground Effects Machine is limited in mobility only by obstacle height and gradients beyond its capability, and by high velocity winds.

Manufacturer

Britton-Norman Ltd.

Name of Vehicle Cushioncraft Ltd. Cushioncraft CC 2 . 2M

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Ground Effects Machine

Physical Size L-39', W-17'1", H-8'6"

Vehicle Weight, Net 3700# (approx.)

Capacity

Weight 1800#

Cubage \_\_\_\_\_

Personnel 10-12

Speed

Improved Roads 45 mph 12" daylight clearance

Cross-Country 10 - 30 mph

Water 40 mph

Gradeability 6 - 10% (est.)

Side Slope \_\_\_\_\_

Angle of Approach \_\_\_\_\_

Angle of Departure \_\_\_\_\_

Ground Clearance 12" daylight @ gross (see vert. obst.)

Range 200 + mi.

Vertical Obstacle Vertical obstacle 2', earth bank 3" (est.)

Armor Protection None

Prominent Operational Feature or Characteristic

The Ground Effects Machine operates (floats) on a cushion of air generated by large fans and operation is not dependent upon actual ground contact.

Type of Terrain Capabilities and Limitations

The Ground Effects Machine is capable of roadway and general cross-country operation on any reasonably level, hard to fluid terrain. The GEM vehicle can navigate rivers of any velocity provided sufficient width exists and passage is not obstructed beyond its obstacle climbing ability.

General Remarks

The GEM vehicle has the ability to negotiate gently inclined banks, within the grade limits of its slow speed gradeability and can negotiate moderately inclined banks provided it can develop sufficient entry speed. The vehicle can negotiate near-vertical banks, provided their heights are within its obstacle climbing ability. Bank structure has no effect on its climbing ability, provided they are not severely dissected.

Generally the Ground Effects Machine is limited in mobility only by obstacle height and gradients beyond its capability, and by high velocity winds.

Manufacturer

Cushion Craft Ltd.



Prominent Operational Feature or Characteristic

Vehicle operates (floats) on a cushion of air-generated by a large fan. Forward propulsion is attained by air propeller. Operation is not dependent upon ground contact. Smooth ride over rough surfaces. Vehicle surface pressure of .17 psi leaves no tracks.

Type of Terrain Capabilities and Limitations

The nature of the terrain surface imposes no limitations on operation. The Ground Effects Machine is capable of roadway and general cross-country operation on any reasonably level, hard to fluid terrain. The GEM vehicle can navigate rivers of any velocity provided sufficient width exists and passage is not obstructed beyond its obstacle climbing ability.

General Remarks

The GEM vehicle has the ability to negotiate gently inclined banks, within the grade limits of its slow speed gradesability and can negotiate moderately inclined banks provided it can develop sufficient entry speed. The vehicle can negotiate near-vertical banks, provided their heights are within its obstacle climbing ability. Bank structure has no effect on its climbing ability, provided they are not severely dissected.

The vehicle can cross ditches and canals up to 12 feet in width (dependent upon gross vehicle weight, entry speed, and bank configuration).

Generally the Ground Effects Machine is limited in mobility only by obstacle height and gradients beyond its capability and by high velocity winds.

Manufacturer

Bell Aerosystems Company

Name of Vehicle	<u>Bell Aerosystems SK-5, GEM</u>
Production	<u>Comma.    Prototype <u>X</u>    Concept _____</u>
Type of Vehicle	<u>Ground Effects Machine (Flex-skirt)</u>
Physical Size	<u>L-39'5", W-22'9", H-16'6"</u>
Vehicle Weight, Net	<u>10,300<sup>#</sup></u>
Capacity	
Weight	<u>3,000-5,000<sup>#</sup></u>
Cubage	<u>528 cu ft</u>
Personnel	<u>20-30</u>
Speed	
Improved Roads	<u>40-50 mph</u>
Cross-Country	<u>45 mph</u>
Water	<u>40-60 mph</u>
Gradeability	<u>18% continuous, 35% for 150' with entry speed of 25 MPH</u>
Side Slope	<u>15%</u>
Angle of Approach	_____
Angle of Departure	_____
Ground Clearance	<u>6-8" skirts, 4.5' hard structure</u>
Range	<u>200-250 miles</u>
Vertical Obstacle	<u>Vertical obstruction 3.5', earth bank 5.0'</u>
Armor Protection	<u>None (can be provided with equivalent weight sacrifice in carrying capacity)</u>

Prominent Operational Feature or Characteristic

Vehicle operates (floats) on a cushion of air generated by a large fan. Forward propulsion is attained by air propeller. Operation is not dependent upon ground contact. Smooth ride over rough surfaces. Vehicle surface pressure of .20 psi leaves no tracks.

Type of Terrain Capabilities and Limitations

The nature of the terrain surface imposes no limitations on operation. The Ground Effects Machine is capable of roadway and general cross-country operation on any reasonably level, hard to fluid terrain. The GEM vehicle can navigate rivers of any velocity provided sufficient width exists and passage is not obstructed beyond its obstacle climbing ability.

General Remarks

The GEM vehicle has the ability to negotiate gently inclined banks, within the grade limits of its slow speed gradeability and can negotiate moderately inclined banks provided it can develop sufficient entry speed. The vehicle can negotiate near-vertical banks, provided their heights are within its obstacle climbing ability. Bank structure has no effect on its climbing ability, provided they are not severely dissected.

The vehicle can cross ditches and canals up to 22 feet in width (dependent upon gross vehicle weight, entry speed, and bank configuration).

Generally the Ground Effects Machine is limited in mobility only by obstacle height and gradients beyond its capability and by high velocity winds.

Manufacturer

Bell Aerosystems Company

Name of Vehicle	<u>Phillips 66 1/2 Ton</u>
Production	<u>Prototype</u>
Type of Vehicle	<u>Transporter, 1-Ton</u>
Physical Size	<u>11'0" x 11'0" x 11'0"</u>
Vehicle Weight, lbs	<u>1000#</u>
Capacity	
Weight	<u>1000#</u>
Cubage	<u>12 sq ft</u>
Personnel	<u>1</u>
Speed	
Improved Roads	<u>15 mph</u>
Cross-Country	<u>6 - 10 mph</u>
Water	<u>5 - 1 mph</u>
Gradeability	<u>6%</u>
Side Slope	<u>10 - 15%</u>
Angle of Approach	<u>10°</u>
Angle of Departure	<u>10°</u>
Ground Clearance	<u>10"</u>
Range	<u>15 - 100 miles</u>
Vertical Clearance	<u>15 - 20"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Vehicle incorporates large diameter, wide, low-pressure bag-type tires.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance), and in swampy marsh terrain. This vehicle is floatable and can navigate lakes, streams and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Side Slope stability very poor.  
Average ground pressure 0.75-2.0 psi.  
Vehicle incorporates hydrostatic drive.

Manufacturer

Rolligon Corporation

Name of Vehicle Holligan R251 Tank-Barrier w/S Radar

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Transformer, 4-Wheel, 1 x 3, Foldable

Physical Size L-11'0" W-3'0" H-1'7"

Vehicle Weight, Net 1600<sup>lb</sup>

Capacity

Weight 1600-1800<sup>lb</sup>

Cubage 24 sq. ft. (Approx.)

Personnel 5-6

Speed

Improved Roads 12 mph

Cross-Country 6-10 mph

Water 2-3 mph

Gradeability 60%

Side Slope 30%

Angle of Approach 90°

Angle of Departure 90°

Ground Clearance 15"

Range 75-100 miles

Vertical Obstacle 15-20"

Armor Protection None

Prominent Operational Feature or Characteristic

Vehicle incorporates large diameter, wide, low-pressure bag-type tires.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation of soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance), and in swampy marsh terrain. This vehicle is floatable and can navigate lakes, streams and slow moving rivers. The vehicle has the ability to negotiate moderately-inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 0.75-2.0 psi.  
Vehicle incorporates hydrostatic drive.

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Holligon Corporation

Name of Vehicle Williams Mark 3 tractor

Production \_\_\_\_\_ Prototype \_\_\_\_\_ Concept X

Type of Vehicle Track, Conv., 1-Door, 4x4 - Trussable

Physical Size 5'-11 1/2" H, 3'-0" W (4'-0" with optional fenders), 4'-5 1/2" L

Vehicle Weight, Max 1000<sup>lb</sup>

Capacity

Weight 5000<sup>lb</sup>

Cubage 44 Sq Ft

Personnel 10 - 12

Speed

Improved Roads 30 mph

Cross-Country 6-12 mph

Water 2-3 mph

Gradeability 20%

Side Slope 30%

Angle of Approach 30° (w/o wind)

Angle of Departure 30°

Ground Clearance 16" (standard)

Range 10000 miles

Vertical Obstacle 20"

Armor Protection None

Prominent Operational Feature or Characteristic

Vehicle incorporates large diameter, wide, low-pressure bag-type tires.  
This vehicle incorporates an articulated steer design.

Type of Terrain Capabilities and Limitations

This vehicle is capable of rough and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain, in soft slippery mud (soft depth somewhat less than its ground clearance), and in swampy marsh terrain. This vehicle is floatable and can navigate lakes, streams and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river-banks.

General Remarks

Average ground pressure 1.1 - 1.3 psi.

Manufacturer

Rolligon Corporation

Name of Vehicle Medium Tank

Production  Prototype  Concept

Type of Vehicle Track, Semi-Track, L., Floatable

Physical Size 11-0-15", 11-0-11", 7-5-15"

Vehicle Weight, Net 6500<sup>#</sup>

Capacity

Weight 5000-6000<sup>#</sup>

Cubage 120 sq. ft.

Personnel 14 - 16

Speed

Improved Roads 25 mph

Cross-Country 8 - 12 mph

Water 2 mph

Gradeability 60°

Side Slope 30°

Angle of Approach 25°

Angle of Departure 15°

Ground Clearance 27"

Range 200 miles

Vertical Obstacle 20"

Armor Protection None

Prominent Operational Feature or Characteristic

Vehicle incorporates large diameter, wide, low-pressure bag-type tires which are driven through a friction roller. Vehicle weight is transmitted to tires by the friction roller and is not axle supported. This vehicle incorporates an articulated steer design.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on soft terrain (soft depth somewhat less than its ground clearance), in moderately-dissected terrain. This vehicle is floatable and can navigate lakes, streams and slow moving rivers. The vehicle has the ability to negotiate moderately inclined, semi-firm structured river banks.

General Remarks

Average ground pressure 4 - 7 psi. This vehicle is designed primarily for sand and soft soil operation. Mud and slope operation under wet conditions is limited as friction drive roller loses traction to tire.

Manufacturer

Rolligon Corporation

**NARROW-TRAIL VEHICLES**

Name of Vehicle Narrow-Trail Vehicle (Recommended)

Production \_\_\_\_\_ Prototype \_\_\_\_\_ Concept X

Type of Vehicle Narrow Trail Vehicle

Physical Size 36-70", W-20", H-40" (Design dimensions)

Vehicle Weight, Net 250<sup>#</sup> (Design weight)

Capacity

Weight 300<sup>#</sup>

Cubage Approx. 4.5 cu ft

Personnel 2

Speed

Improved Roads 25 mph

Cross Country 8 - 12 mph

Water 5 mph

Gradeability 60%

Side Slope 30%

Angle of Approach 90°

Angle of Departure 90°

Ground Clearance No belly

Range 8 - 10 hrs

Vertical Obstacle 12"

Armor Protection None

Prominent Operational Feature or Characteristic

Narrow design with two independent drive units, high displacement track with very low ground unit pressure.

Type of Terrain Capabilities and Limitations

Narrow jungle trails, water and marsh areas where operator can walk alongside.

General Remarks

A test-bed prototype was made by Philco Aercontronic Division to demonstrate the design feasibility and operational characteristics. It did not conform to the target design specifications, which however could be met in a more complete design.

The basic design concept appear to have good cross-country operational characteristics and should be pursued further by study engineering, development and prototype testing.

Manufacturer

Name of Vehicle Iron Pony

Production \_\_\_\_\_ Prototype \_\_\_\_\_ Concept X

Type of Vehicle Motor Cycle

Physical Size L-60"-72", W-15"-24", H-24"

Vehicle Weight, Net 100 to 250 lbs.

Capacity

Weight 300 lbs.

Cutage \_\_\_\_\_

Personnel 1 man

Speed

Improved Roads 40 mph

Cross-Country 2 $\frac{1}{2}$  up

Water none floating

Gradeability 60%

Side Slope 30%

Angle of Approach 90°

Angle of Departure 90°

Ground Clearance 8"

Range 150 miles

Vertical Obstacle 8"

Armor Protection None

Excellent Operational Feature or Characteristic

Narrow and low silhouette design with small wheels.  
Easy to maneuver.

Type of Terrain Capabilities and Limitations

Good performance on rough and hilly terrain.  
Not capable of operating in mud or swampy terrain.  
Non-floatable.

General Remarks

This design has been proposed for commercial use by campers and hunters but has not found wide acceptance. Performance is superior to that of conventional motorcycles, but small wheels and lack of floatability limits its use for cross-country operations.

Manufacturer

Base of Vehicle	<u>Sidewinder</u>
Production	<u>Prototype X</u> <u>Concept</u>
Type of Vehicle	<u>3-Wheel Carrier</u>
Physical Size	<u>L-79 3/4", W-60", H-29"</u>
Vehicle Weight, Net	<u>210 lbs.</u>
Capacity	
Weight	<u>400 lbs.</u>
Cubage	<u>NA</u>
Personnel	<u>2 men</u>
Speed	
Improved Roads	<u>15 mph</u>
Cross-Country	<u>NA</u>
Water	<u>0</u>
Gradeability	<u>12%</u>
Side Slope	<u>20%</u>
Angle of Approach	<u>90°</u>
Angle of Departure	<u>90°</u>
Ground Clearance	<u>8"</u>
Range	<u>100 miles</u>
Vertical Obstacle	<u>8"</u>
Armor Protection	<u>None</u>

Prominent Operational Feature or Characteristic

Two driven rear wheels, one front steering wheel.  
Low-pressure terratires.

Type of Terrain Capabilities and Limitations

Will negotiate semi-firm, rolling terrain.  
Floatable for fording still water without load.  
Will not negotiate slippery hills or mud and swamp areas.

General Remarks

2-wheeled vehicles lack in mobility because the center wheel cut a separate track from the other wheels, greatly increasing the rolling resistance.

Manufacturer

C.P. Maffler Shop

Year of Vehicle Medium Rate (MRA)

Production \_\_\_\_\_ Prototype X Concept \_\_\_\_\_

Type of Vehicle Motor Scooter, Personnel 2 x 1

Physical Size L-5'4", W-1'10", H-3'4"

Vehicle Weight, Wet 120#

Capacity

Weight 50# (est.)

Cubage \_\_\_\_\_

Personnel 1

Speed

Improved Roads 18-30 mph

Cross-Country 8-12 mph

Water C

Gradeability 40-50%

Side Slope 1:1

Angle of Approach 12

Angle of Departure 11

Ground Clearance 8"

Range 185 miles (est.)

Vertical Obstacle 11"

Armor Protection None

Prominent Operational Feature or Characteristic

This is a two wheeled vehicle and its narrow width enables it to operate on narrow jungle trails.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain. This vehicle does not have a floating capability, but can ford shallow lakes, streams, and rivers of moderate velocity with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured banks. Operation of this vehicle in rough, soft, or muddy terrain requires considerable manhandling by the operator.

General Remarks

This vehicle is limited in cargo capacity.

Average Ground Pressure 3.6 psi

Manufacturer

Bonham Corporation

Name of Vehicle Nethercut Trailbreaker

Production Civ. Prototype X Concept

Type of Vehicle Motorcycle, Personnel, 2 X 2

Physical Size L-46" W-24" H-3'5"

Vehicle Weight, Net 100#

Capacity

Weight 50-75# (est.)

Cubage NA

Personnel 1-2

Speed

Improved Roads 20 mph

Cross-Country 8-12 mph

Water

Gradeability 10-50%

Side Slope

Angle of Approach

Angle of Departure

Ground Clearance 14"

Range 100 miles (est.)

Vertical Obstacle

Armor Protection

Prominent Operational Feature or Characteristic

This is a two wheeled vehicle and its narrow width enables it to operate on narrow jungle trails.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain. This vehicle does not have a floating capability, but can ford shallow lakes, streams, and rivers of moderate velocity with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured banks. Operation of this vehicle in rough, soft, or muddy terrain requires considerable manhandling by the operator.

General Remarks

This vehicle is limited in cargo capacity.

Average Ground Pressure 0.85 psi

Manufacturer

Nethercutt Industrial Corporation

Name of Vehicle	<u>2423 (H-D WL)</u>
Production	<u>X</u> Prototype <u>      </u> Concept <u>      </u>
Type of Vehicle	<u>Motorcycle, Personnel, 2 x 1</u>
Physical Size	<u>L=74", W=30", H=35"</u>
Vehicle Weight, Wet	<u>477#</u>
Capacity	
Weight	<u>50-75# (est.)</u>
Cubage	<u>      </u>
Personnel	<u>1 - 2</u>
Speed	
Improved Roads	<u>70 mph</u>
Cross-Country	<u>8 - 12 mph</u>
Water	<u>2</u>
Climability	<u>40 - 50%</u>
Side Slope	<u>NA</u>
Angle of Approach	<u>NA</u>
Angle of Departure	<u>NA</u>
Ground Clearance	<u>8 - 10" (est.)</u>
Range	<u>125 miles</u>
Vertical Obstacle	<u>NA</u>
Armor Protection	<u>NONE</u>

Prominent Operational Feature or Characteristic

This is a two wheeled vehicle and its narrow width enables it to operate on narrow jungle trails.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain. This vehicle does not have a floating capability, but can ford shallow lakes, streams, and rivers of moderate velocity with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured banks. Operation of this vehicle in rough, soft, or muddy terrain requires considerable manhandling by the operator.

General Remarks

This vehicle is limited in cargo capacity.

Average Ground Pressure: 4 psi (est.)

Manufacturer

Harley-Davidson Company

7

Name of Vehicle Sublevel Mine Car

Production Civil Prototype X Concept \_\_\_\_\_

Type of Vehicle Motorcycle, Personal, P.P.I.

Physical Size 7'-6 1/2" L, W-2'6 1/2", H-3'10"

Vehicle Weight 100#

Capacity

Weight 50# (est.)

Cubage \_\_\_\_\_

Personnel 1-2

Speed

Improved Roads 45 mph

Cross-Country 8 - 12 mph

Water 0

Gradeability 40-50%

Side Slope \_\_\_\_\_

Angle of Approach \_\_\_\_\_

Angle of Departure \_\_\_\_\_

Ground Clearance 30"

Range 100 miles (est.)

Vertical Obstacle \_\_\_\_\_

Armor Protection \_\_\_\_\_

Prominent Operational Feature or Characteristic

This is a two wheeled vehicle and its narrow width enables it to operate on narrow jungle trails.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain. This vehicle does not have a floating capability, but can ford shallow lakes, streams, and rivers of moderate velocity with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured banks. Operation of this vehicle in rough, soft, or muddy terrain requires considerable manhandling by the operator.

General Remarks

This vehicle is limited in cargo capacity.

Average Ground Pressure 1.6 psi

Manufacturer

Harley-Davidson Company

Name of Vehicle	Cushman Trailster		
	Production	Civ.	Prototype X Concept
Type of Vehicle	Motor Scooter, Personnel, E. X. 1		
Physical Size	L. 5'8 1/2" W. 2'0" H. 3'1"		
Vehicle Weight, Net	25#		
Capacity			
Weight	50#		
College			
Personnel	1		
Speed			
Improved Roads	12-2 mph		
Cross-Country	8-12 mph		
Water	2		
Gradeability	40-50%		
Side Sway	11"		
Angle of Approach	11°		
Angle of Departure	11°		
Ground Clearance	7 3/4"		
Range	125 miles (est.)		
Vertical Obstacle	N/A		
Armor Protection	None		

Prominent Operational Feature or Characteristic

This is a two wheeled vehicle and its narrow width enables it to operate on narrow jungle trails.

Type of Terrain Capabilities and Limitations

This vehicle is capable of roadway and general cross-country operation on semi-firm terrain. This vehicle does not have a floating capability, but can ford shallow lakes, streams, and rivers of moderate velocity with firm bottoms. The vehicle has the ability to negotiate moderately inclined, firm structured banks. Operation of this vehicle in rough, soft, or muddy terrain requires considerable manhandling by the operator.

General Remarks

This vehicle is limited in cargo capacity.

Average Ground Pressure 4.25 psi

Manufacturer

Cushman Motors

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