An extensive recapitulation of the use of helicopters and CV-2 in logistical airlift and resupply is contained in Annex E, (combat service support). Examples of such use are:


(b) Operation Van Buren. Unit: 1st Brigade, 101st Airborne Division. Dates of Operation: 17 January - 20 February 1966. Number of sorties not available for UH-1D, but nine short tons of emergency supplies, and 40 short tons normal resupply were delivered. CV-2 flew 400 sorties and delivered 4033 personnel and 246 short tons.

(c) Operation White Wing. Unit: 1st Cavalry Division. Dates of Operation: 4 February - 3 March 1966. UH-1D, CH-47 and CH-54 flew 1125 sorties and delivered 2300 tons of supplies.

Measurement of the reaction time of aerial vehicles in support of committed units can be made in relative terms only. Figure B-3-1 in Appendix 3, Annex B depicts the time required to move troops as a function of distance moved and the number of lifts required. The same rationale applies to the movement of supplies, except that load and unload times are greater for internal loads. Reaction time is a function of planning time, load time, distance to be flown, cruise speed of aircraft, delivery point, and unload time. No data could be obtained on the time required to plan specific moves. A discussion of these variables and the average response times is provided in Appendix 3, Annex B. Location of aircraft with the committed brigades has improved responsiveness by reducing the planning time and the flying distance. The 1st Cavalry Division normally allocates 16 to 18 UH-1D helicopters to the committed brigades for immediate reaction type missions. These aircraft are under the operational control of the brigade commander. The responsiveness of aircraft to the 173d Airborne Brigade requirements have also been significantly improved by giving the brigade commander operational control over the helicopter support necessary to lift one rifle company (See Appendix 3 for further discussion).

In summary, the performance characteristics of the UH-1D CH-47, CH-54, and CV-2 have been adequate to provide responsiveness in the missions assigned. Improvement of the lift capability of the UH-1D however, is necessary to achieve still better effectiveness.

Responsiveness has not been adversely affected by night or weather conditions (Appendix 4, Annex B) nor has survivability in the combat environment been a serious limiting factor (Appendix 5, Annex B).
3. (C) CONCLUSIONS

a. Foot movement is a responsive form of mobility when dictated by the mission or environment (or when other means of transport are not suitable).

b. Ground vehicles are not generally responsive to the requirement of moving maneuver battalions in the initial stages of search and destroy operations conducted in areas of operations.

c. Combat support and service support units are moved by ground vehicles when feasible to support maneuver units in search and destroy operations in tactical areas of responsibility and areas of operation.

d. Ground vehicles are responsive to mobility requirements for road clearing, securing, and route reconnaissance missions.

e. The performance and reaction capability of Army aircraft is sufficient to provide the degree of responsiveness required for operations in Vietnam. Significant improvement in responsiveness can be expected when the UH-1D with the T53-L-13 engine is available.

f. Ground and aerial means of mobility available to the fire support elements are responsive to the tactical requirements. Significant improvement could be achieved by replacing the M101 105mm howitzer with the M102 105mm howitzer in all US Army light artillery battalions in Vietnam.
Appendix 3 to Annex B (Mobility)

BZA 16: Is the mobility of a maneuver battalion of a division/separate brigade having an organic air movement capability superior to the mobility of a maneuver battalion of a division/separate brigade which must depend upon supporting/attached aircraft?

1. **GENERAL**

   a. The air movement capability will be compared between evaluated units to determine if the aviation support received by one type battalion is more effective than that received by another. Effectiveness is considered to be the capability of allocated mobility means to respond to the commander's requirements for timely delivery of troops and equipment. The effectiveness will be discussed in terms of planning time required, training of troops, contribution of SOP's, in-flight time, and execution of the assault. Where problems have been encountered during the evaluation period, they will be discussed and an attempt made to define their causes.

   b. Since responsiveness to the movement requirements of a maneuver unit is primarily a function of time, the factors affecting responsiveness will first be identified, followed by an evaluation of the differences between units which contribute to variations in response times.

2. **RESPONSIVENESS**

   a. The general expression for responsiveness in terms of the time required for mission completion (Tm) is:

   \[ T_m = \frac{D_1 + (2n-1)D_2 + t_L + t_{UL} + t_p}{R_1} \]

   where:

   - \( n \) = number of lifts required to move the unit.
   - \( D_1 \) = distance from aircraft location to unit location.
   - \( D_2 \) = distance unit to be moved.
   - \( R_1 \) = average speed of the aircraft in flying to unit location.
   - \( R_2 \) = average speed of the aircraft during the move.
   - \( t_L \) = time required to load aircraft.
   - \( t_{UL} \) = time required to unload aircraft.
   - \( t_p \) = time required to process the request for unscheduled missions.

   b. Based on data collected for 67 battalion size troop lifts within the 1st Cavalry Division, Figure B3-1 was developed to show the variation in response times with a change in the number of lifts required to perform a move. Only 36 of the 67 troop lifts were plotted because of incomplete data, particularly in the utilization of more
FIGURE B3-1(S) DISTANCE VS TIME FOR SINGLE AND MULTIPLE LIFTS
than four lifts. Since the figure includes data only from the 1st Cavalry Division, no comparisons can be made between units. The family of curves can be utilized, however, to relate the responsiveness expression to data gathered from actual combat assaults. Thus, the variables to be used for comparison can be understood in the context of the total time requirement. As noted from the data points available, considerable scatter occurs in the data for multiple lifts of less than 10 miles. This is due to the importance assumed by load and unload times. Data were also not available to permit extension of the curves to movement distances greater than 16 miles. An attempt was made to collect comparable data from aviation units supporting other type battalions, but the records maintained were not compatible with the data requirements. Further, the number of aerial moves performed was insufficient to allow the same type of data presentation.

c. As the distance moved becomes greater, the average rate of travel approaches the cruise speed of the aircraft. Also, as the distance becomes greater the time delay effect of performing multiple lifts is increased, since the number of miles flown is proportionately higher.

d. For moves of shorter distances, the load and unload times, and the request processing time have a more significant effect on the total move time. Not included in Figure B3-1 are the times required for aircraft to fly from location to the unit, and the time required for processing the request.

e. Summarizing, the following variables are important for moves of long distances:

(1) Distance from aircraft location to unit location ($D_1$).
(2) Number of lifts required for move ($n$).
(3) Average speed of the aircraft while flying to unit location ($v_1$).
(4) Average speed of the aircraft during the move ($v_2$).
(5) Time required to process the request ($t_p$).

f. For short moves (less than six to eight miles) the load and unload times becomes more important in measuring responsiveness. The unload time is important not only in measuring responsiveness, but also in the combat effectiveness of a unit at the landing zone. Although a one minute difference in loading times has little significance, a delay in unloading may have considerable effect.

g. In discussing the responsiveness of organic, attached, and
supporting means, all of the following will be included based on the importance each has in the type moves being conducted:

1. Time required to process requests.
2. Unload times at LZ.
3. Distance from aircraft to unit location.

h. In addition to the above, measures that do not lend themselves to quantification will also be discussed as appropriate; i.e., team work required between maneuver and aviation units, information exchanges between units, and consistent SOP's.

3. (C) REQUEST CHANNELS FOR AVIATION SUPPORT

a. 1ST CAVALRY DIVISION. The concept of operation for the 1st Cavalry Division is based upon rapid response to requirements by the use of organic aircraft. Consequently, the maneuver battalions are continually moving by Army aircraft when committed to tactical operations. The tempo maintained by the division through the use of air mobile operations demands close and continuous teamwork between maneuver, combat support, and combat service support elements. The scheme of maneuver of the combat units is built around the capability of the aviation elements to place the units when and where they are desired. Operations of this type demand close, timely, and flexible coordination techniques. Figure B3-2 is a flow diagram of the request and allocation system used to obtain aviation support for a maneuver battalion and brigade.

\[\text{Figure B3-2 Request and Allocation System of 1st Cavalry Division}\]
(1) Preplanned Missions

(a) The proposed aviation requirements for battalion and brigade are submitted to the movement planning conference the evening prior to the operation. Members of the conference are representatives from brigade, division G3 and G4, and aviation group liaison officer, and the support command movement control officer. (Channel 1, Figure B3-2)

(b) Based on the airlift available and the unit requirements, allocations are made to the brigade and to the forward support element supporting the committed brigade. The brigade is given maximum resources available if a major assault is to be performed, or approximately 16 UH-1D if no major moves are foreseen. Four UH-47's are normally assigned to the Forward Support Element to accomplish battalion logistics missions. These helicopters are also used for movement of fire support means when required. (Channel 2, Figure B3-2)

(c) Each battalion is allocated two UH-1D's daily from those furnished to brigade to accomplish local area resupply such as delivery of ammunition, rations, and water to battalion and sometimes company level. These two helicopters can be pulled back by the brigade to meet special mission requirements. Six to eight aircraft are retained at brigade on stand-by to move a reaction type force. (Channel 3, Figure B3-2)

(2) Immediate Reaction Missions

(a) If battalion has an immediate requirement for airlift, the request is forwarded to the brigade S3 Air who compiles all requests from battalions in coordination with the assault helicopter battalion liaison officer. If the request is of sufficient importance, the brigade can recall the two UH-1D's from each battalion and combine them with the helicopters retained at brigade for immediate reaction purposes. The FSE also has access to these aircraft for immediate reaction type requirements. (Channel 4, Figure B3-2)

(b) If the resources available to the brigade are not adequate, the brigade S3 (Air) submits the request to the aviation group liaison officer located with the committed brigade. The aviation liaison officer obtains the required aircraft from the supporting aviation battalion, or if necessary, from other resources within the aviation group. In the event of conflicting requirements, the division G3 arbitrates the allocation. The aviation group has a standing requirement to be prepared to lift one infantry company within 30 minutes of notification and one infantry battalion plus one battery of artillery within one hour of notification. No loading plans are required and no orders are reduced to writing, thus expediting the process.
(3) Discussion

(a) Of particular importance is the attachment of aircraft to the brigade. The ground force commander is now given all the essential tools with which to accomplish his mission. Equally important is the direct request channel from the brigade to the division aviation group. The direct channel is interrupted only when conflicting requests must be arbitrated by the division G3.

(b) For the UH-1D's and CH-47's located daily in the brigade area, the processing time required for an immediate reaction mission for a committed battalion is negligible. As mentioned above, the aviation group has a standing requirement to provide the brigade with the aircraft necessary to lift an additional rifle company on 30 minutes notice. On the average of once a week, the group receives a requirement to lift a company or a battalion with no prior notification. Awareness of the battalion locations and operating procedures insures immediate response. Records maintained by the group do not reflect the exact times that the requests for airlift were received and the exact times when the lift was completed. In all instances, however, the aircraft were airborne within 30 minutes of notification.

(c) Twenty-three returns were received from battalion commanders following aerial moves using divisional aircraft. No problems were encountered with regards to timeliness or number of aircraft provided.

(d) In summary, the aviation allocation and utilization system within the 1st Cavalry Division provides aviation support as required to the committed brigades. Aircraft are co-located with the brigades to fulfill immediate reaction company lifts, with the capability of moving a battalion within one hour remaining at division level.

b. 1ST INFANTRY DIVISION

(1) The 1st Infantry Division has one organic aviation battalion. Two additional aviation battalions were under the operational control of the division during the evaluation period. These battalions also supported the 173d Airborne Brigade which was under operational control of the 1st Infantry Division. The request and allocation system of the 1st Infantry Division during the evaluation period is shown by the flow diagram in Figure B3-3.

On 15 March 1966, the two aviation battalions supporting the 1st Infantry Division were attached to II ForceV. These units are required to provide support to all III Corps units.
(2) Immediate Reaction Missions

(a) Requests for unscheduled missions are submitted by the battalion commander to brigade headquarters. The brigade S3 and brigade aviation officer are tasked to provide the resources. (Channel 1, Figure B3-3)

(b) The brigade aviation officer alerts the Army Aviation Control Center. (Channel 2, Figure B3-3)

(c) Following approval of the request by the brigade headquarters, the airlift request is forwarded to the AACC and the division G3. (Channel 3, Figure B3-3)

(d) Division G3 gives the AACC "guidance" on fulfilling the mission request. (Channel 4, Figure B3-3)

(e) Upon approval of the request by the AACC, the mission is assigned to one of the three aviation battalions under division operational control. (Channel 5, Figure B3-3)

(f) The aviation battalion dispatches a liaison officer.
to the requesting unit to coordinate details of pick-up points, landing zones, flight corridors, number of lifts required, tentative time tables, and refueling/rearming points. (Channel 6, Figure B3-3)

(g) The liaison officer advises the aviation battalion of the mission details. (Channel 7, Figure B3-3)

(h) Aircraft are furnished by the aviation battalion to complete the mission. (Channel 8, Figure B3-3)

(i) If the request cannot be fulfilled from the resources available to the division, the task of providing the aircraft is passed through the division G3, to the next higher headquarters, where the decision process is repeated considering aircraft resources available to that headquarters. (Channel 9, Figure B3-3)

(3) Discussion.

(a) Of interest with respect to responsiveness is the lack of aircraft in direct support of brigade for immediate reaction missions. It is also noteworthy that no liaison officer from the aviation units is in the brigade headquarters, but is dispatched to the brigade/battalion as required. This deficiency has a detrimental effect on responsiveness for reaction missions.

(b) Questions were asked the division G3 to determine if any problems were experienced during all operations. Coordination problems affecting responsiveness were encountered only one time. On Operation Quick Kick IV, the brigades did not have the necessary slings and nets for the external loading of helicopters. Also, the refueling capability available was not adequate for the number of helicopters used, and an adequate parking area was not available for the six CH-47's. The operating unit had never worked with supporting aviation unit previously and preplanning time was inadequate.

(c) Based on all returns from battalion commanders for moves using aerial support, three problem areas were identified. Two of the problems were with supporting CH-47's which were grounded during the operation due to mechanical failures, and the other occurred because of "inadequately trained" pathfinders. Eighteen returns were received in response to a questionnaire directed by the Command, Control, and Communications Functional Area to the battalion S3 following each operation. On five occasions, problems in coordination between the battalion and the supporting unit were encountered. Three of these problems were the same as those presented by the battalion commander. In one, the units had less than one day for coordination and felt this was not adequate, and in the other, the aircraft arrived late with less than the number of aircraft requested. No notice was given the unit...
commander on the change. Although some of the aviation units had supported the battalions up to 25 times and others only three times, no correlation could be established between the number of times support had been provided previously and problems encountered. A complete discussion of the returns to this question is contained in Appendix 3, Annex D.

(d) Based on the returns from 10-flight loaders flying in support of divisional units, problems were encountered three times. The landing zone was improperly marked in one instance. In another, the ammunition to be carried by CH-47 was not ready to be loaded when the aircraft arrived. The final problem occurred during Operation Hattisburg. Three units loaded in the first lift were landed at the wrong landing zone. Subsequent lifts were required to move units into the landing zone and relocate the units originally placed there.

(e) No difference could be detected in the effectiveness of the operation when the units were supported by the division's organic aviation battalion rather than one of the two battalions under division operational control.

(f) In summary, the 1st Infantry Division was supported by aviation battalions under its operational control in addition to the division's organic battalion. Problems encountered were primarily due to a lack of coordination between the using unit and the supporting aviation unit. Coordination problems could not be attributed to the use of a unit under operational control rather than the organic unit.

c. 173D AIRBORNE BRIGADE

(1) The 173d Airborne Brigade has no organic helicopter lift companies. In October, 1965, one aviation company was attached to the brigade. Prior to the attachment, all aviation requirements were fulfilled by placing units in support. The allocation system of the brigade is somewhat complex since the requests for additional support must go through the 1st Infantry Division. The request and allocation system is shown by the use of a flow diagram in Figure B3-4.
NOTE: See following discussion for further explanation of figure.

Figure B3-4. Request and Allocation System of 173d Abn Bde.

(2) The request chain for using the attached aviation company is the same for preplanned and immediate type missions. One exception is the higher priority given to reaction type missions for committed battalions. Request channels are as follows:

(a) Battalion S3 submits request for airlift to the brigade S3. (Channel 1, Figure B3-4)

(b) If brigade aviation is to be used (determined by S3 in conjunction with brigade aviation officer), the aviation officer tasks the operations officer of the attached aviation company. Even if the resources of the aviation company are inadequate to fulfill the entire request, such aviation resources as are available to the company, is provided the battalion until additional resources are made available. (Channel 2, Figure B3-4)
(c) If brigade resources require reinforcement, the additional aircraft must be provided by higher headquarters. The brigade aviation officer requests support from the 1st Infantry Division AACC. If resources are available at division, an immediate decision is made and an aviation unit is tasked to provide the required support. (Channel 3, Figure B3-4)

(d) The aircraft may be provided by division from any one of the three aviation battalions under division control. The brigade does not know which unit will be providing the support until the decision is made at the division AACC. (Channel 4, Figure B3-3)

(e) If division resources are not available to perform the task, the division G3 makes a decision, based on relative priorities of aircraft assignment, whether to divert division aircraft from the previous assignments or forward the request to the USARV aviation officer for decision at that level. (Channel 5, Figure B3-4)

(3) Two returns were received in response to questions asked the brigade S3 concerning coordination problems. Both pertained to Operation Marauder. Problems were recounted in both returns, one a problem of mechanical failure, the other of coordination. The coordination problem resulted in the supporting unit's arriving late at the landing zone as it was not familiar with the brigade SOP's. The supporting aviation unit was not the attached company.

(4) Six data forms were collected from battalion commanders on aerial moves during operations. The only problem encountered was the mechanical failure mentioned involving two CH-47's. Of particular concern was the failure of the unit flying in support to notify the ground force commander that the number of aircraft to be provided had changed.

(5) Seven responses were obtained from battalion S3's following major operations. No coordination or response problems were mentioned. No problems affecting responsiveness were cited in the two responses received from the flight leaders flying in support of the brigade.

(6) Questions were also asked the brigade about the request and allocation procedure utilized prior to the attachment of the aviation company. Information received stated that, prior to the attachment, the following procedures were employed: the battalion S3 requested aviation support from the brigade S3 who passed the requirement to the brigade aviation officer. The brigade aviation officer requested support from the III Corps Tactical Operations Center which then placed the task on a supporting aviation unit. This system did not prove satisfactory since the supporting aviation unit had no knowledge of the tactical situation and normally had to travel a considerable distance in order to get to the mission area. Coordination established in these circumstances
was extremely difficult, and often ineffective, with the result that the battalion did not receive adequate or timely support.

(7) The brigade still must be provided external aviation support for each assault and extraction of battalion size, but in the interim, sufficient airlift is available with the attached company to conduct resupply, evacuation, and tactical airmobile operations.

(8) Following the attachment of the aviation company to the brigade, the total sorties flown per month by the aviation company increased 24 percent, the number of combat sorties increased 165 percent, and the average tonnage carried per month increased 50 percent; while the average number of hours flown monthly per pilot decreased 24 percent, and the average number of hours each aircraft was utilized decreased 23 percent. These percentages are based on data developed over a six month period, three months in support and three months attached.

(9) At the completion of Operation Marauder, the following comments were offered by the brigade S3:

"The cohesiveness and teamwork developed between the supported and supporting units is extremely important. The aviation company is attached to the brigade, lives with the brigade, and works with the brigade on a daily basis. They are a part of the brigade. This unit can move a battalion anywhere within the TAOR within two hours. It would take two or three times as long if you had to go to an aviation unit outside the brigade. This closeness and cohesiveness between the brigade and the aviation company has been achieved through constant practice and improvement of airmobile techniques. Teamwork is the key word."

(10) In summary, the brigade has one attached aviation company for performing immediate lifts of company size. Coordination problems have been experienced when utilizing supporting airlift. The teamwork, useful aircraft utilization, and responsiveness is significantly improved by having the aviation company attached rather than in support.

d. 1ST BRIGADE, 101ST AIRBORNE DIVISION

(1) The 1st Brigade, 101st Airborne Division has no organic aircraft. One aviation company is usually in direct support with additional air support available as required, given sufficient priority. The aviation company has the capability of providing air transportation for the assault elements and command group of a rifle company. Figure B3-5 is a flow diagram of the request and allocation system used to obtain both preplanned and immediate reaction aviation support.
NOTE: See following discussion for explanation of Figure.

Figure B3-5, Request and Allocation System of the 1st Brigade, 101st Airborne Division

(2) Requests channels are as follows:

(a) The battalion submits the request for airlift to the brigade tactical operations center (TOC) in terms of number of troops, amount and type of cargo, and weapons to be lifted, desired time on landing zone, and the desired pick-up point. (Channel 1, Figure B3-5)

(b) Located in the brigade TOC are the S3, aviation liaison officer, brigade aviation officer, Air Force liaison officer, Navy gunfire and artillery liaison officers. The brigade aviation officer and the aviation liaison officer determine the number and type of aircraft required to satisfy the request and the availability of the aircraft.

(c) Upon approval of the mission by brigade, a firm mission requirement is given to the aviation liaison officer. (Channel 2, Figure B3-5)

(d) The aviation liaison officer determines the actual availability, by type, of aircraft required. If brigade missions in progress must be cancelled, the aviation officer, in coordination with S3, determines priorities and cancels missions as necessary. (Channel 3, Figure B3-5)

(e) If the aviation battalion is also providing aircraft to other allied units which will be affected by the request, the cancellations must be approved/disapproved by the representative of FForceV in the area, normally the brigade commanding general acting in his capacity of senior FFV representative in the area. (Channel 4, Figure B3-5)

(f) Upon approval of the mission, the aviation battalion
supplies the necessary resources to the maneuver battalion. The average processing time has been 15 minutes when other allied troops are involved, and five minutes if only US troops are involved. (Channel 5, Figure B3-5)

(3) Data were received from battalion commanders in three instances following movement by aircraft. No problems were encountered during any of the moves.

(4) Data were also available from two flight leaders following delivery of 1st Brigade, 101st Airborne Division troops by air. No problems were encountered during either move.

(5) The battalion commanders have not yet experienced any problems due to dependence on supporting aircraft, as immediate reaction combat missions pre-empt other missions previously scheduled by other units. Response is excellent in these cases. The aviation liaison officer, however, is unable to determine the number of aircraft available to support lift requirements in many instances because the aviation battalion has commitments to support other units.

(6) The brigade S3 states that the following advantages would accrue if an aviation lift company was placed under operational control of the brigade.

(a) Aircraft would be immediately available.

(b) Confusion in command channels would be eliminated.

(c) No fighting for priority would occur.

(7) In summary, aircraft support has been responsive at the battalion level for the limited sample available. Problems exist in determining aircraft availability for planning purposes and in obtaining aircraft when previous commitment has been made to other units.

4. (C) TIME TO UNLOAD

A critical factor which can affect both the responsiveness and the effectiveness of a unit utilizing aviation support is the time required to unload at the landing zone. Flight leaders flying in support of the evaluated maneuver battalions were asked how long the helicopters were on the ground at the landing zone. These data were provided on approximately 50 percent of the flight leader forms returned. Even for those returns received, the times given can be considered estimates only. A pilot unloading troops in a landing zone which is under fire may well estimate the time on the ground to be longer than it actually was. In the absence of accurate data the estimates given will be used.
b. Based on these estimates, the unload times varied from a low for all units of three seconds in the 1st Cavalry Division to a high of one minute, also in the 1st Cavalry Division. The average unload time in the respective units was 11 seconds in the 1st Infantry Division, 27 seconds in the 173d Airborne Brigade, 20 seconds in the 1st Cavalry Division, and 30 seconds in the 1st Brigade, 101st Airborne Division. In addition to the problem of time estimation discussed earlier, the sample for the 173d is only two occurrences and that for the 1st Brigade, 101st Airborne Division is only one.

c. In summary, data collected indicate that the unloading time does not vary significantly from one type maneuver battalion to another.

5. (C) DISTANCE FROM AIRCRAFT TO UNIT LOCATION

a. The effect of the flying time from aircraft location to unit location was discussed in the establishment of major variables affecting responsiveness. Aircraft locations for the units evaluated are in near proximity to the maneuver units except for the 1st Brigade, 101st Airborne Division and two brigades of the 1st Infantry Division. Aircraft flying in support of the 1st Brigade, 101st Airborne Division are located at Dong Ba Thin, approximately 50 kilometers from the brigade base. In operations conducted during the evaluation, the brigade forward base was located 120 kilometers from Dong Ba Thin, a distance requiring a flying time of approximately 45 minutes.

b. The 1st Brigade of the 1st Infantry Division is located approximately 40 kilometers from the supporting aviation units and the 3d Brigade approximately 30 kilometers away. Aircraft flying in support of these units return to home base at night.

c. Aviation units organic to the 1st Cavalry Division are normally located at An Khe, the division base. When units are committed for extended operations away from the home base, as in Operation White Wing, portions of the aviation units that are continually supporting the brigades are located at forward bases to improve responsiveness.

d. In summary, the only unit located a significant distance from the supporting aviation unit is the 1st Brigade, 101st Airborne Division.

6. (C) OTHER FACTORS CONTRIBUTING TO EFFECTIVENESS

a. In addition to the responsiveness of aviation support, other factors also contribute to the differences in mobility between units receiving aviation support. The differences cannot be quanti-
fied as no unit of measure can be established. Based on the overall performance of supporting aviation units during the evaluation and comments received on returned questionnaires, the following have been derived as additional contributing factors to mobility effectiveness:

1. The aviation unit's knowledge of the supported unit's standard operating procedures.

2. A feeling of mutual trust and confidence between the aviation unit and the supported unit.

3. Continual personal contact between the officers and enlisted men of the aviation units and the supported units to foster an understanding of each other's problems.

4. The supported unit's knowledge of the aircraft's capabilities and limitations.

5. The familiarity of the aviators with the area of operation.

b. In summary, although not measureable, the feeling of teamwork and cohesiveness that can exist between an aviation unit and a maneuver unit contributes to the overall effectiveness of the operation.

7. (C) CONCLUSIONS

a. There is no significant difference in the time required to mount top priority preplanned operations between units using an organic/attached airlift capability and those using supporting aircraft.

b. Problems with supporting airlift result from a lack of complete knowledge on aircraft availability and from the need to re-route previously committed aircraft.

c. Continual liaison must be maintained between the brigades and the aviation units supporting them.

d. FM 100-5, paragraphs 6(3)(a) and (b), which define the terms "direct support" and "general support," as applied to Army aviation, should be expanded to give more definitive guidance concerning requirements for liaison; and responsibilities of ground and aviation unit commanders in airmobile operations. A definition of the concept of "reinforcing," as applied to aviation support, should also be added.

e. Retaining a one company airlift capability in direct support of a brigade committed by air assault provides a capability of being immediately responsive to tactical air movement requirement.

ERA 16

B-3-16
f. The cohesiveness and teamwork between aviation units and supported ground forces units necessary for maximum effectiveness is obtained by concurrent training and co-location of these units.

g. No difference in effectiveness can be determined between units using organic aviation and those dependent upon co-located units under their operational control (Direct Support).

h. The overall airmobile effectiveness of units utilizing organic/co-located units under their operational control is greater than that of units utilizing support aviation not under the operational control of the ground commander.

i. The lowest echelon capable of controlling and coordinating the entire airmobile operation should have operational control (Direct Support) of the supporting aerial vehicles.
EIA 17: Do Army aircraft have a sufficient night and all weather capability to support airmobile operations when required?

1. (C) DISCUSSION

a. GENERAL.

(1) As a rule, none of the units in Vietnam conducts large scale airmobile operations at night. This restriction results partially from the reduced capability of Army aviation under night conditions, but is also directly related to the reduced effectiveness of tactical air support.

(2) Other types of missions such as base camp security, medical evacuation and aerial observation are flown at night as a matter of routine, and airmobile operations initiated during daylight hours are seldom discontinued with the advent of darkness. Airmobile operations are also frequently initiated in darkness with the landing in the objective area scheduled for first light.

(3) Available data indicates that airmobile operations are frequently conducted under extremely marginal weather conditions in Vietnam. In one instance an operation by the 1st Cavalry Division, having been delayed two hours due to ground fog, was later carried out successfully when the cloud ceiling was 300 feet, with one mile visibility.

(4) Figure B4-1 shows the general effect of darkness and weather on airmobile operations according to the available data. Of 19 operations investigated, six were conducted partially in darkness. One took place entirely at night. No operations were cancelled due to weather or darkness, but delays due to ground fog were experienced in seven instances, or 3% of the operations. Average time delay was 1.5 hours.

b. MEASURES REQUIRED TO IMPROVE NIGHT AND ALL WEATHER CAPABILITY. To improve the capability of Army aviation to conduct airmobile operations at night and under marginal weather conditions, one universally recommended measure is the FOR requirement for all pilots in aviation units to be instrument qualified in assigned aircraft. A pilot who cannot fly under instrument conditions is only marginally effective in this environment. Training is required to overcome the lack of ground references at night but the operational requirement remains to provide continuous support under conditions of darkness and adverse weather.
### Figure B4-1 (FOUO) Effect of Weather & Darkness on AirMobile Operations

<table>
<thead>
<tr>
<th>TYPE</th>
<th>NUMBER OPERATIONS EXAMINED</th>
<th>OPERATIONS CONDUCTED IN DARKNESS</th>
<th>WEATHER INFLUENCE ON OPERATIONS</th>
<th>PERCENT OPERATIONS CANCELLED</th>
<th>PERCENT OPERATIONS DELAYED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ALL</td>
<td>PARTIAL</td>
<td>CANCELLED</td>
<td>DELAYED</td>
</tr>
<tr>
<td>1st INF DIV</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>173d BDE</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1st CAV DIV</td>
<td>9</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>101st ABN BDE</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

*FOR OFFICIAL USE ONLY*
c. EFFECT OF WEATHER AND DARKNESS ON RATES OF AERIAL MOVEMENT. Rates of aerial movement are affected very little by conditions of limited visibility and adverse weather. If the flight is able to proceed at all, the aircraft are able to maintain normal formations and speed. The formation, however, is often broken down into smaller elements of 4-5 aircraft to reduce congestion in the landing zone, and the interval between elements is increased for safety reasons. As a result, while the airspeed of the individual aircraft is essentially constant, the overall time length of the formation is greater, and the total time required to deliver a given cargo into the objective area is increased.

d. LOSS OF AIRCRAFT IN NIGHT OPERATIONS AND ADVERSE WEATHER.

(1) One hundred fifteen accident reports on file at the USARV Aviation Safety Office were examined to determine what percentage of aircraft losses could be attributed to night conditions or weather. The results of this examination are shown below for the period 1 September 1965 to 31 January 1966.

<table>
<thead>
<tr>
<th>Total Accident Reports Checked</th>
<th>Primary Cause</th>
<th>Times Contributing</th>
<th>Percent of Times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Night Weather</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Night Weather</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>3.5</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>3.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Night and weather as contributing factors to accidents.

(2) It will be noted that in no case was night or weather listed as the primary cause of an aircraft accident. Night and/or weather was listed as a contributing factor in 11 instances. Aircraft losses attributed to enemy action are not included in the above figures, even though they occurred at night or under marginal weather conditions.

e. MOBILITY ADVANTAGE OF ORGANIC GROUND VEHICLES OVER ORGANIC AERIAL VEHICLES DURING PERIODS OF ADVERSE WEATHER. No instance was discovered in the operations examined in which a planned airmobile operation was cancelled due to darkness or adverse weather. When an adequate road net is available, ground vehicles are able to move under conditions which effectively prohibit aerial movement. In Vietnam, however, very little of the road net is usable because of obstacles and the threat of ambush. Few of the roads in Vietnam are used at night except in very rare circumstances. Off-road vehicular movement is extremely difficult except in a few areas during the dry season. Ground vehicles can be used effectively to conduct combat operations in the immediate vicinity of the base camp area, along
established routes of communication in the tactical area of responsibility, usually in road clearing and security operations, or in the course of logistical support when the objective area can be approached by road. Any advantage that the ground vehicle possesses over aerial vehicles during periods of adverse weather or darkness is largely offset by the limited use which can be made of ground vehicles in combat operations in this environment at this time.

f. EFFECT OF DARKNESS, WEATHER AND HIGH DENSITY ALTITUDE ON OPERATIONAL CAPABILITY.

(1) Darkness and periods of adverse weather have had very little impact on the effectiveness of airmobile units in Vietnam except to cause time delays. High density altitude conditions, however, have resulted in a significant depreciation in the operational capability of aviation units by reducing the number of troops that can be carried per lift. To illustrate the problem, Figure B4-2 shows the variance in allowable gross weight at various temperatures for a UH-1D hovering in ground effect at four foot skid height as density altitude varies from sea level to 10,000 feet.

(2) In general, at a given temperature, one less soldier with personal equipment can be carried with each 1000-foot increase in density altitude. In the 1st Cavalry Division area of operations where density altitudes range from 1500 to 4500 feet, the net result is that a significant number of additional sorties are required to move a given number of troops by UH-1D. As a practical matter, the aircraft in all evaluated units are habitually flown in an overloaded condition resulting in increased fuel consumption, reduced range, greater strain on the airframe and engine and a corresponding reduction in aircraft availability owing to the requirement for greater maintenance and repair parts. To further illustrate the loss in operational effectiveness under high density altitude conditions, UH-1D aircraft supporting all units other than the 1st Cavalry Division normally carry seven troops per aircraft on the first lift in airmobile operations. The 1st Cavalry Division aircraft carry six troops per aircraft at the higher altitudes of their area of operation. For a force of 420 men, 10 additional sorties, or an increase of 16.7 percent is required in the 1st Cavalry Division area.

2. (c) CONCLUSIONS

a. Army aircraft have a sufficient night and all weather capability to support airmobile operations in Vietnam.

b. The overall time required to deliver a given cargo into an objective area by aerial means is increased during conditions of limited visibility and adverse weather.
MAXIMUM GROSS WEIGHT FOR UH-ID IS 9,500 lbs.

LEGEND

1. +25°C (77°F)
2. +30°C (86°F)
3. +35°C (95°F)
4. +40°C (104°F)

FIGURE B4-2D DENSITY ALTITUDE CHART
c. Night operations and adverse weather have not been significant factors contributing to aircraft losses in Vietnam.

d. Organic ground vehicles have no significant mobility advantage over organic aerial vehicles during periods of darkness and adverse weather in conducting combat operations in Vietnam because of poor road nets and the enemy tactics.

e. High density altitude conditions have a significant impact on the operational capability of Army aviation units.
Appendix 5 to Annex B (Mobility)

EEA 18: Is the survivability of aircraft a serious limiting factor in airmobile operations?

1. (C) DISCUSSION

a. In considering the impact of aircraft survivability on airmobile operations, a determination must first be made of what constitutes an acceptable loss rate. As a standard for comparison, the USACDC "Army Air Mobility Evaluation" (U) report dated 15 February 1965 quotes the following from the "Operations Evaluation Group Center for Naval Analysis", DFM-29 (Ref No 16211):

"Data from World War II and Korea are used to show that commanders have accepted five percent average aircraft attrition for prolonged periods. Attrition of 20-25 percent suffered in a short period has caused the abandonment or modification of sustained air operations. The acceptability of attrition rates between these two levels seem to depend on factors other than the actual loss itself."

b. Acceptability of losses is not a readily measurable criterion, but is rather a military judgment by commanders based on factors such as accomplishment of the mission, unit morale, and availability of replacement aircraft and trained aircrews. For the purpose of this study, it is considered that a loss rate of five percent or less aircraft attrition for a prolonged period will not present a serious limiting factor to airmobile operations in Vietnam.

c. The data presented show the incidence of various degrees of aircraft damage due to combat causes and accidents compared to total sorties flown, total combat sorties flown, and total flying hours. The period for which data are presented is from 1 July 1965 to 28 February 1966. Source of the information is the US Army Vietnam "Monthly Summary of Army Aviation Losses and Performance" (U), RG5 GS FOR 52.
### INCIDENCE OF CASUALTIES AND AIRCRAFT LOSS OR DAMAGE

<table>
<thead>
<tr>
<th>Type Damage or Loss</th>
<th>Per Sortie</th>
<th>Per Combat Sortie</th>
<th>Per Flying Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RATIO %</td>
<td>RATIO %</td>
<td>RATIO %</td>
</tr>
<tr>
<td>Aircraft Hit</td>
<td>( \frac{1}{608} ) .164</td>
<td>( \frac{1}{362} ) .28</td>
<td>( \frac{1}{448} ) .22</td>
</tr>
<tr>
<td>Aircraft Shot Down</td>
<td>( \frac{1}{11,938} ) .0088</td>
<td>( \frac{1}{8,804} ) .015</td>
<td>( \frac{1}{8,412} ) .012</td>
</tr>
<tr>
<td>Aircraft Shot Down &amp; Lost</td>
<td>( \frac{1}{32,989} ) .0030</td>
<td>( \frac{1}{19,709} ) .0051</td>
<td>( \frac{1}{24,366} ) .0041</td>
</tr>
<tr>
<td>Total Combat Losses</td>
<td>( \frac{1}{14,797} ) .0070</td>
<td>( \frac{1}{8,531} ) .012</td>
<td>( \frac{1}{10,547} ) .0095</td>
</tr>
<tr>
<td>Total Accident Losses</td>
<td>( \frac{1}{11,847} ) .0085</td>
<td>-</td>
<td>( \frac{1}{8,724} ) .011</td>
</tr>
<tr>
<td>Total Losses All Causes</td>
<td>( \frac{1}{6,464} ) .015</td>
<td>-</td>
<td>( \frac{1}{4,774} ) .020</td>
</tr>
<tr>
<td>Aircrew WIA</td>
<td>( \frac{1}{3,847} ) .033</td>
<td>( \frac{1}{1,820} ) .055</td>
<td>( \frac{1}{2,250} ) .044</td>
</tr>
<tr>
<td>Aircrew KIA</td>
<td>( \frac{1}{12,928} ) .0077</td>
<td>( \frac{1}{7,724} ) .013</td>
<td>( \frac{1}{9,549} ) .011</td>
</tr>
</tbody>
</table>

Data are for all types of Army aircraft in Vietnam. Total sorties and flying time includes both combat and administrative missions for all army aviation units. (For definition of sortie, see Glossary.)

d. From the information presented above, it is evident that the aircraft attrition rate from 1 July 1965 to 28 February 1966 is considerably less than the five percent assumed to be acceptable, even when aircraft losses from all combat causes and accidents are added together. It will also be noted that more aircraft are lost in accidents that from all combat causes. Figure B5-1 shows the total sorties, combat sorties, and flying hours from November 1965 through February 1966. From figure B5-2, showing casualties to aircrew and aircraft lost, it can be deduced that although aircraft utilization has recently increased significantly in Vietnam, the casualties and aircraft lost from all combat causes have not increased proportionally except for aircrew personnel wounded in action. This is an indication that improvements in doctrine, tactics, and techniques gained through operational experience...
THOUSANDS

TOTAL SORTIES

TOTAL COMBAT SORTIES

TOTAL FLYING HOURS

NOV  DEC  JAN  FEB

PERIOD

FIGURE B5-1C TOTAL AIRCRAFT SORTIES AND FLYING HOURS

FIGURE B5-2C TOTAL AIRCREW CASUALTIES AND AIRCRAFT LOST

CONFIDENTIAL
have so far offset a constantly increasing enemy threat.

e. During the period 1 July 1965 through 28 February 1966, a total of 67 army aircraft were lost due to enemy action, or an average loss rate of 8.4 aircraft per month as shown below:

### AIRCRAFT LOSSES BY TYPE (1 JULY 1965 - 28 FEBRUARY 1966)

<table>
<thead>
<tr>
<th>Type A/C</th>
<th>Total Loss</th>
<th>Combat Cause</th>
<th>Average Loss/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH-13/23</td>
<td>12</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>UH-1B</td>
<td>29</td>
<td>3.63</td>
<td></td>
</tr>
<tr>
<td>UH-1D</td>
<td>12</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>CH-37/47/54</td>
<td>2</td>
<td>.25</td>
<td></td>
</tr>
<tr>
<td>Fixed Wing</td>
<td>12</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>Total 8.38</strong></td>
<td></td>
</tr>
</tbody>
</table>

Data from all units evaluated indicate that replacement aircraft are either made available immediately from float stock or are received in from seven to 15 days, except for the CH-54. No CH-54 replacement aircraft are expected to be available in the immediate future. Although the CH-54 is used primarily for logistical support, it is the only helicopter in the army inventory which can recover a CH-47, an aircraft essential to airmobility, without extensive dismantling of the aircraft. The loss of CH-54's is doubly serious in that a much higher percentage of CH-47's shot down will be lost if this recovery capability is reduced.

f. During the same period, total aircrew casualties were 74 KIA and 314 WIA. Assuming that all 314 WIA were lost to the parent units, the average monthly aircrew replacement requirement was 68.5 personnel per month. Considering the overall theater requirement for replacement of aircrews for all causes, replacement of combat losses is not a significant problem.

g. Data received from the evaluated units indicate that although the time required to provide replacement aircraft and aircrews is not completely satisfactory, no significant deficiencies in operational readiness have resulted from this problem.

2. **(C) CONCLUSIONS**

a. The survivability of aircraft is not a serious limiting factor in airmobile operations.
b. Sufficient replacement aircraft are available to maintain the required tactical mobility, except for the CH-54.

c. The availability of replacement aircrews lost due to combat causes is not a serious limiting factor in airmobile operations.
EEA 19: It is desirable to substitute armored personnel carriers for wheeled vehicles as general purpose vehicles, prime movers, or weapons carriers?

1. (U) GENERAL

   a. Of the four type units evaluated, only the 1st Infantry Division has organic M113 armored personnel carriers (APC). Twenty-five APC's are assigned to the Armored Cavalry Squadron. The carrier provides light armored protection for a 10-man squad plus a driver, mounts a caliber .50 machine gun, and has a maximum on-road speed of approximately 40 miles per hour. The M113 also has the capability of crossing slow-moving inland waterways.

   b. Questions were directed to the division G3's, brigade S3's, battalion commanders, and officers in charge of motor movements to determine how APC's are being employed in Vietnam and how they would be used if made available to other units.

2. (C) DATA ANALYSIS

   a. Armored personnel carriers were used on seven troop moves of 25, for which data was available, of company size or larger during the evaluation. In the course of these moves, a total of 101 APC's were utilized covering an aggregate distance of 2110 miles. Returns from the officers in charge of the movements indicated that the on-road and off-road operating characteristics of the vehicle were excellent. On 57 percent of the moves the APC was required to move off-road. In all instances it performed in a satisfactory manner. Off-road travel included areas covered with brush and secondary growth and rice paddies. Performance in the rice paddies was excellent. The amphibious capability of the APC was required on 43 percent of the moves. No deficiencies were noted in this regard on any of the moves.

   b. Information concerning the off-road capabilities of organic general purpose vehicles were also obtained from the officer in charge of the movement. The following is a summary of the data obtained:
c. The satisfactory rating denotes a capability for limited off-road travel when required, not to include jungle or delta type of terrain. The \( \frac{1}{2} \)-ton utility vehicle was criticized twice for lack of cross-country mobility but was given a satisfactory rating because of performance the remainder of the time. Inadequacies were noted when moving over rough, open country with secondary growth. The 3/4 ton truck was criticized once when moving through brush and secondary growth for being unable to penetrate the brush and maintain the necessary traction.

d. APC's are better suited to cross-country movement than the general purpose wheeled vehicles. They also possess an amphibious capability. The requirement for off-road travel in Vietnam, however, is not extensive in many of the present areas of operation, nor does a continuing need exist within the maneuver units for an amphibious capability.

e. Units assigned to operate in the northern portion of the delta region can utilize APC's effectively for cross-country vehicular movement during the dry season. Problems arise occasionally in crossing the many canals because of the steep entry and exit banks. Proper selection of routes and the addition of the winch on the M113 can reduce the problems. During the rainy season, however, extreme flooding severely limits the vehicle's capability.

f. Thirteen engineer units were queried as to the effect APC's would have on existing road-nets if use of the carrier became more widespread. Due to the width and length of the tracks, the weight of the vehicles creates less ground pressure on the road than comparable size general purpose wheeled vehicles, resulting in less road damage. Additional road repairs will be required, however, following operation on roads during the rainy season no matter what vehicles are utilized.

g. APC's offer a better off-road capability than organic general purpose vehicles, prime movers, and weapons carriers, and also possess a better swimming capability; the desirability of substitution, however, varies by unit depending upon the area of operations and other resources available. Each major unit will be discussed in turn.

<table>
<thead>
<tr>
<th>TYPE VEHICLE</th>
<th>TIMES UTILIZED</th>
<th>OFF-ROAD CHARACTERISTICS</th>
<th>PERCENT OF TIME OFF-ROAD TRAVEL REQ'D</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{1}{2} )-ton Utility</td>
<td>23</td>
<td>Satisfactory</td>
<td>35</td>
</tr>
<tr>
<td>3/4ton Truck</td>
<td>19</td>
<td>Satisfactory</td>
<td>37</td>
</tr>
<tr>
<td>2( \frac{1}{2} )-ton Truck</td>
<td>20</td>
<td>Satisfactory</td>
<td>40</td>
</tr>
</tbody>
</table>
1st Infantry Division

(a) As previously mentioned, the 1st Infantry Division has 25 M113's organic in the Armored Cavalry Squadron. These APC's were used four times as described below:

<table>
<thead>
<tr>
<th>TYPE MISSION</th>
<th>NO. USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Security &amp; Recon</td>
<td>6</td>
</tr>
<tr>
<td>Convoy Security</td>
<td>UNK</td>
</tr>
<tr>
<td>Security &amp; Troop Carrier</td>
<td>5</td>
</tr>
<tr>
<td>Troop Carrier</td>
<td>31*</td>
</tr>
</tbody>
</table>

(b) The listing below reflects the substitutions desired on moves within the 1st Infantry Division:

<table>
<thead>
<tr>
<th>MOVE NO.</th>
<th>NO. VEHICLES</th>
<th>VEHICLE TYPE</th>
<th>NO. APC REQ'D</th>
<th>MISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>1/4 Ton</td>
<td>4</td>
<td>Command vehicle</td>
</tr>
<tr>
<td>9</td>
<td>3/4 Ton</td>
<td>9</td>
<td></td>
<td>Mortar carrier</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>1/4 Ton</td>
<td>5</td>
<td>Scout vehicles</td>
</tr>
<tr>
<td>17</td>
<td>2 1/2 Ton</td>
<td>17</td>
<td></td>
<td>Troop carrier</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>3/4 Ton</td>
<td>4</td>
<td>Mortar carrier</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>3/4 Ton</td>
<td>4</td>
<td>Mortar carrier</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>1/4 Ton</td>
<td>4</td>
<td>Command vehicle</td>
</tr>
<tr>
<td>9</td>
<td>3/4 Ton</td>
<td>5</td>
<td></td>
<td>Mortar carrier</td>
</tr>
<tr>
<td>18</td>
<td>2 1/2 Ton</td>
<td>33</td>
<td></td>
<td>Troop carrier</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>2 1/2 Ton</td>
<td>10</td>
<td>Troop carrier</td>
</tr>
<tr>
<td>7</td>
<td>15</td>
<td>2 1/2 Ton</td>
<td>20</td>
<td>Troop carrier</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>2 1/2 Ton</td>
<td>8</td>
<td>Troop carrier</td>
</tr>
</tbody>
</table>

(c) Summarizing the above, the APC was desired on three moves to replace 13 1/2-ton trucks as a command or scout vehicle.

* The 31 APC's reflect an augmentation of the squadron's resources for this move.
On four moves, 22 APC's were desired to replace 28 3/4-ton trucks for the purpose of moving mortars. Sixty-eight APC's were desired on five moves to replace 59 2 1/2-ton trucks as troop carriers. APC's were either used or desired on 71 percent of the moves for which data were available in the 1st Infantry Division.

(d) Three of the battalion commanders in the 1st Infantry Division stated a requirement for a vehicle to replace the 1 1/4-ton with 106mm recoilless rifle in the reconnaissance platoon. Three mentioned the APC and the other cited a requirement for a vehicle not restricted to roads. Although the M113 is suited for the mission requested, this vehicle should not be assigned to the battalion because of the continuing requirement to be capable of movement by UH-1D.

(e) One of the brigade S4's suggested that the 1/4-ton scout vehicles within the battalions be replaced with M113's. Again, the replacement of organic 1/4-ton vehicles with M113's is not in consonance with the requirement for the battalion to be UH-1D mobile.

(f) Based on the data above it is concluded that an additional APC capability could be used advantageously by the division to provide route security for on-road convoys, for use as mortar carriers for on and off road movements, and for use as troop carriers when operating off road. Replacing 3/4-ton trucks with APC's without tops as mortar carriers on road movements and route security operations provides the capability of furnishing continuous fire support to the convoy and to troops sweeping areas adjacent to the road since the mortars can be fired from the beds of the APC's.

(g) Additional armored personnel carriers should not be organic to the division, however, but available to the division for assignment on a mission basis to those units participating in extensive road-clearing operations or search and destroy missions in regions where trafficability permits their use.

(2) 1st Cavalry Division.

(a) Data were collected on three moves on-road of company size or larger. APC's were not used on any of the moves since the division's primary means of movement is by air. Although the officer in charge of the move stated that "very little difficulty had been experienced on the road over which the travel occurred", a desire was stated for six more APC's to replace six 1 1/4-ton utility vehicles as armed escort vehicles. No comments were received from any other source within the division that indicated a desire for APC's.
(b) As long as ARVN forces are charged with route security for logistical convoys moving on the road from Qui Nhon to An Khe, it is doubtful that the 1st Cavalry Division would have a requirement for APC's, except on a special mission basis.

(3) 1st Brigade, 101st Airborne Division:

(a) The 1st Brigade, 101st Airborne Division did not use APC's on any of the four ground vehicular moves of company size or larger for which data were collected. The following is a summary of substitutions desired on the moves:

<table>
<thead>
<tr>
<th>MOVE NO.</th>
<th>NO. VEHICLES</th>
<th>VEHICLE TYPE</th>
<th>NO. APC'S REQ'D</th>
<th>MISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>1/4 ton</td>
<td>20</td>
<td>Scout &amp; Recon</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>1/4 ton</td>
<td>36</td>
<td>Scout &amp; Recon</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>3/4 ton</td>
<td>14</td>
<td>Mortar Carrier</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2 1/2 ton</td>
<td>8</td>
<td>Troop Carrier</td>
</tr>
</tbody>
</table>

(b) Although not used on any of the moves, APC's were desired 75% of the time. The primary purpose for which desired is as a scout and reconnaissance vehicle to replace 1-ton vehicles in the two moves described above. On a one time questionnaire pertaining to vehicle suitability, the brigade S3 stated that APC's should be available on a mission basis.

(c) Although sufficient data are not available to either prove or disprove a requirement for APC's in the 1st Brigade, 101st Airborne Division, the situation appears similar to that of the 1st Infantry Division. If the brigade is assigned extensive road clearing operations along Highway 1, APC's should be made available on a mission basis to serve as scout and reconnaissance vehicles and as mortar carriers.

(4) 173d Airborne Brigade.

(a) Data were collected on only four ground vehicular moves of company size or larger. APC's were utilized on all of these moves. Three commanders offered unsolicited comments on the excellent performance of the vehicles on the operations. Utilization was as follows:
(b) Not included above, is the M106 (modified M113 with 4.2" mortar mounted in vehicle), which was also used on three moves.

(c) The brigade S4, in response to a one time question concerning additional or replacement vehicles desired, stated a requirement for 18 M113's, four M106's, and one M574 (Carrier, command post, tracked) to be used for troop transport, clearing operations, and providing mobility for the mortars. Of the required vehicles, 11 M113's, one M574, and four M106's have already been provided to the tank company by special authorization.

(d) The commander of the Cavalry Troop also stated a requirement for vehicles with improved cross-country mobility, swimming capability, and the ability to break through brush, as replacements for 1/4 and 3/4-ton trucks.

(e) Missions assigned to the 173d have been in areas particularly well suited to APC usage. Assignment of the APC's to the Tank Company has alleviated the immediate requirement for full time usage. As with the 1st Infantry Division, additional armored personnel carriers could be utilized on an as required basis to perform particular missions.

3. (c) CONCLUSIONS

a. A requirement exists for cross-country vehicular movement for units operating along the coastal plain and in the northern portion of the Mekong delta.

b. General purpose vehicles organic to the battalion/brigade can perform limited off-road movement.

c. Armored personnel carriers have performed off-road movement satisfactorily when required, during the evaluation period.

d. No major impact on road repairs would result from substituting APC's for general purpose wheeled vehicles.
e. Armored personnel carriers should not be substituted for wheeled vehicles at battalion level.

f. Additional armored personnel carriers in support can be used effectively in the 1st Cavalry Division, 1st Infantry Division, 173d Airborne Brigade, and the 1st Brigade, 101st Airborne Division for the following missions:

(1) Road-clearing operations.

(2) Search and destroy in the delta or lowland coastal plain region.

(3) Route security.
EEA 20: Has the requirement for ground mobility after delivery of the airborne force into the objective area generated any new requirements for specialized tactical vehicles or other equipment?

1. (U) GENERAL

The majority of the units evaluated were performing search and destroy missions during the period of the evaluation. All of the infantry battalions made frequent air assaults into objective areas. In the conduct of operations, a forward battalion base was normally set up with the rifle companies conducting patrolling actions around the base perimeter. Supplies were usually airlifted into the forward battalion base in the late afternoon along with 81mm mortars and ammunition required for perimeter security and returned to the main base in the morning. The primary use for vehicles was local movement of supplies within the forward battalion base.

2. (C) DATA ANALYSIS

a. AVAILABILITY OF GROUND VEHICLES.

(1) Data were collected from 34 battalion commanders following operations in which commitment of troops by air occurred to determine what ground vehicles were available after delivery into an area by Army aircraft. Data shown below reflects the results of the survey.

<table>
<thead>
<tr>
<th>TYPE BATTALION BY UNIT</th>
<th>NUMBER TIMES VEH AVAILABLE AFTER AIR DEL</th>
<th>NUMBER AIR DEL EXAMINED</th>
<th>PERCENT OF TIME AVAILABLE</th>
<th>NUMBER VEH TAKEN</th>
<th>PERCENT OF TIME SATISFACTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Cav</td>
<td>7</td>
<td>17</td>
<td>41</td>
<td>4 6 12</td>
<td>86%</td>
</tr>
<tr>
<td>101st</td>
<td>2</td>
<td>2</td>
<td>100</td>
<td>3 3.5 4</td>
<td>100%</td>
</tr>
<tr>
<td>17th</td>
<td>1</td>
<td>6</td>
<td>17</td>
<td>4 4 4</td>
<td>100%</td>
</tr>
<tr>
<td>1st Inf</td>
<td>1</td>
<td>9</td>
<td>11</td>
<td>25 25 25</td>
<td>100%</td>
</tr>
</tbody>
</table>
(2) Of the 34 returns, ground vehicles were available after delivery by air 11 times. This supports the one time responses that previously indicated ground vehicles are available after delivery a small percentage of the time due to unsuitable terrain and limitations in availability of helicopter lift.

(3) The battalions of the 1st Cavalry Division had ground vehicles available after delivery by air 41 percent of the time. In all instances when ground vehicles were available to the battalions of the 1st Cavalry Division, some 1/2-ton utility carriers (Hules) were included. The 1/4-ton utility vehicle was available in addition to the 1/2-ton on three of the moves.

(4) The battalions of the 1st Brigade, 101st Airborne Division, had ground vehicles available in both of the operations for which data were available. The 1/2-ton utility carrier (Hule) was used in both instances. No vehicular deficiencies were noted, with satisfaction expressed 100 percent of the time. The data base for this unit is limited, however, and precludes drawing any conclusions concerning the availability of ground vehicles after aerial delivery of the unit.

(5) The battalions of the 173d Airborne Brigade had ground vehicles available only once in six operations evaluated. Four 1/2-ton utility carriers (Hules) were available to the battalion and were found to be satisfactory.

(6) The battalions of the 1st Infantry Division had ground vehicles available in only one instance out of nine returns. During Operation Bushmaster II, a total of 25 1/4-ton and 3/4-ton trucks were available to the air delivered ground forces. The vehicles were satisfactory, but were used for only the first five days of a 12-day operation.

(7) In summary, ground vehicles were available to forces delivered by air 32.6 percent of the time based on the returns received. Of the times vehicles were available, the 1/2-ton utility carrier (Hule) was used 90.9 percent of the time. No vehicular deficiencies were noted.

b. UTILIZATION OF GROUND VEHICLES.

(1) It is seldom feasible to take ground vehicles with the maneuver elements of a battalion when conducting search and destroy missions because of the rugged terrain and the necessity for surprise and flexibility of movement. Vehicle usage in the forward battalion base has proved feasible, however, an analysis was conducted to determine if the 1/2-ton utility carrier satisfied the requirement for transport in the forward battalion base. The accompanying table shows the normal utilization of this vehicle by battalion with the 1st
Brigade, 101st Airborne Division on tactical operations.

UTILIZATION OF 1/2-TON UTILITY CARRIER IN BATTALIONS OF 1ST BRIGADE, 101ST AIRBORNE DIVISION

<table>
<thead>
<tr>
<th>Battalions</th>
<th>CONVOY PLATOON</th>
<th>GROUND SURVEY</th>
<th>4.2&quot; MORTAR</th>
<th>ANTI-TANK</th>
<th>MAINT PLAT</th>
<th>ROCKET SECTION</th>
<th>MPNS PLAT</th>
<th>EQ MORTAR</th>
<th>SQUAD</th>
<th>ANTI-TANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0 0 2 0 1 3 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1 - Battalion Commander has never tried using vehicle.

Note 2 - When possible, all mules go on tactical operations. Have taken mules into every tactical area.

Note 3 - Normally uses four mules in tactical operation. "Mule is a very fine vehicle."

(2) The battalions using the mule assign it a variety of tasks in the tactical environment. These include:

(a) Laying wire in tactical area.

(b) Distribution of supplies from landing zone to the units.

(c) Displacement of mortars and ammunition.

(d) Movement of supplies within the battalion base.

(3) The vehicle is often loaded with supplies and ammunition, slung beneath a UH-1D, and delivered to the committed battalion as a "self-propelled" pallet that can, if desired, be extracted when the next load is delivered. Two problem areas were mentioned:

(a) Frequent flat tires.
(b) Difficulties in maintenance.

(4) The number of mules normally taken on operations by the battalions in the 1st Cavalry Division is shown below.

**UTILIZATION OF 1/2-TON UTILITY CARRIER IN BATTALIONS OF 1ST CAVALRY**

<table>
<thead>
<tr>
<th>BATTALIONS</th>
<th>COMBAT SUPPORT Co. (5)</th>
<th>HQ &amp; HQ Co. SPT SEC (6)</th>
<th>HQ &amp; HQ Co. KESS (2)</th>
<th>RIFLE CO (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

AVERAGE: 4 4 1 1

(5) The 1/2-ton utility carriers not taken on operations are employed in the rear area for administrative and logistical missions. Of those taken on operations, the following missions are normally assigned:

(a) Transporting 8mm mortars and ammunition.

(b) Hauling ammunition, supplies, and water from helicopters to supply points.

(c) Carrying communications equipment.

B-7-4

EEA 20
(d) Moving supplies within the forward support base.
(e) Hauling rations to companies.
(6) Comments concerning the mule were as follows:
"Simple and versatile, requires little POL"
"Could not be replaced"
"No replacement desired"
"Ideal vehicle"
(7) The mule was considered by the 1st Air Cavalry Division to be an ideal vehicle for loading the UH-1D. Mules have also been slung and hauled by UH-1D as in the 1st Brigade, 101st Airborne Division. They were also loaded and driven into the CH-47 to be transported internally. No criticism of the vehicle was received.
(8) Data was obtained from the two battalions of the 173d Airborne Brigade. Of the mule assigned to each weapons squad of the rifle company, none was normally taken on operations by either battalion. Of the four assigned to the mortar platoon, all were taken on tactical operations and used to carry mortars and ammunition from the helicopter landing zone to the weapon positions.
(9) Comments concerning the mule are as follows:
"Outstanding vehicle for resupply of ammo and rations"
"Vehicle is indispensable"
"Unnecessary for use in a rifle company"
(10) Problems encountered with the vehicle are:
(a) Starter unreliable.
(b) High deadline rate.
(c) Larger tires required in rice paddies.
(d) Inability to operate in jungle.
(11) In summary, the 1/2-ton mule is considered an excellent vehicle for use in the battalion forward base. The vehicle cannot be effectively used with the rifle company on tactical operations.
c. REQUIREMENTS FOR SPECIALIZED EQUIPMENT. Based on data received by the firepower functional area, rifle companies are taking only one 81mm mortar on operations because of the difficulties in carrying the mortar and the ammunition through the type terrain encountered in Vietnam. (See Appendix I for further discussion) No suitable carrier is available for performing this task. It appears that a requirement exists for a carrier capable of carrying the disassembled 81mm mortar (bipod, tube, and base plate) and/or ammunition while on an extended tactical foot movements. A carrier of this type would allow the company to carry more ammunition or additional mortars with the same number of men and less energy expenditure.

3. (U) CONCLUSIONS

a. The 1/2-ton mule satisfies requirements for ground mobility within the battalion forward base.

b. A carrier should be developed for use in the rifle company to carry mortars and ammunition on operations.
EEA 21: Can the number of ground vehicles currently authorized the division/brigade be decreased without degrading tactical mobility?

1. **GENERAL**

Under existing conditions in Vietnam, tactical mobility in area of operation (AO) missions is basically achieved through the use of Army aircraft and foot movement. The mobility required for tactical area of responsibility missions (TAOR) includes requirements for base camp operations and road clearing and securing operations, primarily through the use of ground vehicles augmented by aerial vehicles. Ground vehicles have been used for both types of mission, but primarily during operations in the TAOR because of existing conditions discussed in Appendix 1. Should the complexion of the war change from an airborne search and destroy campaign in the AO to a ground mobile securing and clearing operation, vehicles currently authorized the division/brigade will perform the roles for which they were intended rather than being restricted primarily to the TAOR. Because of the limited usage of ground vehicles in the tactical mobility role (AO) thus far, the only basis for responding to the EEA are one time responses from division/brigade unit commanders. Judgements as to future requirements are also utilized based on projections by the Commanding General, USARV and major unit commanders.

2. **(C) VEHICLE REDUCTIONS.**

Vehicle usage by the evaluated units, based on returns from the division/brigade unit commanders, are discussed in the following paragraphs. (Vehicle changes within the maneuver battalions are covered in Appendix 1).

a. **1ST INFANTRY DIVISION.**

(1) Vehicles authorized the division support elements have been utilized primarily in the TAOR mission. The artillery prime movers have been required during AO missions more frequently than any of the other combat support vehicles during the evaluation. Twenty-seven displacements of artillery were conducted by use of organic vehicles. Five displacements were also conducted by the use of CH-47's in support of the division.

(2) All of the combat support and service support units within the division stated that the number of vehicles authorized could not be decreased due to requirement for ground vehicles in TAOR operations. In addition, the data returns received were unanimous in stating that additional aerial support would be required if the number of ground
vehicles were decreased.

b. 173D AIRBORNE BRIGADE.

(1) As in the 1st Infantry Division, the primary use of organic brigade vehicles, other than artillery prime movers and tracked vehicles, has been in the TAOR. Vehicle convoys, both troop and logistical, have been utilized on several occasions. The combat service support battalion and engineer company have replaced some of the lighter vehicles designed specifically for airborne operations with heavier vehicles necessary for conducting sustained ground combat by local authorization. These vehicles are primarily utilized within the TAOR. Artillery units within the 173d have utilized organic ground vehicles as prime movers except when the tempo of operations dictated displacement by supporting CH-47's.

(2) All of the combat support and service support units within the brigade stated that the number of vehicles authorized the unit could not be decreased without additional aviation support being provided.

c. 1ST CAVALRY DIVISION. As the primary means of tactical mobility in the division is by organic Army aircraft, a minimum number of ground vehicles have been authorized for support. For fulfilling mission requirements in the TAOR, additional trucks have been placed in support of the division. The combat support and service support units within the division stated that the number of vehicles authorized the units could not be decreased.

d. 1ST BRIGADE/101ST AIRBORNE DIVISION. The brigade was committed to Vietnam with insufficient transport means to conduct sustained combat operations. The brigade has requested additional vehicular support through appropriate channels. All of the combat support or service support units within the brigade stated that the number of vehicles authorized the units could not be decreased because of the TAOR missions. As with the other units, responses indicated that any reduction in ground vehicles would have to be accompanied by an increase in aviation support.

3. (U) VEHICLE STORAGE.

Although no significant decreases in vehicles above maneuver battalion were recommended, the opinion expressed by respondents was that any vehicles taken from the unit because of local conditions should be retained in the TOE and placed in limited storage in Vietnam. This would allow ready access to them if the complexion of the war changed and they were needed for operations.

4. (U) CONCLUSIONS.

a. Ground vehicles are required primarily for TAOR missions
and base camp operations at the present time.

b. If the number of ground vehicles is decreased, a greater air movement capability would be required for operations within the division/brigade TAOR.

c. The airborne units and the 1st Cavalry Division have required ground vehicle augmentations for TAOR missions.
Appendix 9 to Annex B (Mobility)

EEA 22: Do the organizations' combat support and service support units have the organic mobility capability to fragment their operations and provide the required support to battalions/brigades?

1. GENERAL

Combat support elements considered in this EEA are artillery, Army aviation, engineer, and signal units. Service support elements are the units found in the Support Command at division level and in the Support Battalion for the separate brigades.

2. (C) DISCUSSION

a. COMBAT SUPPORT. None of the combat support elements in the units evaluated are self sufficient in mobility means for all types of operations conducted in Vietnam. For airmobile operations in Tactical Areas of Responsibility and Areas of Operations, combat support elements of the 1st Infantry Division, 173d Airborne Brigade, and 1st Brigade, 101st Airborne Division must be augmented with aerial vehicles, either organic to or in support of the division/brigades to fragment their operations and provide effective support to the maneuver battalions. One example of this procedure is the movement of supporting artillery by CH-47 instead of the normal prime mover during airmobile operations. When the tactical plan calls for a ground operation supported by a ground line of communications, usually within or near the Tactical Area of Responsibility, the three ground oriented units mentioned above are more nearly self sufficient with organic vehicles; in the 1st Cavalry Division, however, where the primary means of mobility is by air, combat support elements must be augmented by ground vehicles to conduct sustained ground combat operations. (For further discussion of the adequacy of combat support see Annex C, Firepower; Annex E, Service Support; and Annex D, Command, Control, and Communications.)

b. COMBAT SERVICE SUPPORT

(1) During the period of this evaluation, none of the support commands/battalions has operated without additional vehicular or aviation support. It is difficult, therefore, to draw conclusions concerning the adequacy of organic mobility means. Certain deductions may be made, however, based on the capability designed into the units and an analysis of the unique situation in Vietnam.

(2) Both the 1st Infantry Division and the 173d Airborne Brigade have a design capability for combat service support with organic means. In Vietnam, where the available road net is of limited use because of enemy obstacles and the threat of ambush, both units have had
to depend to a great extent on aerial movement of troops and supplies or on periodic large convoys moving on roads opened by combat forces for the period of the movement. In either situation, the combat service support elements must be augmented with additional aerial or ground vehicles to sustain operations.

(3) The 1st Cavalry Division and the 1st Brigade, 101st Airborne Division, however, are not designed for sustained combat without augmentation in the form of additional ground vehicular and/or aerial support. Any attempt to permanently modify their organization by changing the TOE to make them self-sustaining would abandon the concept under which they were organized and is beyond the purview of this study. Recommended modifications to organization and materiel, however, designed to increase the units' capabilities in this environment, are presented elsewhere in the study.

(4) In 1st Cavalry Division operations, the 1st Logistical Command, where feasible, hauls supplies from depots directly to brigade bases over a ground line of communications on a "through put" basis. If the division is required to maintain the ground line of communications, its organic ground vehicles must be augmented for the period of the operation. Normally, however, the division operates an air line of communications to the forward support elements at the forward brigade base using organic and attached aircraft. The combat service support elements are provided mobility means commensurate with the requirements of the tactical plan in accordance with the principle that they must have at least the same mobility capability as the units supported. The vehicles allocated to these units, therefore, will vary from operation to operation. A vehicle allocation for a given operation is shown in Figure B9-1. Within the brigade and division forward base all combat service support elements have adequate mobility means to provide the required support.
<table>
<thead>
<tr>
<th>TYPE VEHICLE</th>
<th>NUMBER</th>
<th>UNIT FROM WHICH VEHICLE OBTAINED</th>
<th>PURPOSE FOR WHICH USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-ton truck</td>
<td>10</td>
<td>Spt Cmd</td>
<td>6 Radio jeeps, 4 Misc transp</td>
</tr>
<tr>
<td>3/4-ton truck</td>
<td>7</td>
<td>Spt Cmd</td>
<td>4 Supplies, 3 Maint</td>
</tr>
<tr>
<td>3/4-ton wrecker</td>
<td>1</td>
<td>Spt Cmd</td>
<td>Recovery</td>
</tr>
<tr>
<td>21/2-ton truck</td>
<td>4</td>
<td>Trans Plt SSV Bn</td>
<td>Cargo, Vehicles</td>
</tr>
<tr>
<td>UH-1D</td>
<td>7</td>
<td>1 - Maint Bn, 2 - Support Hel Bn</td>
<td>Recovery, Cargo, Med Evac</td>
</tr>
<tr>
<td>CH-47</td>
<td>4</td>
<td>11th Avn Gp</td>
<td>Cargo</td>
</tr>
<tr>
<td>CH-54</td>
<td>1</td>
<td>Spt Cmd</td>
<td>Recovery</td>
</tr>
<tr>
<td>3-wheel utility</td>
<td>3</td>
<td>Spt Cmd</td>
<td>Airfield Control</td>
</tr>
<tr>
<td>1/2-ton (Mule)</td>
<td>10</td>
<td>Spt Cmd</td>
<td>General Purpose</td>
</tr>
</tbody>
</table>

Figure B9-1. Vehicle Allocation to Forward Support Element, 1st Cavalry Division for a Given Operation. (U)
(5) The situation in the 1st Brigade, 101st Airborne Division, is different in that they have no organic transportation section or organic logistical support aircraft. To overcome this deficiency, a provisional truck platoon has been organized by stripping various elements of the brigade. In addition, an MTOE providing 20 2½-ton trucks, two 5-ton tractors, and two stake and platform semitrailers has been requested. With this augmentation, and the aviation support which is currently being provided, the elements of the brigade Support Battalion can support the maneuver units on a continuing basis. (For more detailed discussion of this area for all four units, see Annex E, Service Support).

(6) Both Support Commands and Support Battalions require continuous responsive aviation support to accomplish their mission. In the 1st Cavalry Division this support is provided through attachment of Army aircraft from resources available to the division. Air Force aircraft also provide support on a mission basis. Aerial support in the other units is provided on a similar basis, but the aircraft are not attached. Both fixed and rotary wing aircraft are used and required, depending on the situation and tactical mission, with one type of aircraft complementing the other. Fixed wing aircraft, such as the CV-2/7, are usually more efficient on long hauls when adequate airfields are available. It is neither necessary nor desirable for supporting aircraft to be organic to the Support Commands/Battalions. More flexibility and more efficient utilization of available aircraft can be achieved by providing necessary support on a mission basis.

b. ADEQUACY OF GENERAL PURPOSE VEHICLES. All of the general purpose vehicles have been found generally suitable to the environment and capable of providing the required mobility to support the maneuver units when the tactical situation permits a ground LOC and the road net is adequate. For a detailed discussion of vehicle suitability and responsiveness in all units, see Appendix 1 and 2 of this Annex. For a discussion of the requirement for an improved off-road vehicle capability, see Appendix 6, this Annex.

3. (C) CONCLUSIONS

a. None of the units' combat support and combat service support elements has the organic mobility capability to fragment their operations and provide the required support to battalions/brigades under all circumstances found in Vietnam.

b. Except for medical evacuation aircraft in the 1st Cavalry Division, aircraft need not be organic to the Support Commands/Battalions.

c. Both fixed wing and rotary wing aircraft are required in support of combat support and combat service support elements.