Considerations for Improving Tactical Reconnaissance
- The Eyes of the Combat Commander -

by

Major Barry D. Fulbright
USAF

School of Advanced Military Studies
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas

21 December 1987

School of Advanced Military Studies
Monograph Approval

Name of Student: Major Barry D. Fulbright

Title of Monograph: Considerations for Improving Tactical Reconnaissance -- The Eyes of the Combat Commander

Approved by:

Lieutenant Colonel Gary Stewart, M.S. — Monograph Director

Colonel L. D. Holder, M.A. — Director, School of Advanced Military Studies

Philip J. Brookes, Ph.D. — Director, Graduate Degree Programs

Accepted this 4th day of March 1987.

ABSTRACT

CONSIDERATIONS FOR IMPROVING TACTICAL RECONNAISSANCE -- THE EYES OF THE COMBAT COMMANDER
by MAJ Barry D. Fulbright, USAF, 40 pages.

This monograph discusses the importance of responsive, timely, and accurate intelligence upon the tactical ground commander's ability to influence the battlefield decisively. The effective use of tactical air reconnaissance can provide the ground commander with invaluable intelligence information which can be used as a force multiplier. This study examines ways in which tactical air reconnaissance can best be used to satisfy the tactical ground commanders' battlefield intelligence requirements.

The monograph first studies historical examples to derive lessons learned which might be applicable today. Next, current doctrinal requirements and systems capabilities are examined to determine the ability of current and planned systems to satisfy intelligence needs. Finally, doctrinal requirements and systems capabilities are compared to determine where areas of improvement in the tactical air reconnaissance system are required.

Planned systems incorporating electro-optical and data-link capability promise to be the most capable and responsive systems for the ground commander in providing timely intelligence information. In the meantime, current systems must be optimized to provide the user with real or near-real time intelligence in order to most decisively affect the battlefield.

TABLE OF CONTENTS

I. INTRODUCTION

Tactical air reconnaissance (formerly aerial observation) is airpower's oldest mission, dating back to the French Revolution when captive balloons were used to observe enemy positions. In his classic work, On War, Carl von Clausewitz states that "accurate recognition constitutes one of the most serious sources of friction in war, by making things appear entirely different from what one had expected."[1] No less true today, an accurate picture of the battlefield is critical to reducing "friction" and allowing the battlefield commander to fully exploit the resources at his disposal.

The purpose of this study is to determine the best methods to employ current and planned tactical reconnaissance (TAC RECCE) assets to satisfy the Corps and Division Commander's battlefield intelligence requirements. The proper employment of friendly forces has traditionally been a function of accurate and timely assessment of enemy force capabilities, composition, and location. Since today's perception of future battles envisions the employment of U.S. forces against numerically superior enemy troops, an accurate picture of the enemy situation is absolutely critical if success is to be achieved. TAC RECCE is a primary means of satisfying the battlefield commander's intelligence requirements; however, it must be intelligently employed to maximize its capabilities.

This study will first examine TAC RECCE by looking at examples from World War II, Korea, and the Vietnam War to arrive

at lessons learned. Next, we will look at current systems capabilities and their performance during recent exercises and maneuvers such as REFORGER/COLDFIRE and TEAM SPIRIT. Finally, an analysis of current and planned systems will be conducted in light of historical lessons learned and doctrinal requirements, and conclusions and recommendations will be derived with regards to proper employment and needed improvements. In order to limit the scope of this paper, only manned penetrating assets of the Tactical Air Command will be addressed.

According to Air Force Manual 1-1, "An intelligence system must acquire, process, and dispatch information gained from a variety of sources in time for decision makers to assess what needs to be done and take proper actions."[2] Reconnaissance forces must be accurate and timely and highly responsive to the needs of the modern battlefield.[3] Tactical air reconnaissance is "the mission that's oriented to give the tactical commanders the information they need to plan and execute the battle. It supports the entire spectrum of the tactical mission."[4] In other words, tactical reconnaissance must provide the battlefield commander with a source of responsive, accurate, and timely intelligence to influence the battlefield decisively.

Army doctrinal requirements are totally in line with Air Force requirements for tactical air reconnaissance. In fact, the definitions of surveillance and reconnaissance in the Army's FM 100-5, Operations, are virtually a direct quote from AFM 1-1. The ten imperatives of AirLand Battle as outlined in FM 100-5 all

require effective use of intelligence resources to gain and maintain effective knowledge of enemy forces. Not only must the battlefield commander anticipate events on the battlefield, but he must recognize the most effective and decisive ways to bring his forces to bear on the enemy. TAC RECCE provides the commander with information which is critical to the successful conduct of AirLand Battle and serves as a force multiplier by maximizing the effectiveness of limited friendly forces. NATO's Follow-On Forces Attack (FOFA), in many ways similar to AirLand Battle doctrine, stresses the primary importance of real-time surveillance, target acquisition, and intelligence that are precise and timely enough to allow for the destruction and disruption of rear echelon forces before they can influence the battle.[5] It is the role of penetrating TAC RECCE assets to keep the tactical commander appraised of location and movement of the enemy's follow-on forces.

With doctrinal requirements established, it is clear that the modern battlefield commander must rely on responsive, timely and accurate intelligence to effectively defeat potential enemy forces. This is not only true today, but has been true throughout the history of warfare.

II. HISTORICAL BACKGROUND

History is full of examples of the effects of timely and accurate intelligence upon the outcome of battles and engagements. The following section will examine the role of TAC

RECCE from World War II to present, looking at sensor systems, requesting and control procedures, and intelligence analysis/dissemination methods.

During World War II, tactical reconnaissance was conducted primarily by modified fighter-bombers and light bombers equipped with a variety of optical cameras. The only night-capable photo reconnaissance aircraft available in Europe was the F-3, a version of the A-20 "Havoc" light bomber. This limited night/all-weather capability would prove to be a serious deficiency as we will discuss later. However, day photo reconnaissance was quite capable and provided the tactical ground commander with invaluable information concerning enemy terrain and troop locations.

Tactical reconnaissance groups were assigned to each tactical air command which, in turn, supported a particular Army. Each TAC RECCE Group consisted of two tactical reconnaissance squadrons, one photographic squadron, and various specialized detachments, including two photographic technical units and an Air Force photo interpretation detachment. In addition, an Army photo interpretation detachment was also maintained at the group by the army associated with the tactical air command. Air-ground coordination parties were maintained at army, corps, and division headquarters to coordinate requests and act as liaison from the group to the supported ground unit.[6] Therefore, the army commander had a pool of dedicated reconnaissance aircraft and interpretation assets with which to satisfy intelligence requirements down to division

level. Control of these reconnaissance assets was centralized, but only up to the associated tactical air command level. For example, all reconnaissance requests from Third U.S. Army units were controlled by their associated air unit, the XIX Tactical Air Command. Translated into today's situation, this arrangement would be nearly analogous to a corps possessing a dedicated TAC RECCE wing.

Essentially, information was disseminated to interested parties in two phases. First, the results of aircrew debriefings were immediately sent out using telephone, teletype, the Reconnaissance Information Broadcast Net, or the G-2 (Air) Radio Net. Of particular interest is the Reconnaissance Information Broadcast Net where intelligence information was broadcast to corps and division headquarters every 20 minutes and the G-2 (Air) Radio Net which was set up between the individual reconnaissance groups, the tactical air commands, and Twelfth Army Group headquarters. The second phase of intelligence dissemination consisted of detailed photo interpretation reports and distribution of photographic prints, a rather time consuming process.' Of significant interest here is the fact that the timeliness of intelligence dissemination was greatly improved through the use of a dedicated radio reporting net for information gathered from aircrew debriefs. This effectively provided a system by which "raw" intelligence was disseminated in near-real time to be followed by detailed intelligence (from photo interpretation) as quickly as possible.

While daytime/fair weather reconnaissance was generally

effective during World War II, the lack of an effective night and all weather capability left something to be desired. There was only one U.S. night photo reconnaissance unit in the European Theater of Operations and it was equipped with a rather primitive night photo capability. The system employed consisted of optical camera systems which were triggered by the light from photo-flash bombs or electric flash units. The quality and reliability of this system was marginal at best and was further complicated by the problems of night navigation using the limited radar and radio navigation means available at the time. It was during the German Ardennes campaign of 1944 that these shortcomings became critical. The German Army made use of night and poor weather to mass its troops against the U.S. armies occupying the supposedly "quiet" sector of the front. During the early stages of the offensive, the Germans took advantage of the poor weather not only to protect their troops from allied air attack, but also to mask troop movements from TAC RECCE assets.[8] This inability to operate effectively at night and in poor weather would haunt TAC RECCE in later wars also.

As the Korean War unfolded, the Air Force found itself woefully lacking in TAC RECCE assets with little improvement in sensor systems since World War II. Although the platforms themselves had improved with the introduction of such aircraft as the RF-80 and RB-45 jets, the sensor systems remained essentially the same as those of World War II, at least with regards to capability. Only limited night and all-weather capability existed and this was manifested primarily in modified bombers

such as the RB-29 and RB-45 which were highly vulnerable to enemy fighters. Without an effective night and all-weather capability, TAC RECCE would again prove vulnerable to enemy masking techniques and fail to detect a critical enemy build-up.

Unlike World War II in which the reconnaissance groups of the tactical air commands were directly responsive to army-level requests, in Korea, all TAC RECCE assets were controlled through a centralized Joint Operations Center. Not unexpectedly, complaints arose that the Eighth Army "has not been able to obtain adequate intelligence from aerial sources since the start of the war."[9] While it was true that a large percentage of targets were flown as Air Force requests, it was not the requesting and control procedures that proved inadequate. Instead, one of the key deficiencies of TAC RECCE in Korea was its exploitation and dissemination process. The increasing pace of battle required more timely intelligence information, but, unfortunately, procedures in existence at the time delayed dissemination of intelligence information to the ground commander.

While actual interpretation and reporting procedures differed little from those of World War II, the weakest link in the reconnaissance production line from the very beginning of the Korean War was the critical shortage of trained photo interpreters. In 1951, not only was the interpretation section of the 67th Tactical Reconnaissance Wing unable to handle the full photo capability of the wing, but it was estimated that it was only able to extract 20 percent of the available information contained in the photographs it examined.[10] This deficiency

was largely alleviated by mid-1952, but clearly illustrates the reliance of TAC RECCE on its ground processing and interpretation facility to fulfill its mission.

Once again, movement at night or during adverse weather and careful camouflage afforded the enemy significant protection from detection by TAC RECCE assets. Although the aircraft had changed since World War II, the actual sensor systems were essentially the same. This limited ability to see at night and in poor weather was instrumental in the failure of reconnaissance assets to detect the Chinese build-up along the Manchurian border in 1950. Most movement was made by night and excellent camouflage discipline was practiced at all times. According to AFM 1-1, "...tactical surveillance and reconnaissance provide timely notification of hostile intent and actions as well as other information vital to the National Command Authorities and combat commanders."[1] It was the lack of a reliable night sensor coupled with an inability to "look deep" across the border that failed to provide commanders notification of hostile intent and actions in December of 1950.

Though we entered the Vietnam War with TAC RECCE systems which were essentially of Korean War capability, the introduction of the RF-4C gave us our first true night/all-weather capability. This was especially important during this conflict since the enemy moved almost entirely at night and during periods of poor weather. In addition to an optical sensor suite capable of horizon-to-horizon coverage, the aircraft was also equipped with an infrared sensor and a terrain-following radar for night

and poor weather operations at low level. Additionally, some aircraft were equipped with Side Looking Airborne Radar (SLAR) for all-weather detection of vehicle-sized targets. At roughly the same time, the Army fielded the OV-1 "Mohawk" aircraft which had capabilities similar to the RF-4C. Overall, the first real improvements in the capability of TAC RECCE since World War II occurred during the Vietnam War.

As in the Korean War, command and control was highly centralized with control of reconnaissance assets excercised at the Military Assistance Command level. Without going into needless detail, it is sufficient to say that the requesting system was cumbersome at best. All missions were targeted from a central location, the 7th Air Force in Saigon, and mission results were also routed through this headquarters before being disseminated to the user.[12] The result was that it normally took upwards of five days for a target discovered on a TAC RECCE sortie to be targeted and as much as two weeks for Army requests for mosaics (aerial maps made by "splicing together" numerous individual photos) to be processed and disseminated.[13] Not only did Army requests take a second priority to Air Force requests, but results were so long in coming that Army commanders began to rely less and less on Air Force TAC RECCE and more on organic assets such as the OV-1 "Mohawk". Unfortunately, the elusive nature of the enemy made intelligence information as to enemy location and strength even more critical to the ground commander. In other words, the need for TAC RECCE had increased since previous wars but its lack of timeliness had made it less

effective.

Especially in the later stages of the war, computerization and standardization of exploitation reports were used in an attempt to increase the timeliness of reconnaissance information to the battlefield commander. This turned out to be a mixed blessing. The introduction of computers not only tied the major intelligence centers in Vietnam together, but also provided direct links to Pacific Command and Pacific Air Command headquarters in Hawaii and the Defense Intelligence Agency (and thereby the National Command Authority) in Washington."[4] As a result, these agencies were directly able to task reconnaissance missions from their own headquarters. This further reduced the responsiveness of TAC RECCE to the tactical ground commander. On the other hand, the introduction of standardized, highly structured imagery report formats ultimately helped to improve the timeliness of intelligence reporting. The use of Initial and Supplemental Photo Interpretation Report (IPIR/SUPIR) formats remain in use today.

The Vietnam War was characterized by tremendous improvements in sensor system capabilities, but was plagued by an inefficient and unresponsive requesting and reporting system. Improvements in our night/all-weather capability were of great importance in detecting enemy movements, but the ability to disseminate the intelligence information to the requestor in a timely manner negated much of this improved capability. However, the seeds were planted for future improvements in TAC RECCE, many of which are in effect today.

The above examples illustrate the varying degree to which TAC RECCE has been able to satisfy the ground commander's requirements for responsive, timely, and accurate intelligence of the battlefield. Admittedly, progress has not always been positive, and we have, in fact, digressed in many areas. Lessons can be learned from these examples which apply to today's AirLand Battle doctrine.

III. LESSONS LEARNED

From the historical examples studied, it appears that the success or failure of TAC RECCE depended both on the adequacy of systems capabilities and employment/dissemination methods. Interestingly, the above examples seem to indicate that at least one of the key ingredients was lacking in each case. When sensor systems were lacking, employment and dissemination methods seemed to be rather effective and, conversely, when sensor systems were adequate, employment and dissemination procedures were severely lacking. At the same time, it appears that the ground commander's need for timely and accurate intelligence actually increased during the same period. This was due both to the increased pace of the modern battlefield and the use of guerilla warfare in increasingly numerous situations.

In World War II and Korea, the ability of TAC RECCE to detect and observe the enemy at night and in poor weather severely hampered its effectiveness. As we have seen, the system of "attaching" a reconnaissance unit to each army in World War II

proved both responsive to the army commander's requests for intelligence and timely in its reporting of information. However, sensor capability remained a limiting factor in overall effectiveness. Night and poor weather afforded the enemy with the opportunity to evade the "eyes" of TAC RECCE. In Korea, similar technological problems existed with regard to sensor capability, but the effectiveness of reconnaissance was also severely affected by the shortage of trained interpreters to effectively analyze and disseminate the intelligence information to the requestor. Therefore, we begin to see the importance of both the air and ground elements of TAC RECCE.

As the pace of battle increased from World War II to the present, responsiveness and timeliness of employment and dissemination methods have become even more critical to the battlefield commander. In Vietnam, many of the technological problems with regards to sensor capabilities were solved, but the cumbersome employment and dissemination procedures negated much of this improvement. The ground commander needed information quickly enough to strike at the enemy before he could "melt away", but the reporting system often took several days to get the intelligence to the commander. An unconventional war involving guerilla operations requires that the ground commander receive information almost immediately in order to bring his forces to bear against the enemy. No matter how good the sensor-derived information is, it must reach the tactical commander in time for him to strike at the enemy force.

During recent exercises such as REFORGER/COLDFIRE and TEAM

SPIRIT, the success of TAC RECCE has been mixed. Problems have been identified in both sensor systems and employment and dissemination procedures. While the specific results of these exercises is for the most part classified, general conclusions and trends can be presented in this paper in an unclassified manner.

Unfortunately, recent exercises have shown some of the more advanced and expensive sensor systems to be less than reliable. SLAR, particularly, has proven to possess a high failure rate. Not only has the SLAR system itself presented problems, but the ability of imagery interpreters to accurately analyze the imagery has proven to be a problem. Coupled with imagery interpretation deficiencies are demonstrated problems in disseminating information to the requesting agency. A prime example of this problem was demonstrated during the exercise COLDFIRE 1/85 where the average time from message release to corps receipt of SLAR exploitation reports was 268 minutes.[15] The primary reason for this excessive delay in disseminating TAC RECCE results is due to the rather primitive teletype systems available to NATO forces. This same problem has proven to be common to all potential theaters of operation. In short, reliance on existing means of communication for the reporting of reconnaissance missions is not adequate to satisfy the ground commander's requirement for timely intelligence information, which has increased over the years. The requirement for a dedicated means of relaying time-critical intelligence information to the requesting agency is repeatedly demonstrated during large-scale

exercises.

History has shown that TAC RECCE must employ capable and reliable sensors to detect the enemy at all times and timely reporting and dissemination methods must quickly report critical information to the ground commander in time for him to react decisively to enemy movements. These lessons should be applied to the situation as it exists today in order to most effectively use the information that our reconnaissance forces are able to provide.

IV. CURRENT/PLANNED SYSTEMS AND CAPABILITIES

Before we can analyze the overall ability of TAC RECCE to satisfy the ground commander's tactical intelligence requirements, a look at current and planned sensor systems is in order. Historical lessons learned and doctrinal requirements must be kept in mind when looking at current and planned systems.

Perhaps the most responsive and timely system employed by TAC RECCE is its Electronic Intelligence (ELINT) system. The Tactical Electronic Reconnaissance (TEREC) system was first excercised by the 26th Tactical Reconnaissance Wing at Zweibrucken, Germany during REFORGER '74. The system is capable of detecting virtually all threat radars out to a range in excess of 200 miles. Selected emitters can be data-linked to small, portable ground stations which provide the user with real time intelligence of hostile emitter locations.[16] These portable data-link stations, known as TEREC Remote Terminals (TRTs), are

the key to the effectiveness of the system. They can be transported by virtually any military vehicle and easily set up at any location where a commercial power source (or equivalent) is available. There are currently enough TRTs in Europe to locate one at each U.S. corps headquarters. Adding to the system's utility is the fact that the information data-linked to the TRTs is essentially in plain language, requiring little expertise for interpretation of emitter locations.

Since TEREC provides the requestor with real-time intelligence of hostile emitter locations, the emitters can be targeted by the tactical commander's organic assets as well as Air Force weapon systems. If used properly, location of enemy formations can be detected by correlating emitter locations with various formations. For example, a concentration of SA-6s or SA-8s would indicate a possible Soviet tank or mototized rifle division. Although TEREC has traditionally been used by the Air Force to locate individual air defense radars, it is possible to estimate the location of enemy ground formations using information derived from TEREC. Additionally, this information can be used to cue other sensor systems to a specific location in order to determine the exact composition of enemy forces in the area.

Optical and infrared (IR) collection systems have continually evolved over the years and today are highly accurate and reliable systems. The AAS-18 infrared detection set first used during the Vietnam War was somewhat unreliable and produced imagery if insufficient quality to be easily interpreted. By the mid-1970s,

the AAS-18 was being replaced by the AAD-5 improved infrared detection set. This system provides high-resolution imagery for exploitation and has proven to be a highly reliable system.[17] The imagery produced by the AAD-5 actually approaches optical imagery in terms of resolution and, because it is based on the infrared spectrum, frequently reveals more intelligence information than optical imagery. Optical sensors used in the Tactical Air Command's reconnaissance aircraft are of essentially Vietnam War vintage, but continue to provide useful service. Figure 1 shows the coverage of various optical and infrared sensors on a typical low altitude RECCE mission.[18]

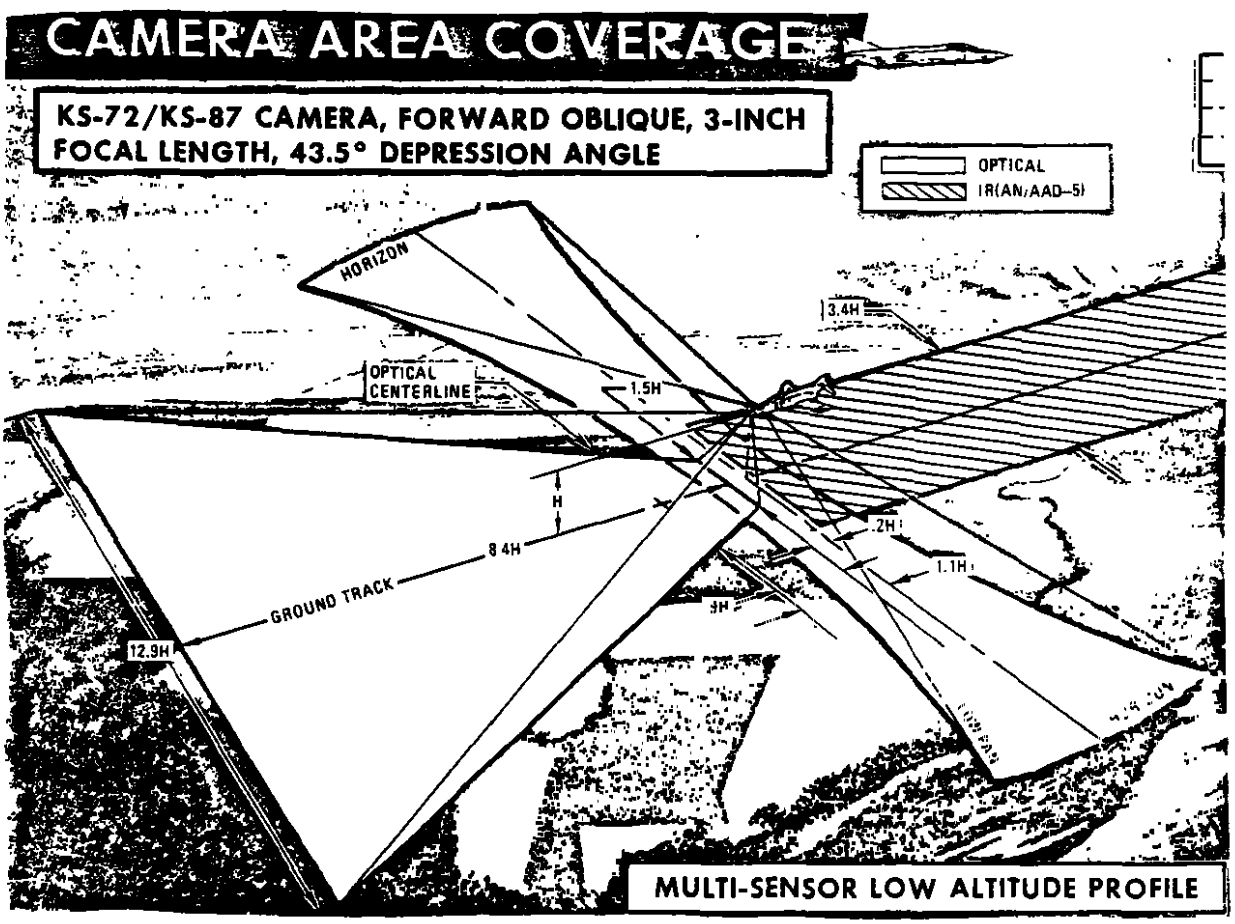

Figure 1

While accurate and reliable, today's optical and infrared systems are not tied to data-link and, therefore, do not provide real time or near-real time intelligence to the requestor. According to FM 100-5, the ground commander "must seek out the enemy where he is most vulnerable to defeat".[19] In order to do this effectively, he must have accurate and timely intelligence of enemy locations and movements. Advanced models of both IR and electro-optical (EO) sensors are being developed which not only greatly reduce processing time, but also are capable of data-link for near-real time intelligence dissemination. While no plans exist to replace the RF-4C in the near future, TAC plans to upgrade the aircraft with EO sensors, complete with data-link capability.[20]

A key step in revitalizing TAC RECCE assets is the introduction of the Reconnaissance Management system (RMS). The primary components of the system consist of IR/EO sensor systems coupled with data-link capability and a high-resolution monitor for cockpit display of sensor-derived information. Additionally, the RMS ground station will use the Digital Imagery Transmission System (DITS) which, in practice, could be located at corps level to provide field commanders with a detailed picture of targets in their area of responsibility.[21] As the aircraft crosses the target area, the Weapon Systems Officer (WSO) would analyze the imagery on the cockpit display. At a tactically convenient time, selected portions of the imagery would then be data-linked to the RMS ground station via UHF or HF radio. Not only will the system provide the ground commander with near-real time intelligence,

but the transmission of only select imagery will serve to reduce the ground commander's "intelligence saturation". This will, of course, require that aircrews be highly trained in Army doctrinal requirements, enemy employment concepts, and are aware of the ground commander's intelligence requirements. Tables 1 and 2 show the increased timeliness of TAC RECCE intelligence dissemination using RMS/DITS versus current conventional systems.[22]

TABLE 1

CONVENTIONAL
RECCE SYSTEM TIMELINESS

Node	Time in minutes	
Flyback	10-40	(30)*
Download/Processing	2-10	(8)
Exploitation	7-60	(18)
Reporting	2-10	(5)
Comm Transmission	30-300	(200)
Total time to decision makers:	51-420	(261)

(*)=expected value

TABLE 2

RMS/DITS RECCE SYSTEM TIMELINESS

Node	Time in minutes
Flyback (across FLOT)	25
Download/Processing	N/A
Field Exploitation	5
Reporting	N/A
Comm Transmission	N/A
Time to Corps	30

An advanced Side-Looking Airborne Radar (SLAR) system is currently available for the RF-4C which provides high-resolution radar imagery of large areas of the battlefield. Though the system is capable of ten foot resolution, problems with imagery interpretation and dissemination methods limit its effectiveness in providing timely information to the requestor.[23] While the system is tied to data-link, detailed ground interpretation is required before useable intelligence information is available to the user. Although TAC RECCE continues to maintain its SLAR capability, the radar imagery role is increasingly being fulfilled by other assets. The Strategic Air Command's TR-1 and the Joint Surveillance and Target Attack Radar System (JSTARS) will provide the bulk of radar imagery intelligence in the future.

Visual reconnaissance, while the oldest method of aerial intelligence gathering, should continue to be an integral part of the TAC RECCE system. Observations by aircrews can be relayed to the ground commander via UHF or HF radio providing near-real time intelligence information. Unfortunately, this method of reconnaissance has been neglected in recent years. Increased reliance on high technology methods of intelligence gathering has relegated visual reconnaissance to a purely secondary role.

Obviously, the accuracy and timeliness of visual reconnaissance is dependent upon the level of training of individual aircrews, their appreciation for the ground commander's intelligence needs, and the reliability of radio systems for voice reports. In recent years, inflight reports of

intelligence sightings have been slighted by both air and ground crew alike. The tendency to wait for the sensor imagery to confirm the visual report before transmitting the exploitation report has caused the aircrew to believe erroneously that the voice report is simply a waste of time. Consequently, training in this vital aspect of TAC RECCE has lapsed. Also, jam-resistant radios common to both the Army and Air Force do not exist to facilitate voice reports in a "comm-jam" environment such as is expected in a European conflict scenario. It would seem that such a simple and potentially reliable method of timely intelligence dissemination would receive higher priority from both the Army and Air Force, but technological advances have tended to push this old and effective system aside.

It would appear that current and planned sensor systems, if efficiently employed, will contribute immeasurably to the ability of the ground commander to accurately "see" the battlefield. The move towards electro-optical systems coupled with data-link has the potential to tremendously improve the timeliness of intelligence flow to the user.

V. ANALYSIS AND EVALUATION

In order to analyze and evaluate the ability of TAC RECCE to satisfy the battlefield commander's intelligence requirements, historical lessons learned from the above examples will be compared to current doctrinal requirements and systems capabilities. The requirements for intelligence from TAC RECCE

has increased over the years due to the increased lethality of modern weapons, the expanded battlefield, and the increased pace of Soviet-style warfare. This section will take into account all of these factors in evaluating the timeliness, responsiveness, and accuracy of TAC RECCE assets.

To apply historical lessons to the current situation, we must take into account the increased pace of the modern battlefield. The basic principle of Soviet land warfare is "violent, sustained, and deep offensive action".[24] Furthermore, they emphasize "swift, efficient movement, or transfer of combat power from one point on the battlefield to another".[25] In order both to anticipate enemy movements and to detect enemy vulnerabilities, the tactical ground commander must have an accurate picture of the battlefield. TAC RECCE assets, if responsive, timely, and accurate, can provide the ground commander with the necessary intelligence information to react swiftly and decisively to enemy actions and, when the situation allows, seize the initiative and strike the enemy where he is most vulnerable.

The Soviet style of echeloning forces requires a greater ability to see and strike deep which necessitates extremely timely reconnaissance systems. As mentioned earlier, one of the key aspects of both AirLand Battle and NATO's FOFA involve delaying and disrupting the enemy's second and third echelon forces before they can influence the battle. Against this echeloned Soviet-style force, a primary mission of TAC RECCE is to gather intelligence information and feed it to the command

structure in real or near-real time, enabling "commanders to make timely decisions for action in the form of effective air strikes and surface missile and artillery strikes".[26] The Army's FM 100-5 further emphasizes the importance of deep operations by stating "...deep operations must be focused against enemy capabilities which most directly threaten the success of projected friendly operations".[27]

Historical examples have shown that the responsiveness of TAC RECCE assets is often limited by the Tactical Air Control System (TACS) requesting procedures. While quite responsive to the ground commander under the World War II system of "attaching" a reconnaissance group to individual armies, the extreme centralization of control in Korea and Vietnam adversely affected the responsiveness of TAC RECCE. While the centralized control of reconnaissance assets remains in effect today, streamlined and standardized tasking procedures greatly improve the responsiveness of reconnaissance assets. Centralized control serves to assure unity of effort and allocates resources where they are most needed. However, once priorities are established, individual sorties are assigned down to corps level in the daily Air Tasking Order (ATO). This effectively provides the ground commander with "attached" TAC RECCE assets for tasking. Reconnaissance missions are tasked as either preplanned or immediate missions. Whenever possible, missions should be preplanned to allow optimum collection means to be employed and the consolidation of collection requests.[28] When unforeseen requirements for information of immediate value to the tactical

commander arise, missions are tasked as immediate requests. The daily ATO commits, in three hour time blocks, sorties to individual organizations down to corps level and lists them as either preplanned or immediate requests. Immediate sorties are reserved for the requestor to use as he sees fit. The system has proven to be quite responsive, given the limited TAC RECCE resources available.

Planned systems incorporating data-link for near-real time intelligence will tremendously improve the timeliness of information for the ground commander. For example, it is estimated that electro-optical systems using the proposed RMS/DITS system could reduce the time of information transmission to the corps commander from an average of 261 minutes using conventional sensors and reporting methods to as little as 30 minutes.[29] The above times represent the period from time over target to actual requestor receipt. The primary difference between the two values involves the elimination of ground processing/exploitation and normal transmission times by using RMS/DITS. This represents an increase in timeliness of intelligence dissemination of over 800% versus using today's conventional systems and procedures!

Accuracy of current systems, especially ELINT systems, is directly linked to the accuracy of the aircraft's Inertial Navigation System (INS). TEREC printouts provide the user with an expected accuracy of location based on the direction of arrival of signals from the hostile emitter. However, this accuracy estimate does not take into account errors in the INS.

Therefore, if the INS is off by two miles, the emitter location will be in error by a like amount. The ARN-101 navigation system installed in the most advanced RF-4Cs is accurate to a circular error probability of one nautical mile per hour and manual updating would be required to improve significantly on this. Other sensors such as the optical and IR systems use the Automatic Data Annotation System (ADAS) to record target location and time on the sensor-derived imagery.[30] This system is also tied to the INS and is subject to the same innacuracies as TEREC. As a result, exact target location must be determined either by the aircrew or an imagery interpreter with reference to maps. Since TEREC is not an imagery-producing sensor, visual and/or photo confirmation of exact target location is required. Since exact target location can be determined by referencing imagery to maps, targeting itself is not a serious problem, but it does require additional time for interpretation and exploitation.

As mentioned earlier, TAC RECCE sorties are tasked through the TACS as either preplanned or immediate sorties and are outlined in the daily ATO. Preplanned sorties allow the tasking system to review target requests and combine taskings into one sortie whenever possible. This obviously tends to maximize the utilization of our limited TAC RECCE assets. However, compatible immediate missions are seldom combined due to the extremely limited time available for target review by the TACS personnel. In order to increase the availability of immediate taskings to the ground commander, division and corps commanders should,

whenever possible, coordinate with adjacent units to determine if requests can be combined or expanded. Maximum effort in this area by ground commanders, TACS personnel, and the executing unit would increase the availability of reconnaissance taskings to the tactical ground commander.

Current dissemination methods are perhaps the largest contributor to delays in the timeliness of intelligence reporting. Photo interpreters are allowed a maximum of 45 minutes from film download to interpret the imagery and transmit the exploitation report to the requestor. In spite of concerted efforts to reduce exploitation time, lengthy delays in the communication system delay the reporting of intelligence information to the user. In Europe, the average transmission time is expected to be in the vicinity of 200 minutes.[31] Although exploitation reports are initially transmitted on high data-rate communications lines (AUTODIN) they are later routed to slower NATO teletype systems for transmission to corps. The proposed electro-optical systems coupled with data-link directly to the user will eliminate this communications transmission delay.

From the previous discussion, it is apparent that shortfalls exist to some degree in sensor systems, employment methods, and in dissemination and reporting procedures. First, we will look at sensor problems. With the exception of TEREC, current sensor systems require time consuming processing and interpretation at the home station. Even though SLAR is capable of data-link, the imagery requires detailed analysis by highly trained interpreters before useable intelligence information is derived.

Additionally, the logistics "tail" is staggering. The ground station for current systems requires 6000 gallons of water, 400 gallons of chemicals, twenty-eight vans, and ten C-141 "Starlifters" to relocate to a new location![32] Obviously, the requirement for lengthy ground processing delays the timeliness of reporting of critical intelligence information to the ground commander, but more importantly, deployment of the bulky ground processing equipment in a contingency could create tremendous logistics problems. Therefore, although the sensors themselves are quite capable of providing useful intelligence during both night and all-weather situations, their ties to the ground processing station limit their usefulness.

Secondly, tasking and employment problems detract from the overall effectiveness of TAC RECCE. For formal and structured tasking, the current Tactical Air Control System is adequate. Granted, better coordination among requesting units for immediate requests would help, but basically, the system is sound. However, a formal system for the requesting organization to directly task inflight RECCE assets does not exist. Let's take, for example, an RF-4C enroute to a preplanned target in support of VII Corps. If a division commander or the corps commander determines that coverage of another target area is more critical to the battle situation, he must go through the formal Tactical Air Control System to get the aircraft diverted. In all likelihood, the time required to go through the TACS would prohibit the aircraft from being redirected in time to be of value. The ability to retask inflight RECCE assets directly

would make them highly responsive to the tactical ground commander's battlefield intelligence requirements. Finally, the current reconnaissance reporting system is not timely enough to allow the ground commander to target fleeting targets with his organic assets. The previously mentioned time delays in transmitting sensor-derived intelligence to the requestor makes the information useless for perishable targets. Since no direct communications links exist between the reconnaissance base and the tactical ground commander, existing command and control nets consisting primarily of teletype communications are usually used for intelligence dissemination. The ground commander must only use this information to establish general trends in the shape of the battlefield and rely on more timely information such as voice reports to target enemy forces.

The impact of identified shortfalls will be lessened with the introduction of systems capable of data-link directly to the requestor. However, those systems, such as SLAR, which are tied to centralized ground processing/exploitation stations will become useless if these stations are destroyed. The effectiveness of current systems which require ground processing will continue to be adversely affected by the slow dissemination systems available. Perhaps most importantly, sensor systems are only as good as the platform which carries them. The newest RF-4 is almost sixteen years old and the Air Force has no plans to replace them before the late 1990s at the earliest.[33]

AirLand Battle doctrine requires that the battlefield commander "anticipate events on the battlefield" and "concentrate

combat power against enemy vulnerabilities".[34] In order to effectively accomplish this task, he has to have a current and accurate picture of the battlefield. Current shortfalls in the TAC RECCE system require that innovative ideas be developed to satisfy the ground commander's requirements for responsive, timely, and accurate intelligence. Improvements and/or modifications in current tasking, employment, and exploitation procedures are needed if TAC RECCE is to be an effective force multiplier for the tactical ground commander. While planned improvements in sensor systems will provide the user with more timely and useful intelligence information, efforts must be made to maximize the effectiveness of current systems until the new equipment is fielded.

VI. CONCLUSIONS AND RECOMMENDATIONS

If effectively employed, current and planned tactical reconnaissance systems have the potential to satisfy the corps and division commander's battlefield intelligence requirements. However, modifications to the tasking, employment, and intelligence dissemination methods should be made to realize its potential fully. The purpose of this study was to examine historical examples, current Air Force and Army doctrine, and reconnaissance capabilities to determine how tactical reconnaissance can best be used to satisfy the tactical ground commander's intelligence requirements. It is with this in mind that the following conclusions are drawn.

Current and planned sensor systems are highly effective, but should not be linked to vulnerable, centralized ground stations. The optical and infrared systems currently employed in the RF-4C require ground processing before imagery can be fully exploited. Other U.S. and allied bases have limited capability to process and exploit the imagery, but timeliness of intelligence flow to the user is adversely affected. The SLAR system is exclusively linked to the ground station and is completely ineffective if the processing facility is destroyed. Furthermore, lengthy and complicated analysis of the imagery is required to derive useable intelligence. TEREC, on the other hand, can be data-linked to one of several remote ground terminals and requires little expert interpretation to obtain useful intelligence information. The TEREC system is indicative of the movement of TAC toward sensors using digital data-link to pass imagery and other intelligence data directly to the user in real or near-real time.[35] The positive results of eliminating centralized ground processing/exploitation stations are twofold. First, the survivability of TAC RECCE as a whole is enhanced by severing the "umbilical cord" tying it to the highly vulnerable and centralized ground station. Second, the need for unresponsive and complicated communications nets from home station to the various users is eliminated.

No matter how good a sensor system is, the tasking, employment, and dissemination procedures determine its overall effectiveness. As previously discussed, established procedures whereby tactical ground commanders coordinate immediate

reconnaissance requests with adjacent units should be developed. During World War II, when reconnaissance groups were directly responsive to the army commander, the equivalent of today's Tactical Air Control System could effectively deconflict and combine reconnaissance taskings. In Europe today, an Allied Tactical Operations Center (ATOC) must coordinate air requests from several corps as well as Air Force and higher headquarters requests. Assuming that a modern corps is roughly equivalent to the army of World War II, it is apparent that the ATOC's span of control precludes detailed coordination of all immediate reconnaissance requests. It is therefore incumbent upon the requestor to coordinate taskings with other units in order to maximize reconnaissance availability.

Another area where tasking and employment of TAC RECCE assets can be improved involves sensors which cover large areas of the battlefield such as SLAR and TEREC. Since both systems are limited in number, tasking should be designed to serve as many users as possible. A proposed solution is for the Air Component Commander to task SLAR assets on a recurring basis. The idea is for recurring SLAR coverage of the FEBA area to be flown on a 24-hour basis providing continuous coverage. The resulting information would form an intelligence data bank which would then be available for tasking by tactical commanders.[46] Instead of tasking an individual sortie, the ground commander could request enemy locations within his own area of interest. Since SLAR imagery requires several hours to exploit fully, tasking an existing data bank rather than an individual sortie would

actually be more responsive to the user's needs.

A similar system could be employed using TEREC, except that instead of simply establishing an intelligence data bank, emitter locations could be data-linked to the tactical headquarters in real time. The TEREC data-link is not directional, therefore any remote terminal within radio range can receive the data. In order to eliminate saturation with excessive information, filters within the remote terminal can be programmed to receive emitter data from selected geographical areas only. If employed in this manner, both SLAR and TEREC assets would be available to virtually all corps and division commanders on a regular basis. Additionally, timely information would continually be available to the tactical commander with no need to request SLAR or TEREC sorties through the Tactical Air Control System.

A final recommendation involving the tasking and employment of TAC RECCE assets involves inflight targeting. Currently, there are no detailed procedures for direct inflight tasking of designated reconnaissance aircraft by requesting units. Occasionally, requests are passed through Air Force channels to airborne reconnaissance aircraft, but unless specifically directed to work with a forward air controller, no contact with the requesting unit or its Air Force liaison officer is made. All reconnaissance aircraft flying in support of ground units should be required to contact the unit's Air Liaison Officer for possible retasking. Based upon the changing nature of the battlefield, the commander could then redirect the reconnaissance effort to more critical areas. The overall effect would be an

increase in responsiveness to the commander's intelligence requirements. It must be noted, however, that in a high threat environment, careful mission planning to avoid enemy air defenses is key to survival. Inflight planning, due to other events occurring simultaneously, is seldom as thorough as ground planning, so the ground commander should use the inflight targeting option only when absolutely essential.

The Air Force is fully committed to the incorporation of digital data-link, electro-optical systems into the tactical reconnaissance force. The Reconnaissance Management System is an absolutely critical part of the system in that it is designed to identify the most important portions of the imagery for data-link to the requestor.[37] Without this feature, the ground commander would be forced to sort through excessive amounts of imagery to derive meaningful intelligence information. The system will, however, increase the workload of the Weapon Systems Officer in the rear cockpit and will also require an extensive aircrew training program to be fully effective. This training program must include a good foundation in Army doctrinal requirements. The system promises to be one of the most significant advances in the timeliness of tactical reconnaissance to come along in many years. The Air Force expects to have an operational capability for the system in the early 1990s.[38]

In summary, it appears that the tactical reconnaissance force is headed in the right direction with regards to effective and timely sensors. Until these new systems are fully incorporated into the TAC RECCE system, increased emphasis must be placed on

careful and efficient tasking of our limited reconnaissance resources. Establishing intelligence data banks with SLAR and TEREC as well as emphasizing inflight voice reports from aircrews will serve as an interim measure to speed up the dissemination of time-critical intelligence information to the battlefield commander. Coordination of tasking among requestors and judicious use of inflight targeting can further improve the overall responsiveness of TAC RECCE. Once again, the increased size, pace, and lethality of the modern battlefield require that accurate intelligence be available to the ground commander in order to accurately anticipate events and concentrate combat power against enemy vulnerabilities.

Of course, TAC RECCE is only a portion of the total Air Force intelligence effort. The distinction between tactical and strategic reconnaissance is somewhat blurred with tactical assets often performing strategic roles and vice versa. Developing systems such as JSTARS and the Strategic Air Command's TR-1 with their highly sophisticated sensor equipment play a large role in the overall intelligence effort, both tactical and strategic. Overhead (satellite) systems as well as land based sensors further add to the intelligence information network. But in the forseeable future, there is still a vita3l role for manned tactical reconnaissance. The Air Force believes that the EO-equipped RF-4C will prove especially useful "...in providing information beyond standoff-sensor range, under-the-weather, or at night, and in areas of the world where other systems may not be available".[39] And one should not forget that in an

electronic countermeasures-intense environment, the crewmembers' eyes may be the only available "sensor" to provide the tactical ground commander with the information necessary to win the AirLand Battle.

ENDNOTES

1. Carl von Clausewitz, On War, edited and translated ny Michael Howard and Peter Paret, (Princeton, N.J., Princeton University Press, 1984), p. 117.

2. Headquarters, Department of the Air Force, AFM 1-1, (March 84), p. 2-21.

3. Ibid, p. 3-7.

4. Jim Coghlan, "Air Reconnaissance Gathers Speed for the AirLand Battle", Defense Electronics, Vol. 18, Sep 86, p. 131.

5. James W. Canan, "Getting the Picture Behind the Lines", Air Force Magazine, Vol. 70 No. 11, Nov 87, p. 49.

6. AAF Evaluation Board in ETO, Tactics and Techniques Developed by the United States Tactical Air Commands in the European Theater of Operations, March 45, p. 26.

7. Ibid, pp. 27-28.

8. Richard Natkiel, Atlas of World War II, (New York, The Military Press, 1985), p. 182.

9. USAF Historical Division, Air University, United States Air Force Operations in the Korean Conflict (1 Nov 1950-30 Jun 1952), (Department of the Air Force, 1955), p. 226.

10. Ibid, p. 230.

11. AFM 1-1, p. 3-5.

12. Ken Nolde, "Tactical Strike Reconnaissance: Airpower's Oldest Profession", Defense and Foreign Affairs, Oct 80, p. 16.

13. Ibid, p. 16.

14. Major Elmer F. Symsack, "Improving Air Force Imagery Reconnaissance Support to Ground Commanders", Master of Military Art and Science Thesis, (Command and General Staff College, Fort Leavenworth, Kansas, 1983), p. 54.

15. Ernest Lopez, "26TRW SLAR Operations in COLDFIRE 1/85 -- Final Report", (26TRW/DO, APO NY 09860, 1985), unclassified information from CONFIDENTIAL document.

16. Robert F. Jobe, "Near-Real-Time Reconnaissance in Reforger

1977", Presentation at the 1978 Air University Airpower Symposium, (Air War College, Maxwell AFB, Alabama, Feb 13-15, 1978), p. 25-26.

17. Ibid, p. 30.

18. McDonnell Aircraft Corp., Technical Order 1F-4(R)C-1, (Apr 82), Illustration reproduced from above document, p. 4-48.

19. Headquarters, Department of the Army, FM 100-5, Operations, (May 86), p. 23.

20. Canan, p. 48.

21. Major Mike Poore, "Integrating New Technology Into the TAC RECCE (Tactical Reconnaissance) Cycle", Electronic Defense, Vol 9, May 86, p. 55.

22. Ibid, p. 54-56. (Information for tables).

23. Lopez, "26TRW SLAR Operations in COLDFIRE 1/85 -- Final Report".

24. Headquarters, Department of the Army, FM 100-2-1, The Soviet Army: Operations and Tactics, Jul 84, p. 1-1.

25. Ibid, p. 5-1.

26. Canan, p. 49.

27. FM 100-5, p. 20.

28 Headquarters, Department of the Army, FM 34-1, Intelligence and Electronic Warfare Operations, Aug 84, p. 3-40.

29. Poore, p. 55-56.

30. Jobe, p. 30.

31. Poore, p. 54.

32. Canan, p. 48.

33. Ibid, p. 56.

34. FM 100-5, p. 23.

35. Coghlan, p. 131.

36. Major Rick Lanier, "26TRW How We Fight Briefing", presented Oct 84 at Zweibrucken AB, Germany.

37. Poore, p. 55.

38. BG Michael C. Kerby, Director, Air Force Issues Team, Air Force Issues Book, Fall 85, p. 5-19.

39. Ibid, p. 5-19.

BIBLIOGRAPHY

BOOKS

Appleman, Roy E., South to the Naktong, North to the Yalu, Office of the Chief of Military History, Department of the Army, Washington, D.C., 1961.

Craven, Wesley F., and James L. Cate, The Army Air Force in World War II, Vol VI, Chicago University Press, Chicago, 1948.

McDonald, William E., Tactical Air Reconnaissance Operations in Europe and North Africa, Dec 1941 to Jan 1946, Air Command and Staff College, Maxwell AFB, AL, 1967.

Natkiel, Richard, Atlas of World War II, The Military Press, New York, 1985.

Stokesbury, James L., A Short History of World War II, William Morrow and Company, Inc., New York, 1980.

von Clausewitz, Carl, On War, Edited and translated by Michael Howard and Peter Paret, Princeton University Press, Princeton, NJ, 1984.

Yeager, James A., Tactical Reconnaissance: Southeast Asia, Air Command and Staff College, Maxwell AFB, AL, 1971.

MANUALS

Air Force Manual 1-1, Basic Aerospace Doctrine of the United States Air Force, HQ Department of the Air Force, Washington, DC, 1984.

Field Manual 34-1, Intelligence and Electronic Warfare Operations, HQ Department of the Army, Washington, DC, 1984.

Field Manual 100-2-1, The Soviet Army: Operations and Tactics, HQ Department of the Army, Washington, DC, 1984.

Field Manual 100-5, Operations, HQ Department of the Army, Washington, DC, 1986.

GOVERNMENT DOCUMENTS

AAF Evaluation Board in European Theater of Operations, Tactics and Techniques Developed by the United States Tactical Air

Commands in the European Theater of Operations, Washington, DC, 1945.

Department of the Army, Vietnam Studies: The Role of Military Intelligence, 1965-1967, Washington, DC, 1974.

HQ, XIX Tactical Air Command, Tactical Air Operations in Europe. HQ (Advanced) XIX Tactical Air Command, APO 141, 1945.

Kerby, BG Michael C., Director, Air Force Issues Team, Air Force Issues Book, Department of the Air Force, Washington, DC, Fall, 1985.

Lopez, Ernest, 26TRW SLAR Operations COLDFIRE 1/85 -- Final Report (CONFIDENTIAL), 26TRW/DO, APO NY 09860, 1985. (Unclassified information used).

USAF Historical Division, Air University, United States Air Force Operations in the Korean Conflict, 1 November 1950-30 June 1952, Maxwell AFB, AL, 1955.

PERIODICALS

Brugioni, Dino, "New Roles for RECCE (Reconnaissance)", Air Force Magazine, 68:94-96+, Oct 85.

Canan, James W., "Getting the Picture Behind the Lines", Air Force Magazine, 70:46-53, Nov 87.

Coghlan, Jim, "Air Reconnaissance Gathers Speed for the AirLand Battle", Defense Electronics, 18:131-132, Sep 86.

Gabriel, Charles A., "Tactical Reconnaissance for the 1980s...A Close-up Look at the TR-1 and QSR", Signal, 34:9-11, Oct 79.

Nolde, Ken, "Tactical Strike Reconnaissance: Airpower's Oldest Profession", Defense and Foreign Affairs, pp. 14-16+, Oct 86.

Poore, Mike, "Integrating New Technology Into the TAC RECCE (Tactical Reconnaissance) Cycle", Electronic Defense, 9:51-52+, May 86.

MISCELLANEOUS

Lanier, Major Rick, "26TRW How We Fight Briefing", presented Oct 84 at Zweibrucken AB, Germany.

McDonnell Aircraft Corporation, Technical Order 1F-4(R)C-1, Ogden ALC/MMEDT, Hill AFB, UT, April 1982.

Jobe, Robert F., "Near-Real-Time Reconnaissance in REFORGER

1977", Text from presentation at the 1978 Air University Airpower Symposium, Air War College, Maxwell AFB, AL, Feb 13-15, 1978.

Stanford, Nolen B., "Tactical Reconnaissance -- A Time for Change", Text from presentation at the 1978 Air University Airpower Symposium, Air War College, Maxwell AFB, AL, Feb 13-15, 1978.

Symsack, Elmer F., Improving Air Force Imagery Reconnaissance Support to Ground Commanders, Master of Military Art and Science Thesis, Command and General Staff College, Fort Leavenworth, KS, 1983.