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Observations on Visit to  
REFORGER '77 (U)

ASAP Ad Hoc Group on  
Electronic Warfare and Intelligence

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## PREFACE (U)

(U) An earlier draft of this report, dated November 1977, was circulated for comments to Major General Pat Crizer, Commander of the 3rd Infantry Division during REFORGER '77; Major General Dean Tice, current Commander of the 3rd Infantry Division; and Major General Oliver Dillard, DCSI of USAREUR. Their comments have been incorporated in this revised draft.

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1. BACKGROUND (U)

(U) During the five day period, September 12-16, 1977, three members of the Army Scientific Advisory Panel Ad Hoc Group on Electronic Warfare and Intelligence visited the 1977 REFORGER field training exercise CARBON EDGE, as observers of the intelligence and electronic warfare activities of the 3rd Infantry Division (ID). The three ASAP members (Dr. Seth Bonder, Dr. Richard Hundley, and Mr. Allan Simon) spent four days with the 3rd ID itself, observing activities in the Division Tactical Operations Center (TOC) and in the Division Forward Command Center (called the TAC by the 3rd ID), and also visiting two brigade headquarters and a few maneuver elements. On the fifth day the ASAP members visited the VII Corps Tactical Operations Center in order to gain a picture of the 3rd ID operations and intelligence as viewed from the Corps level.

(U) The ASAP Ad Hoc Group on EW/I has been engaged in a review of the Army's plans and programs for the next generation EW/I architecture and systems. This review has identified a number of key questions relative to the types of EW/I systems that are required, the way in which they should interact, and the proper interplay between Division assets, Corps assets, and echelon above Corps (EAC) assets.\* The ASAP members found their REFORGER visit--with the opportunities it provided for observation of the actual operation of EW/I systems, the processing of their data, and the use of the intelligence by the operational commanders and staff--extremely useful in providing further insights into these questions.

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(U) \* These questions are highlighted in two previous reports by the ASAP Ad Hoc Group on EW/I, References 1 and 2.

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(C) The CARBON EDGE field training exercise was a particularly fertile source of such insights because of the intelligence "experiment" conducted by the 3rd ID during this exercise. In this experiment a large number of intelligence collection systems--normally not operated in direct support of an individual division--were dedicated to the support of the 3rd ID. (Table I lists the principal sensor systems involved.) The intended purposes of this experiment were to demonstrate the ability of modern intelligence collection systems to provide useful, timely tactical intelligence to a division commander, and further, to address two questions: (1) Could the division commander and staff handle the output from this collection of sensor systems, or would they be overwhelmed by the deluge of data? and (2) How much difference would this intelligence asymmetry in favor of the 3rd ID make in the course of the battle?

(S) For the first four days of CARBON EDGE, this intelligence experiment was largely a failure--at least as a demonstration of the ability of modern sensor systems to support the tactical commander. For most of this time, most of the collection systems listed in Table I provided little or no intelligence information to the 3rd ID. At critical points in the battle, the intelligence supplied to the division commander was critically deficient and limited his ability to make sound tactical decisions.

(C) Even though a failure as a demonstration of intelligence capabilities, the experiment was nevertheless an extremely valuable source of data on the problems a tactical intelligence system must surmount and on the characteristics new EW/I

Table I(C). Sensor Systems Committed to Support of 3rd Infantry Division During CARBON EDGE (U)

<u>SYSTEM</u>	<u>TYPE</u>	<u>OPERATED BY</u>
851st ASA COMPANY	COMINT/ELINT	3rd INFANTRY DIVISION (ORGANIC)
SOTAS	HELICOPTER-BORNE MTI RADAR	DEVELOPMENT PROGRAM MANAGER
GUARDRAIL	AIRBORNE COMINT/DF	66th MI GROUP
QUICK LOOK	AIRBORNE ELINT	66th MI GROUP
ARMY SLAR	AIRBORNE SIDE LOOKING RADAR	66th MI GROUP
LRRP	LONG RANGE RECONNAISSANCE PATROLS	VII LRRPs (FRENCH)
NRT SLAR	AIRBORNE SIDE LOOKING RADAR WITH REAL TIME DOWNLINK	AIR FORCE
AIR FORCE SLAR	AIRBORNE SIDE LOOKING RADAR	AIR FORCE
AIR FORCE IR/PHOTO	AIRBORNE IR/PHOTO RECCE	AIR FORCE
QSR	AIRBORNE ELINT/IR	AIR FORCE
TEREC	AIRBORNE ELINT	AIR FORCE
COMFY LEVI	AIRBORNE COMINT	AIR FORCE
SENIOR BOOK	AIRBORNE COMINT	AIR FORCE
RIVET JOINT	AIRBORNE COMINT/ELINT	AIR FORCE

NOTE: 3rd INFANTRY DIVISION WAS ALSO SUPPORTED BY COMINT ANALYSTS AT VII CORPS AND 6911th SQUADRON (AIR FORCE).

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architecture and equipment should possess.\* The remainder of this report contains a number of observations relative to these topics.

(C) As mentioned previously, the three ASAP members observed only the first five days of CARBON EDGE. Many of the problems discussed here may well have been solved during the second week of the exercise; the intelligence experiment may have been a success during that second week.\*\* Nevertheless, we consider it useful and important to focus on the problems encountered during the first week for two reasons: (1) these problems provide valuable insights into potential difficulties the designers of the next generation EW/I systems must surmount, and (2) the ability of the tactical intelligence systems to perform at a high level of effectiveness during the early stages of a NATO/Warsaw Pact engagement could be of decisive importance.

(U) The Ad Hoc Group members greatly appreciated the cooperation extended by the commander and staff of the 3rd Infantry Division, and by the willingness of all of the personnel involved to discuss frankly and in detail the performance and problems of the various intelligence collection systems.

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(C) \* In these terms--as an identifier of problem areas in systems, training, or procedures--the experiment was clearly a success. This is emphasized in Reference 3.

(C) \*\* Indeed, the performance of many of the intelligence collection systems appears to have improved significantly during the second week of the exercise. This is discussed in References 3-8.

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2. OBSERVATIONS (U)

2.1 Difficulties Inherent in Using Modern Intelligence Collection Systems to Support the Tactical Commander (U)

(S) As mentioned previously, an impressive list of modern intelligence collection systems was dedicated to the use of the 3rd ID during CARBON EDGE. During the first four days of the exercise, and during the critical deployment phase immediately prior to the exercise, these systems provided disappointingly little useful intelligence data to the 3rd ID. The reasons, which are illustrative of the difficulties a modern tactical intelligence system must surmount, seem to fall into three general categories:

Airborne Platforms (U)

Sensors based on airborne platforms have limited operational availability, particularly if they are operated by some other organization. This is illustrated by Table II, which presents data on the number of operational hours programmed, and actually obtained, by the 3rd ID for the various airborne sensors during the period September 10-14. In most cases the 3rd ID personnel were unaware of the reasons for the performance shortfall; they only knew they were not being supported as planned.\* In a few cases (e.g., GUARDRAIL), the 3rd ID was aware of specific platform and communication problems.

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(C) \* It was learned later than the intelligence collection requirements of the Air Force's COLD FIRE exercise conflicted with some of the REFORGER requirements during the first week. This problem was not present during the second week [3,7].

Table II(C). Operational Availability of Airborne Sensor Systems (U)

SYSTEM	September 10		September 11		September 12		September 13		September 14	
	HOURS PROGRAMMED	HOURS OBTAINED	HOURS PROGRAMMED	HOURS OBTAINED	HOURS PROGRAMMED	HOURS OBTAINED	HOURS PROGRAMMED	HOURS OBTAINED	HOURS PROGRAMMED	HOURS OBTAINED
SOTAS	12	0	12	?	12	?	?	3	?	5
GUARDRAIL	5	0	7	0	7	0	8	0	?	0
QUICK LOOK	4	1	4	0	4	0	4	2	?	7
ARMY SLAR	?	?	2-1/2	0	2-1/2	0	2	2	2	2
NRT SLAR	2	1-1/2	5	3-1/2	5	3-1/2	4-1/2	6	?	4
AIR FORCE SLAR	2	1-1/2								
AIR FORCE IR/PHOTO			1-1/2	0	1-1/2	0	?	0	?	0
QSR			4	0	4	0	4	1	4	1
TEREC			5	1	5-1/2	1	4-1/2	0		
COMFY LEVI			8	0	8	0	8	0	8	0
SENIOR BOOK	1	0	8	0	8	0	8	0	8	0
RIVET JOINT			8	0	8	0	8	0	8	0

? = DATA UNAVAILABLE

SOURCE OF DATA: LOG BOOK, ALL SOURCE INTELLIGENCE CENTER, 3RD INFANTRY DIVISION

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## Remote Readout and Analysis Location (U)

For sensors that depend on readout and analysis at a location remote from the division headquarters, there appears to be great difficulty in guaranteeing reliable communication links to get the data to the division. This could be the reason for the poor performance of the various Air Force systems (TEREC, COMFY LEVI, SENIOR BOOK, RIVET JOINT) during the exercise. Apparently, there were persistent breakdowns somewhere in the communication chain between Hahn (where these systems were read out), VII Corps tactical headquarters at Leipheim (which relayed the information), and the 3rd ID TOC.\* There were also persistent breakdowns in the communications from the GUARDRAIL platforms and from the VII Corps All Source Intelligence Center (ASIC).\*\*

## Complex Systems Operated at Division (U)

One way to circumvent the above problems is to operate the intelligence collection systems at the division level. This creates a new set of problems: difficulties in keeping complex systems operating in the field environment, difficulties in moving the systems to keep up with the movement of the division, and an encumbrance of the division TOC with a great deal of additional

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(C) \* Communications from the Near-Real-Time Side-Looking Radar (NRT SLAR) were handled differently and worked very well. This will be discussed later.

(C) \*\* Some of these communications problems were solved during the second week of the exercise, cf References 4-6.

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personnel, equipment, vans, etc. These problems were illustrated by the experience with SOTAS during CARBON EDGE. This system--a helicopter-borne MTI radar--was operated in the division area, and the SOTAS control van was colocated with the division TOC. When this system was working, the tactical intelligence it provided was extremely valuable. When the Division TOC had to move, however, there was a major disruption in the performance of the SOTAS system; it was inoperative for about 14 hours after the initiation of one such move, during a critical period in the battle. This is particularly significant since the Division TOC moves every one to two days.

(S) As a result of these various difficulties, the array of modern intelligence collection sensors contributed relatively little to the 3rd ID's perception of the battlefield during the first week of CARBON EDGE. This is illustrated by Table III, which presents data on the number of spot reports--intelligence reports of any utility--recorded in the 3rd ID ASIC for the deployment period, September 8-12, and the initial maneuver period, September 13-15, for the different sources of intelligence information.\* As can be seen from the data, once the battle began the most consistently productive sources of intelligence information were front line troop contacts and long-range reconnaissance patrols (LRRPs). With the exception of SOTAS, NRT SLAR, and the COMINT/ELINT activities of the

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(U) \* The data shown in Table III was taken from the working log book kept in the Division ASIC during the exercise. For definitive data, the reader should consult the 3rd ID After Action Intelligence Report, Reference 5.

Table III(S). Intelligence Reports Recorded in 3rd Infantry Division ASIC (U)

SOURCE	SEPT. 8	SEPT. 9	SEPT. 10	SEPT. 11	SEPT. 12	SEPT. 13	SEPT. 14	SEPT. 15
FRONT LINE TROOPS	1		6	20		19	24	19
851st ASA	10	1		9	5	4	19	6
SOTAS	1	1		3	10	5	28	15
VII CORPS G-2					1	6		1
GUARDRAIL								
QUICK LOOK						3	8	3
ARMY SLAR					2		5	
LRRP						4	31	11
NRT SLAR							6	8
AIR FORCE SLAR								
AIR FORCE IR/PHOTO								
QSR								5
TEREC								
COMFY LEVI								
SENIOR BOOK								
RIVET JOINT								

NOTE: PROGRAMMED TASKING OF THESE COLLECTION ASSETS IS SHOWN IN TABLE II.  
SOURCE OF DATA: LOG BOOK, ALL SOURCE INTELLIGENCE CENTER, 3RD INFANTRY DIVISION

851st ASA company, the other intelligence collection systems contributed relatively little.\*

(C) The lessons to be drawn from this experience for use in the design of new EW/I systems are obvious:

- For systems using airborne collection platforms, an adequate number of spare platforms should be provided to ensure sensor availability when the tactical commander needs it.
- For systems employing readout and analysis sites remote from the tactical commander, reliable, dedicated communication links to the tactical commander must be provided as an integral part of the intelligence collection system.
- Systems operating in the division area must be designed to move frequently without significant loss of collection coverage.

## 2.2 SOTAS and NRT SLAR: An Example of the Potential of Modern Intelligence Collection Systems to Support the Tactical Commander (U)

(S) Two of the sensor systems used in support of the 3rd ID during CARBON EDGE worked very well, albeit for limited periods of time, and when they were operating they made an impressive contribution to the overall collection capability

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(C) \* As indicated previously, the performance of some of these systems improved during the second week [3-8].

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of the 3rd ID. These two sensor systems were the Stand Off Target Acquisition System (SOTAS) and the Near-Real-Time Side-Looking Radar (NRT SLAR). As mentioned previously, the SOTAS control van was colocated with the Division TOC with hard wire communications between the SOTAS control officer and the collection manager in the 3rd ID ASIC. Using this communication link, moving targets located by SOTAS were immediately transferred to the ASIC for plotting and processing. Also, the ASIC was able to task the SOTAS system to look at suspected threat areas within minutes, or less, of their being identified by other sensors. In this manner, the SOTAS/ASIC combination was able to provide a large amount of timely and accurate information on moving threat targets for order of battle estimation and, we believe, targeting. It was surprising to observe that the Division Fire Support Element did not initiate fire missions based on this information.\*

(S) The NRT SLAR was carried on an F-4 platform with a real time downlink to the Air Force processing center at Zweibrucken. There was a dedicated COMSAT link between Zweibrucken and the 3rd ID TOC, and every 24 hours the 3rd ID sent a fresh liaison officer to Zweibrucken to work with the SLAR image interpreters. This system also provided many timely enemy locations to the 3rd ID and, in addition, the COMSAT link was often used to cue the NRT SLAR to areas of suspected enemy concentration.\*\*

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(C) \* Reference 4 indicates that this was due to the large volume of raw data provided the FSE by the G-2/ASIC which was difficult to analyze for targeting and required dedicated personnel not available in the FSE.

(C) \*\* Problems developed in this COMSAT link during the second week of the exercise [5].

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(C) The performance of these two systems during CARBON EDGE was illustrative of the potential that modern intelligence collection systems possess to support the tactical commander. More specifically, they were illustrative of:

1. the value of radar imagery type sensors as an intelligence tool;
2. the value of, and perhaps the necessity for, dedicated communication links between the collection platform, the processing center, and the tactical headquarters.\*

## 2.3 G-2 Section (U)

(U) A significant amount of the Ad Hoc Group's time was spent with the G-2 section. We were greatly impressed with the quality of the personnel of that section, their dedication and drive to produce important information for operational planning, and their experience in working together as a team. However, we believe there exists some systemic problems that precluded the G-2 section from providing full support to the operational staff and the Division Commander.

(U) Figure 1 provides a schematic view of the Ad Hoc Group's perception of the roles and functions of the G-2 section. As

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(C) \* The other Air Force collection systems did not have a dedicated communication link from their read-out point at Hahn to the 3rd ID TOC. During the first week of CARBON EDGE, very little of their data reached the 3rd ID. What little did were usually so out of date as to constitute history, not intelligence.

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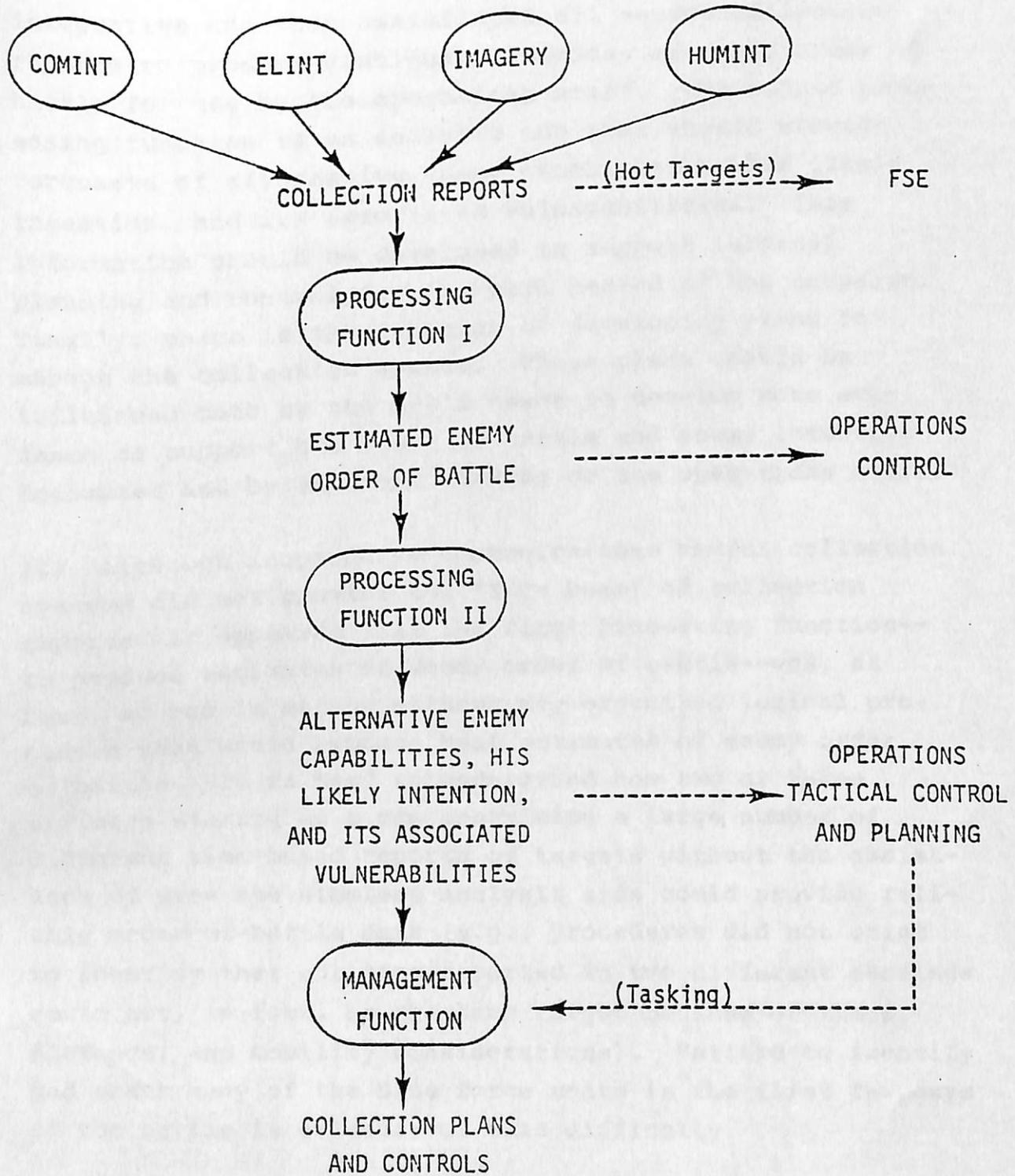


Figure 1(U). Schematic Structure of G-2 Section Functions (U)

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noted in the figure, the first processing function is an integrative one that assimilates all source collection reports to produce continual estimates of enemy order of battle for use by the operations staff. The second processing function is an analytic one that should provide forecasts of alternative enemy capabilities, his likely intention, and its associated vulnerabilities. This information should be developed to support tactical planning and control for the next period of the campaign. Finally, there is the function of developing plans to manage the collection assets. These plans should be influenced both by the G-2's needs to develop more evidence to support his order of battle and enemy intention estimates and by explicit tasking of the operations staff.

(C) Although inoperative communications and/or collection systems did not provide the "fire hose" of collection reports, it appeared that the first processing function--to produce estimates of enemy order of battle--was, at best, ad hoc in nature without any organized logical procedure that would produce best estimates of enemy order of battle. It is hard to understand how two or three officers staring at a map containing a large number of different time-based reports of targets without the assistance of even the simplest analysis aids could provide reliable order-of-battle data (e.g., procedures did not exist to identify that entities reported in two different sensings could not, in fact, be the same target because of times, distance, and mobility considerations). Failure to identify and track many of the Blue force units in the first few days of the battle is evidence of this difficulty.

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(C) It is not at all clear that the second processing function was being performed, or if it was, it was not reported at the daily commander's briefing.\* We recognize this is also a difficult cognitive process but one that could be enhanced with some simple aids. For example, at a minimum, it would seem appropriate to provide unit trajectory information on the map rather than just static locations so that movements to particular areas could be observed. The difficulty of drawing such inferences via the current process is evidenced by the G-2 section's inability to forewarn the Division Commander of two, essentially simultaneous, major counterattacks.

(C) As noted at the beginning of this observation, inoperative communications and/or collection systems provided a relatively small number of collection reports upon which to base order-of-battle estimates or to forecast likely enemy intentions. Since better communications with current systems and the advent of new systems such as TACELIS and AGTELIS will provide more input collection reports to the intelligence operations, improved operating procedures in the G-2 section will be needed to make effective use of these data in producing intelligence information.

## 2.4 G-2/G-3 Interactions (U)

(C) The G-2 section is a support function for the operations staff and the Division Commander, and the Army is currently planning to spend a significant amount of funds

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(C) \* It has since been learned that this second processing function was carried out at nightly sessions that the ASAP members did not attend [7].

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to support this function via the purchase of new collection and processing systems. We had expected to see a set of dynamic, synergistic activities between the intelligence and operations staffs. Yet, during the first four days of this exercise, we did not observe any formalized set of procedures or interactions between the G-2 and the G-3 sections that would insure effective use of the intelligence support either in operational-tactical planning or targeting by the fire support section. It appeared that the sections were engaged in two disparate wars: the operations section focusing on the 0-5 km region based on reports of units in contact, and the intelligence section focusing on the 5-30 km region. This may have been adequate in campaigns with slow rates of advance; however, we believe these two views of the battlefield must be blended and integrated in tactical planning in anticipated campaigns with high rates of advance and mobile defenses.\*

#### 2.5. Division Asset Availability (U)

(S) A large amount of the intelligence-related division assets appear to be associated with the main TOC, and accordingly, move with it on a periodic basis, perhaps every one to two days. This results in a not insignificant break in the direct intelligence support provided and an inability to use corps and EAC intelligence asset outputs at the TOC. For example, in the one move we observed, it took the division TOC approximately six hours to tear down, move twenty kilometers, and set up again, and an additional eight hours for SOTAS to become

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(U) \* According to References 3, 7 and 8, the G-2/G-3 interaction improved during the second week of the exercise.

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operational again. The TAC appeared to have operational control for about 25-50 percent of the time, especially during the start-up, transient phase of the war. Recognizing that there are many cost and personnel implications, it might be worthwhile to consider equipping and manning the TAC in an identical fashion to the main TOC.

## 2.6 Division vs Corps vs EAC Assets (U)

(S) In August, the committee strongly favored the control of COMINT assets at corps rather than division level. This recommendation was based on a number of factors--frequent loss of the assets when the division main TOC moved; the belief that a large number of personnel are required to do an effective job of collection, analysis, and processing; and the immobility of large vans required to house such assets at the division main TOC--which were in large part supported by our visit to REFORGER. However, intelligence data developed by corps and EAC assets during CARBON EDGE most often could not be transmitted to the division in a timely manner because of extreme communication failures. The question of whether assets be located at division, corps, or EAC must be thought through again and very carefully. Moreover, it is clear that if a system is developed for use at corps or EAC level, it must have a dedicated communication link direct to the divisions. This dedicated communications link should be considered as an integral part of the intelligence collection system.

## 2.7 Intelligence System Transient (U)

(S) The committee visited the 3rd ID during the first three to four days of the war and spent a significant amount of

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time observing the intelligence process and its output. Although, as noted earlier, the personnel in the 3rd ID G-2 section are extremely competent and have learned to work well together, from an overview perspective the overall intelligence system did not provide the required support to the Division Commander. Many of the enemy's battalions could not be located early in the campaign, and intelligence failed to identify the development of two major counter-attacks between the teams of the 2nd and 3rd Brigades and the 3rd and 1st Brigades. It is our impression that there was a long start-up time for the intelligence system to come up to speed over the first three to four days due to frequent long duration communication failures and the nature of COMINT systems. The communication failures have been discussed previously. The COMINT systems at division level were major contributors to this transient since they were heavily reliant on (a) having a good data base CEOI which would have to be heavily developed and revised during a campaign, and (b) cues from related COMINT (at corps and EAC) and other sensors. Although there were a large number of tactical reports to the COMINT analysts at the division TOC from the division COMEX platoons, frequency and call sign manipulations by the Blue force precluded many firm correlations with the enemy CEOI.\* COMINT does not appear to be an effective stand-alone sensor early in the campaign,

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(U) \* It would appear that significant intelligence information could have been obtained from the many reports just by identifying the *type* of signal without the requirement for specific frequency and call sign correlation.

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but rather is a low-probability, high-yield system that supports the intelligence picture provided by the many imagery sensors, such as SOTAS and NRT SLAR.\*

## 2.8 Electronic Warfare (U)

(C) The Ad Hoc Group has long held the position that the use of EW assets could have a significant impact on the campaign. This position was not substantiated by the experiences of the 3rd ID during the first four days of the campaign. It is conjectured that the lack of operational impact was due to the following factors:

- The amount of EW assets available to the division was very limited.
- The resources were used too broadly across the front rather than being focused on a particular area of operations.

The G-3 is currently responsible for the use of EW assets similar to his responsibility for controlling artillery and air fire support. However, it appeared that there were an insufficient number of appropriately cleared or knowledgeable G-3 personnel to use the EW assets and no conscious effort to actively integrate this capability into the tactical operations.

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(C) \* The near real time SLAR system operated by the Air Force provided valuable information to the division G-2. It would be extremely useful if more of this capability could be made available for tasking by the division.

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## 2.9 GUARDRAIL (U)

(S) GUARDRAIL was supposed to be a principal resource for DF and locating VHF and HF communications. Yet during the first four days of the campaign, it contributed essentially no intelligence data, primarily due to the unavailability of aircraft for mechanical problems and, in part, inoperative communication links to the division TOC. This level of performance is much lower than the system's performance two years ago in REFORGER '75. This deterioration may be related to the extensive changes in organization and responsibilities for EW/I in the Army during the past year.\*

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(S) \* GUARDRAIL's performance over the entire course of REFORGER '77 has been assessed quite differently at various command levels within USEUCOM and USAREUR. USAREUR and VII Corps consider GUARDRAIL to have performed well [3]. The 3rd ID stated: "GUARDRAIL, because of the numerous equipment failures, had little impact on the intelligence situation....This was a major disappointment [5]." Both the 3rd ID and USEUCOM expressed concern with the state of GUARDRAIL equipment and personnel readiness [6,7].

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7. 3ID Review Comments on Observations on Visit to REFORGER '77 by the ASAP Ad Hoc Group on Electronic Warfare and Intelligence (U), 3rd Infantry Division, 19 December 1977 (Confidential).
8. Letter from Major General Pat W. Crizer, Department of the Army, to Richard Hundley, R & D Associates, 17 November 1977.

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## GLOSSARY (U)

GTCELIS	Automatic Ground Transportable Non-Communications Emitter Location and Identification System
ASIC	All Source Intelligence Center
CEOI	Communications Electronics Operating Instructions
COMEX	Communications Exploitation
COMINT	Communications Intelligence
DF	Direction Finding
EAC	Echelon Above Corps
ELINT	Electronic Intelligence
EW/I	Electronic Warfare and Intelligence
LRRP	Long Range Reconnaissance Patrols
NRT SLAR	Near-Real-Time Side-Looking Radar
SOTAS	Stand Off Target Acquisition System
TAC	Division Forward Command Center
TACELIS	Tactical Communications Emitter Location and Identification System
TOC	Division Tactical Operations Center
3rd ID	3rd Infantry Division