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A USAFE Special Study

THE TACTICAL AIR CONTROL PROCESS

IN EUROPE

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ATTN OF: HO

01 November 1982

SUBJECT: The Tactical Air Control Process in Europe Cover Ltr

TO: HQ ECD/HO

This short study of the tactical air control process was prepared by TSgt Stephen A. Toepfer, Historian, 601st Tactical Control Wing, on his own initiative. It's purpose is to explain in the simplest manner possible how this extremely complex system works so that members of his own unit could understand. We showed this study to Dr Richard Kohn and Mr Grant Hales, USAF Office of History, during a recent staff visit to USAFE. It was their suggestion that it be reproduced in sufficient numbers so that a copy could be provided to those historians throughout the Air Force whose units were involved with tactical air control.

If the number we have provided you is not sufficient for your command, please let us know.

Sincerely

Charles H. Hildreth

CHARLES H. HILDRETH
Command Historian

A USAFE Special Study

THE TACTICAL AIR CONTROL PROCESS IN EUROPE

by

TSgt Stephen A. Toepfer
601st Tactical Control Wing

Headquarters, United States Air Forces in Europe
Ramstein Air Base, Germany
27 September 1982

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THE TACTICAL AIR CONTROL PROCESS IN EUROPE

Introduction

This special study provides a brief and simple look at the tactical air control process within the European theater of operations. Unfortunately, too few people have a working knowledge of the tactical air control system (TAGS). Indeed, those who come into contact with this topic are often rewarded with confusion and bewilderment. With this thought in mind, a wide range of side issues which affect day-to-day TACS operations have not been included in this synopsis. We intentionally left these matters out to avoid a web of complexity and to keep the narrative unclassified, allowing for maximum distribution. For in-depth coverage of TACS related activity in Europe, to include actual air control activity, mission limitations, and force modernizations, please refer to the 601st Tactical Control Wing (TCW) histories on file at the Albert F. Simpson Historical Research Center, Maxwell Air Force Base, Alabama.

The 601st is the only American military unit of its kind in Europe. Its four groups, 18 squadrons, 10 numbered flights, and over 30 separate operating locations scattered throughout Germany make it one of the largest Air Force units assigned to the United States Air Forces in Europe (USAFE). The wing's basic mission is to provide tactical air control support to North Atlantic Treaty Organization (NATO) units. To understand the tactical air control system process, the reader should first acquire some knowledge of 601st Tactical Control Wing operational procedures. Accordingly, brief functional descriptions of major tactical air control elements operated and maintained by the wing are included in the following narrative report. Also, three appendix items provide detailed data on Control and Reporting Post (CRP), Forward Air Control Post (FACP), and Tactical Air Control Party (TACP) operations. A glossary is provided, listing many of the more common tactical air control system acronyms to assist readers who may be less familiar with TACS operations. This study was not intended to address every TACS operational requirement

or procedure; it does, however, provide a basic understanding of special terms, equipment, and procedures in layman terms, which should acquaint the reader more fully regarding the value of a successful tactical air control operation.

What Is Tactical Air Control?

Just what is tactical air control and how does it affect aircraft units based in Europe? By technical definition, with respect to the 601st Tactical Control Wing, this process involves the command and control of United States Air Forces in Europe (USAFE) and North Atlantic Treaty Organization (NATO) aircraft during the conduct of air operations. In simpler terms, wing elements are responsible for bringing friendly aircraft to the right target at the right time, and making sure that they return home via the safest route possible. In this study defensive operations will denote missions involving air-to-air intercepts. Radar assistance rendered during defensive missions could be for the identification of unknown aircraft or the conduct of air operations in the highly fluid environment of a dogfight. Conversely, offensive activity will refer to air strikes against ground targets in support of American or NATO ground elements. Both terms carry major implications, which will be referred to throughout this narrative. It should also be noted that, for political and military purposes, West Germany is divided into two areas with respect to American and NATO aircraft operations--2d Allied Tactical Air Force (ATAF) in northern Germany and 4ATAF in southern Germany.*

Before continuing, the reader should be aware of four major wing functions involved in the tactical air control process. The first two elements involve radar operations, and the remaining two concern forward

*2ATAF supports Northern Army Group (NORTHAG) ground forces primarily composed of British, Dutch, Belgium, and German forces, while 4ATAF supports Central Army Group (CENTAG) ground forces largely composed of American, Germany, French, and Canadian troops.

air control taskings performed either in the air or on the ground. Specifically, the wing works with two types of radar systems. One is immobile or "fixed" in permanent facilities, and the other involves a more survivable mobile radar network. Forward air control requirements are fulfilled either by airborne forward air controllers (FAC) using OV-10A aircraft or ground FACs who work with US Army units at battalion level. Several other wing units also come into play during tactical air control missions, but they'll be introduced later to save confusion.

Fixed Radar Operations

The defensive air control process begins with fixed radar sites whose domed facilities dot the West German countryside. They are similar in appearance to radar stations found along the northern border of the United States, which serve as part of the distant early warning system. The six fixed radar sites located in 4ATAF are collectively known as the "412L System" because of the type of equipment they employ.* Fixed radar sites in 2ATAF use a different system called the NATO Air Defense Ground Environment (NADGE) network. However, it should be noted that the wing is only involved with fixed radar operations in 4ATAF. Although six 412L fixed radar sites operate in southern Germany, only the unit at Boerfink comes under the 601st TCW. The other sites (Lauda, Freising, Messtetten, Doebraberg, and Wasserkuppe) are operated by the German Air Force (GAF).

Boerfink's control and reporting center (CRC) mission is carried out by the wing's 615th Aircraft Control and Warning Squadron (AC&WS). The

*These 412L sites are undergoing a transition to newer equipment, and Boerfink is the first control and reporting center to receive the conversion. When the modification is complete, the "412L" designation will be dropped and the fixed radar sites in 4ATAF will become the German Air Defense Ground Environment (GEADGE) network. It should be noted that one of the wing's mobile radar units picked up Boerfink's responsibility of providing 24-hour surveillance coverage. This unit will continue to augment the fixed radar system until Boerfink comes back on line as an operational unit. This site was also a master control and reporting center which ran the entire 412L system. This will no longer hold true after the new GEADGE conversion.

site 1s tasked with providing 24-hour-a-day surveillance of its assigned airspace and rendering support for offensive and defensive air operations as directed by NATO planners. The 615th Aircraft Control and Warning Squadron's control and reporting center also maintains the unique posture of being the wing's only unit under NATO operational control for peacetime and wartime conditions. To insure mission accomplishment, the 615th AC&WS maintains two detachments—one at the Frankfurt Air Defense Notification Center (ADNC) and the other collocated with the sector operations center at Kindsbach, Germany. Kindsbach provides air situation and status displays in support of the Allied Sector III commander, and the Frankfurt operation produces the collection, processing, and dissemination of military and civilian flight information for use by the NATO air defense system. Elements of the 32d Army Air Defense Command's missile control center receive logistics and facility support from the Boerfink CRC.

Mobile Radar Operations

Unfortunately, the close proximity of 412L sites to the East German border, coupled with the immobile nature of their operations, results in the generally accepted belief that they will not survive very long in a hostile environment; thus, there 1s a need for a more mobile and survivable radar system. A total of 15 mobile radar units are garrisoned at separate operating locations throughout West Germany. Nine of these units operate in 4ATAF and the remaining six work out of and support the 2ATAF area. Five of the 15 mobile radar units consist of tactical control squadrons, also known as control and reporting posts (CRP). In turn, each CRP is the parent organization for two tactical control flights or forward air control posts (FACP).

Control and Reporting Posts. CRPs maintain more equipment than forward air control posts and possess a wider range of capabilities. (See Appendix I for a listing of wing CRPs, their locations, call signs, and major equipment assets assigned.) These "heavy" radar units are designed to provide radar control in support of friendly aircraft; maintain surveillance of assigned airspace to include the classification of

aircraft which enter their area of responsibility; and to collect, display, and disseminate information on all activity picked up by their radar.* In addition to providing radar control for reconnaissance and refueling missions, control and reporting posts are tasked with guiding friendly aircraft to air or ground targets and assisting in their return to home bases. CRPs operate from technical sites or from deployed locations in the field with complete autonomy with respect to receiving outside logistical support. If a CRP needs to deploy it can be ready to move within 24 hours. Their more important assets include the TSQ-91V "operations central," a TPS-43E radar set, a message processing center (MFC),** the GSQ-120 radar data transfer system (RDTS), and various power production equipment which runs the control and reporting post's equipment during field operations.

A TSQ-91V operations central is the nerve center of CRP operations. This three-celled inflatable building, commonly referred to as a "rubber duck", houses 14 radar consoles used by air weapons controllers (AWC) and air surveillance officers (ASO). The number of scopes dedicated between the surveillance function or actual control of aircraft varies with changing mission requirements at any given time. In essence, inputs from the revolving TPS-43E radar are received by a Hughes-built HM 4118 computer inside the operations central. The computer converts this raw data into workable images which can be displayed on the CRP's radar consoles. A rather large and bulky manual display board is also located inside the rubber duck so that information can be manually logged in the event of a computer breakdown. Though controllers need this backup system to ensure mission accomplishment during computer outages, its presence requires the use of the TSQ-91V which ultimately results in the 24 hour

*The CRC, with information provided by the ADNC, was responsible for identifying unknown "tracks." The CRPs classified aircraft as being either unknown or hostile.

**0nly the 602d, 603d, 606th, and 609th Tactical Control Squadrons possess Message Processing Centers. The 601st TCS achieves tactical interface with other radar units by using a data link established through the 603d TCS's MPC.

deployment criteria. Should the wing find some means of replacing the display board with an automated system, the TSQ-91V can be modified to allow for its teardown/set-up in much less time.*

Message processing centers or MPCs allow mobile 407L TAGS units to exchange radar data with all other mobile, fixed, and airborne radar systems in the Central European Region. (407L describes the type of equipment employed by control and reporting posts.) Basically, this piece of equipment, designated the AN/TYC-10, takes information received in the "language" of the 407L system and converts it into one of several forms understood by other computer systems used by 412L units and our NATO allies. The message processing center also can "downlink" automated data from E-3A Sentry Airborne Warning and Control System (AWACS) aircraft. Such interfaces are critical in providing adequate command and control services within the NATO environment. With this capability, strategists at all levels of command can instantaneously view the air picture of any given quadrant almost as soon as the CRP. Under current use, MPCs are generally attached to one end of the TSQ-91V although they can operate considerable distances away in a "stand alone" configuration. The major factor inhibiting more frequent use of the stand alone posture is the lack of spare support equipment. There just aren't enough support assets available to sustain both MPC and CRP operations should they be configured apart from each other.

The TPS-43E is a lightweight, transportable, three-dimensional surveillance radar which requires 60 kilowatts of power at 400 HZ for operation. Designed to provide range, azimuth, and height data on targets of interest within the TAGS environment, it possesses a detection range of 240 nautical miles and has a height finding capability up to 100,000 feet. The radar system can be erected by six men in 60 minutes during daylight

*These manual display boards also contain other information which is not stored in the computer such as frequency assignments, weather information, call signs, frag orders, etc. Additionally, individual cells could be added or taken away from the TSQ-91V operations central. A good example is the 603d TCS which uses four TSQ-91V operations central cells for its GEADGE augmentation activity.

or 90 minutes during darkness. This radar is also compatible with the identification friend-or-foe/selective identification feature (IFF/SIF) system used to interrogate aircraft to determine if they are friendly.

Yet another important asset utilized by CRPs is the GSQ-120 radar data transfer system. One of the newer additions to the TAGS inventory, the GSQ-120 is comprised of two complete, self-contained terminals, and each terminal uses a GRC-99 microwave line-of-sight radio with a six-foot diameter dish antenna to transfer radar data. While not particularly impressive in looks, use of this equipment allows the TPS-43E to be placed up to five miles away from the TSQ-91V. This capability has two distinct advantages. First, TPS-43Es can operate from locations more conducive for radar operations in areas not accessible to the main CRP element due to rugged terrain. Second, remoting of the TPS-43E greatly increases the survivability of the CRP's main element should the enemy use radar seeking warheads.

Forward Air Control Posts. Two FACPs are assigned to each control and reporting post as subordinate units. Unlike CRPs which will deploy a good distance from the front lines during wartime, FACPs will operate about 30 kilometers away from the forward edge of the battle area (FEBA). These lean, highly mobile units provide low-level radar coverage, control offensive missions, aid in the conduct of defensive intercepts, and render early warning surveillance assistance to include filler gap radar coverage.* Forward air control posts possess much less equipment than CRPs and thus can be ready to deploy within six hours after notification to do so. (See Appendix II for a listing of wing FACPs, their locations, call signs, and major equipment assets assigned.)

FACP radar consoles are manned by air weapons controllers and air surveillance technicians.** Where CRPs possess 14 radar consoles within

*Filler gap radar coverage meant that FACPs covered certain airspace not accessible to the CRPs such as that found around mountainous or hilly regions. Also, due to training limitations, not all wing FACPs were qualified to conduct defensive missions.

**Where the CRP has air surveillance officers, the FACP has air surveillance technicians who are enlisted members.

the TSQ-91V operations central, forward air control posts possess only four—two in the TSQ-61V operations central and two 1n the TPS-43E radar set van. Neither of these vans have the HM 4118 computer utilized by control and reporting posts. Rather, FACP controllers use a small circular slide rule with special markings to work air mass problems as input by their TPS-43E. Obviously, this slide rule does not possess the capabilities of the highly sophisticated HM 4118. However, it is adequate for FACP operations. Basically, FACP air weapons controllers accept control of aircraft from either the CRC or CRP during offensive missions and subsequently hand them off to an airborne or ground forward air controller for final targeting guidance. Several FACPs are also qualified to work defensive missions. After pilots complete their mission, they will normally return home by contacting the TAGS elements in reverse order. When required, FACP air surveillance technicians establish and maintain an accurate air traffic picture within their assigned airspace. Again, the number of radar scopes dedicated to aircraft control or airspace surveillance depends on mission requirements at that time.

Air Support Radar Teams. In addition to CRPs and FACPs, the 601st Tactical Control Wing also utilizes three air support radar teams (ASRT). One each is assigned to forward air control posts at the 611th, 619th, and 632d Tactical Control Flights. Unfortunately, much of the ASRT's equipment capability is classified information and cannot be discussed in this study. It can be said, however, that the primary mission of air support radar teams is to provide attack aircraft with precision guidance to predetermined bomb release points. Their secondary mission is to offer precision navigational support to tactical or other air operations. This includes providing precise vectoring for aircraft when other methods are not possible due to weather, darkness, or other adverse conditions.

Although an integral part of their associated forward air control posts, ASRTs are operationally independent and may be employed in several configurations. In the autonomous configuration the entire air support radar team is sited as a unit, normally to the rear of the first echelon of friendly troops. This operational mode minimizes the possibility of

hostile detection and assault while keeping the ASRT within range of close air support (CAS) targets along the forward edge of the battle area. In the second configuration, the air support radar team splits up wherein a combat bomb team operates in the forward area, while ASRT support elements remain in the rear. The combat bomb team would thus be highly mobile and able to operate within 15 to 24 kilometers of the FEBA. This configuration increases radar control accuracy for close air support missions, but it also increases the possibility of assault by hostile ground and/or air forces. It should be noted that, other than providing occasional navigational guidance during inclement weather, ASRTs only work with offensive air support missions.

Forward Air Control

Radar units work with offensive and defensive missions. This narrative will now continue with discussions on the remaining two major elements involved with the tactical air control process; airborne forward air control (FAC) and ground controllers who operate as an element of the wing's tactical air control party (TACP) network. Again, in contrast to radar operations, forward air controllers only work with offensive air strikes against ground targets. First, let's take a look at OV-10A FAC requirements.

OV-10A Airborne Forward Air Controllers. OV-10A aircraft were designed originally for airborne forward air controller use in providing final targeting guidance directly to attack aircraft flying over the battlefield area. Such guidance could be furnished through voice communications bringing attack aircraft to easily distinguishable landmarks near enemy positions (known as initial point or IP targeting) or by the firing of white phosphorus rockets near the enemy's position to mark their location. However, the relatively slow speed of the OV-10A "Bronco", plus a lack of armor plating and armament, make them very susceptible to hostile fire. As a result, the airborne FAC role has evolved to the point where they now serve primarily as a communications relay platform for TACPs on the ground. Specifically, the mission of the

OV-10A controller is to operate as an element of the command, control, and communications (C^3) structure of the TAGS system to expand tactical air control party capabilities in fulfilling army requirements for close air support. This encompasses both the role of forward attack coordinator-airborne (FAC-A) and forward FAC (FFAC). The FAC-A attempts to operate at a distance far enough behind the FEBA where communications jamming is minimal and he can communicate with fighters. His primary function is to pass targeting information on to fighter aircraft. The FFAC operates further forward and communicates directly with the TACPs so that information can be passed on to either the FAC-A or attack aircraft. Should the environment be less hostile, OV-lOAs could return to their more traditional role of "smoking" targets with their 2.75-inch white phosphorus rockets.

Tactical Air Control Parties. The second major element in forward air control operations involves TACPs assigned to each maneuver battalion in the US Army V and VII Corps areas. In essence, these two-man TACPs accompany army units in the field to advise battalion commanders on the utilization of air power against ground targets and to up-channel air strike requests once a decision has been reached to employ an air strike. Ground FACs are actually mission capable OV-10 pilots who stay at Sembach unless their battalions move out to the field. On the other hand, the other member of the TACP (who is an enlisted member) stays with the army unit fulltime and maintains tactical air control party equipment for immediate use. Two main platforms are used for TACP operations: the MRC-107A communications central and the M-113 armored personnel carrier (APC). In all, the 601st Tactical Air Support Group maintains 22 TACP locations in the Central Region including one at Camp Ederle, Italy. (See Appendix III for a table showing TACP locations.) It should also be noted that the wing maintains air liaison officer (ALO) and/or reconnaissance liaison officer (RLO) positions at both division and brigade levels within the V and VII Corps hierarchy. Although technically TACPs, this narrative will address these positions as ALOs/RLOs to prevent confusion since virtually all air strike requests are generated by TACPs at the battalion level. The wing also maintains liaison offices at the

headquarters of V and VII Corps. Wing members at all levels work closely with their army counterparts on matters involving use of offensive air power.

Generally, each TACP operates out of a MRC-107A communications center. This consists of the M-151A %-ton jeep packed with radios and antennas for communications with aircraft or other TAGS units. The jeep serves its purpose reasonably well but is highly recognizable as an enemy target and not too mobile over rough terrain. This particularly hampers the battalion TACP trying to keep up with troops on the move. To compensate for this deficiency, the Air Force purchased Collins adapter kits in 1979 which permitted the placement of communications gear into armored personnel carriers. This serves two purposes—survivability and maneuverability over hilly terrain. When available, FACs also utilize Army Scout helicopters as operating platforms for controlling air strike missions.

The battalion TACP is the forward most element of the tactical air control system. As such, he normally takes a fighter on a radio "handoff" from the FACP although such missions are not dependent on radar control. The incoming pilot provides his heading and speed, and the controller uses this information to vector him toward a highly visible landmark or initial point. The ground FAC gives final targeting information in terms of heading and distance from the IP. Once spotting the enemy, the fighter pilot is then on his own.

How Does the Tactical A1r Control Process Work?

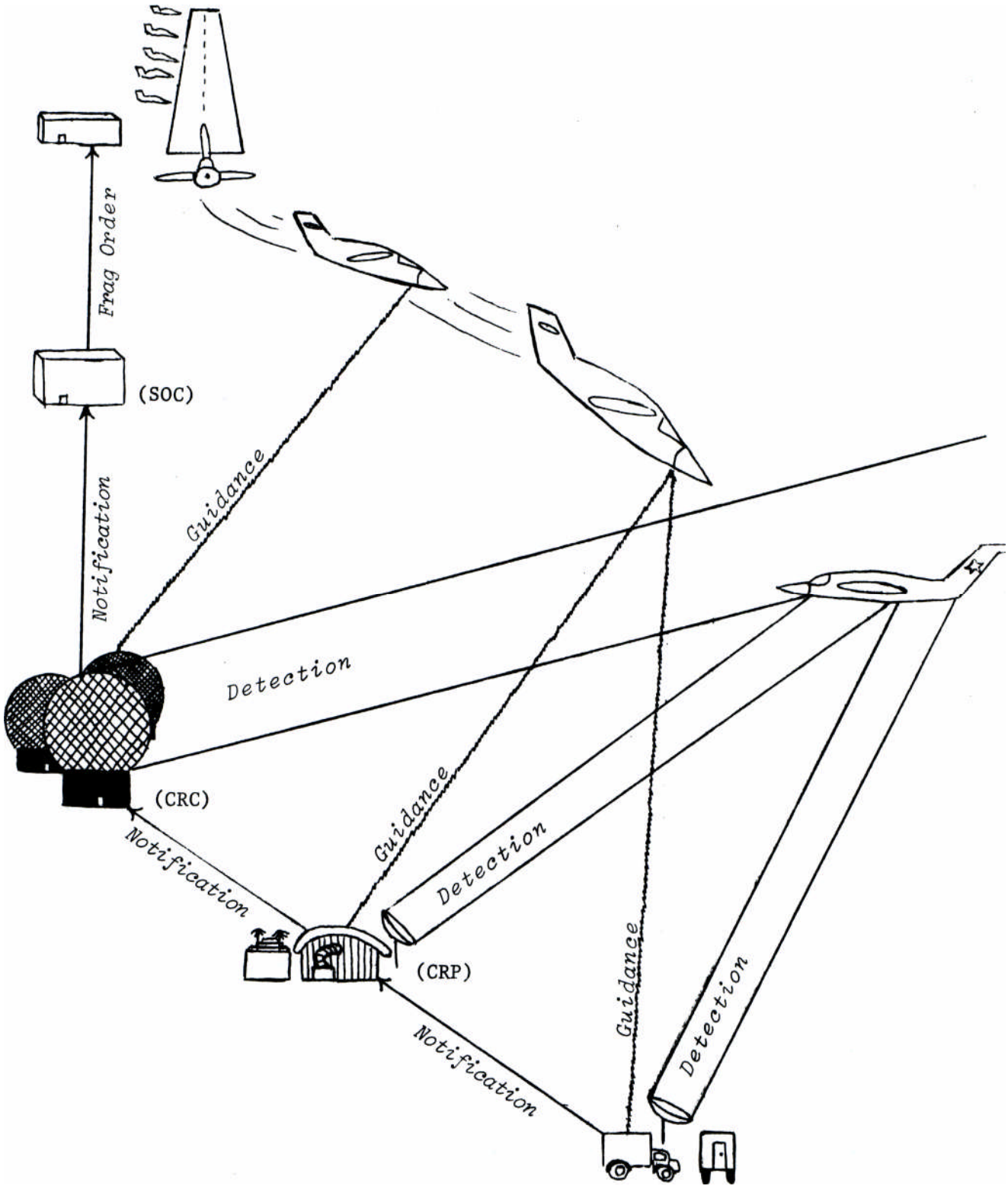
Hopefully, you now have a working knowledge of major TAGS elements within the wing. But how do all these seemingly unrelated functions fit and mesh together in the process of tactical air control? The answer will be provided shortly but, first, a few additional functions should be discussed for anything to truly make sense. The wing also possesses two air support operations centers (ASOC) which are collocated with the two corps tactical operations centers (CTOC) at V and VII Corps. As will be

noted, ASOCs work closely with their army counterparts in the CTOC when coordinating air strike missions. Two other important elements consisting of the sector operations center (SOC) and allied tactical operations center (ATOC) also come into the pictu re during related TAGS activity. The sector operations center is responsible for all air defense efforts in the Central Region. This important NATO element coordinates and directs all air-to-air intercept activity.- In contrast, the ATOC generates all air tasking orders pertaining to close air support missions against ground targets. With the help of several illustrations, let's take a look and see how all these elements fit together.

The "Defensive" Control Process

Very simply, during a general defensive o peration, the forward based FACP will pick up incoming enemy aircraft on its radar. The forward air control party will then use radio communications to pass on pertinent information to the rearward based CRP who subsequently up-channels the reported sighting. As depicted in the illustration on the next page, the SOC will then frag (or schedule) an alert aircraft to intercept the intruder and subsequently notify radar units of the mission number and radio frequencies to be used in its control. Following grou nd radar directions, the interceptor will usually pass from the CRC to the CRP and, if needed, to the FACP. After mission accomplishment, the friendly aircraft returns to its home base by contacting the TACS units in reverse order.

While many scenarios can be used to describe defensive missions, virtually all involve two basic types of procedures used by wing control-lers. The first pertains to the traditional intercept process wherein interceptors are brought to intercept coordinates of unknown or hostile aircraft. A lot of people are unaware that international doctrine places certain restrictions on peacetime intercepts whenever aircraft are sent up to identify unknown "tracks". Operating under strict international regulations which govern the conduct of i ntercept missions, wing controllers must provide guidance which permits intercepting aircraft to



Defensive Air Support
(Air-to-Air Intercepts)

overtake the intruders at just the proper angle and speed to prevent alarming the Tatter's pilot or passengers should the aircraft be privately owned or a commercial carrier. Because of the expertise and finesse required during such operations, intercept missions are the most difficult to control.

The other major process used during defensive missions involves control of air combat tactic (ACT) and dissimilar air combat tactic (DACT) missions. Quite simply, the term ACT is used to describe tactical engagements which involve two of the same type aircraft (i.e., an F-16 versus another F-16). Conversely, DACT "dogfights" involve engagements of differing type aircraft (i.e., an F-16 versus an F-15). In peacetime, wing controllers are largely responsible for flight safety by keeping combating aircraft properly separated and within the confines of temporary reserved airspace (TRA) during ACT/DACT missions. In wartime these controllers will help friendly pilots attain advantageous positions over enemy aircraft and keep them informed of the tactical situation in their immediate airspace to include the location of any additional enemy aircraft in the area.

The "Offensive" Control Process

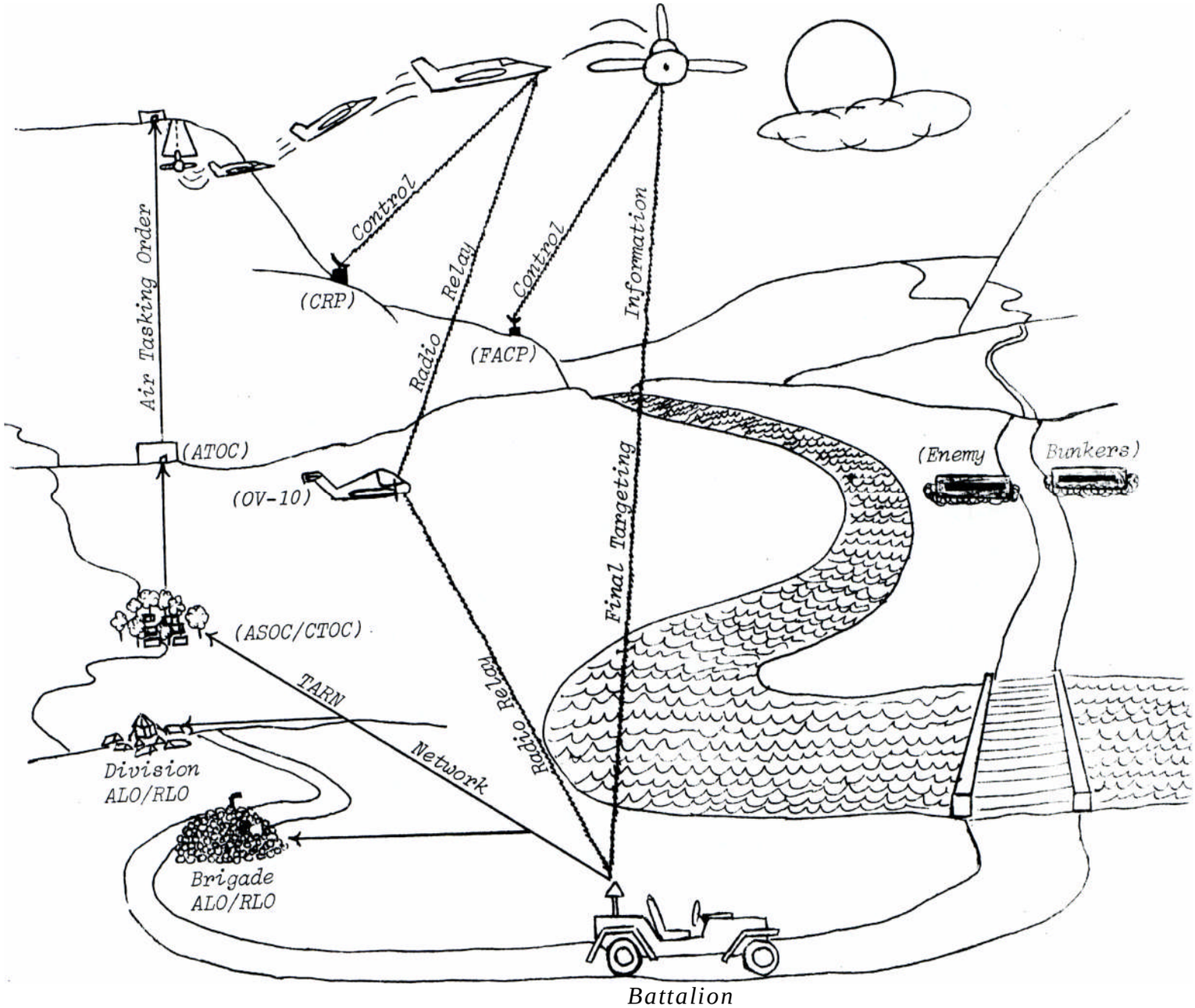
As previously discussed, control of offensive missions brings remaining TAGS elements into the picture. In a typical contingency situation requiring close air support, a battalion facing superior forces or armored resistance will coordinate with their TACP to request an air strike. The TACP will use the high frequency tactical air request network (TARN) to pass on the request. It should be noted that this HF frequency is fairly easy to jam. An alternate method for requesting air support could be via OV-10 aircraft since its equipment is less susceptible to communications jamming. In any event, the battalion's request for air support goes to the ASOC collocated with the CTOC. At the same time, the request is monitored on the TARN by the intermediate brigade and division ALOs/RLOs. If brigade or division ALOs/RLOs do not negate the request within 10 minutes, the ASOC will petition the ATOC to frag sorties for the

mission. Brigade or division headquarters might cancel the air support request within this 10-minute period if they think other means are available to dispose of the threat, such as artillery or other friendly ground troops in the area. Once the aircraft are airborne, wing radar units come into play again. As seen in the illustration on the next page, wing CRPs and FACPs will control the pilots until they fly into range of either the airborne or ground FAC. These elements, in turn, provide final targeting information before the fighter makes its pass. Upon completion of the air strike the fighter returns home using the same TAGS control it received in arriving.

Summary

In summary, 601st Tactical Control Wing elements play a major role in NATO's tactical air control network. Whether command and control is provided through radar or FAC resources, tactical aircraft would be hard pressed to accomplish their respective missions without the assistance rendered by wing functions. The 601st TCW has come a long way since the mid-1940's when some of its units were first activated. The going hasn't always been easy as the 601st TCW, itself only recently activated in 1968, is the "new kid on the block" with respect to radar and FAC operations in Europe. Indeed, there are still some interoperability problems. But, through exercise exposure and a constant promoting of wing concepts by 601st TCW representatives, our NATO allies are coming around and recognizing the validity, importance, and need for the "command and control" product the wing has to offer. At first, working almost solely with American aircraft, the wing is now periodically controlling most types of NATO assigned fighters. Three major factors contributed greatly toward this achievement. The first big boost came in 1976 when six new radar units were activated and assigned to 2ATAF. This allowed wing controllers to work with British, Dutch, and Belgium aircraft more frequently. Secondly, in June 1979, wing radar units began controlling ACT/DACT missions. Now, these type missions comprise the majority of control activity experienced by wing controllers. Lastly, computer software changes and the addition of the message processing center to the wing's

Offensive Air Operations (Air-to-Ground Close Air Support)



equipment inventory in October 1979 allowed wing CRPs to interface with other computers throughout the NATO force structure. New plans are also in the making to improve wing interface capabilities still further through equipment modifications and force modernization projects. To be sure, whenever flying missions are scheduled or fragged by the ATOC and SOC, it is almost a certainty they will receive some type of control support by wing resources. Hopefully, this pamphlet has clarified the course of events pertaining to such activity and remedied the confusion that may have been previously encountered on this topic.

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APPENDIX I

CONTROL AND REPORTING POSTS

1. Brief Description: To operate and maintain a mobile unit capable of providing radar control and surveillance within a designated area; to collect, display, and disseminate information on aerial activity. Provide radar coverage for control of air forces in tactical interface between dissimilar systems through the use of a message processing center.

2. Major CRP Equipment assigned to the average unit:

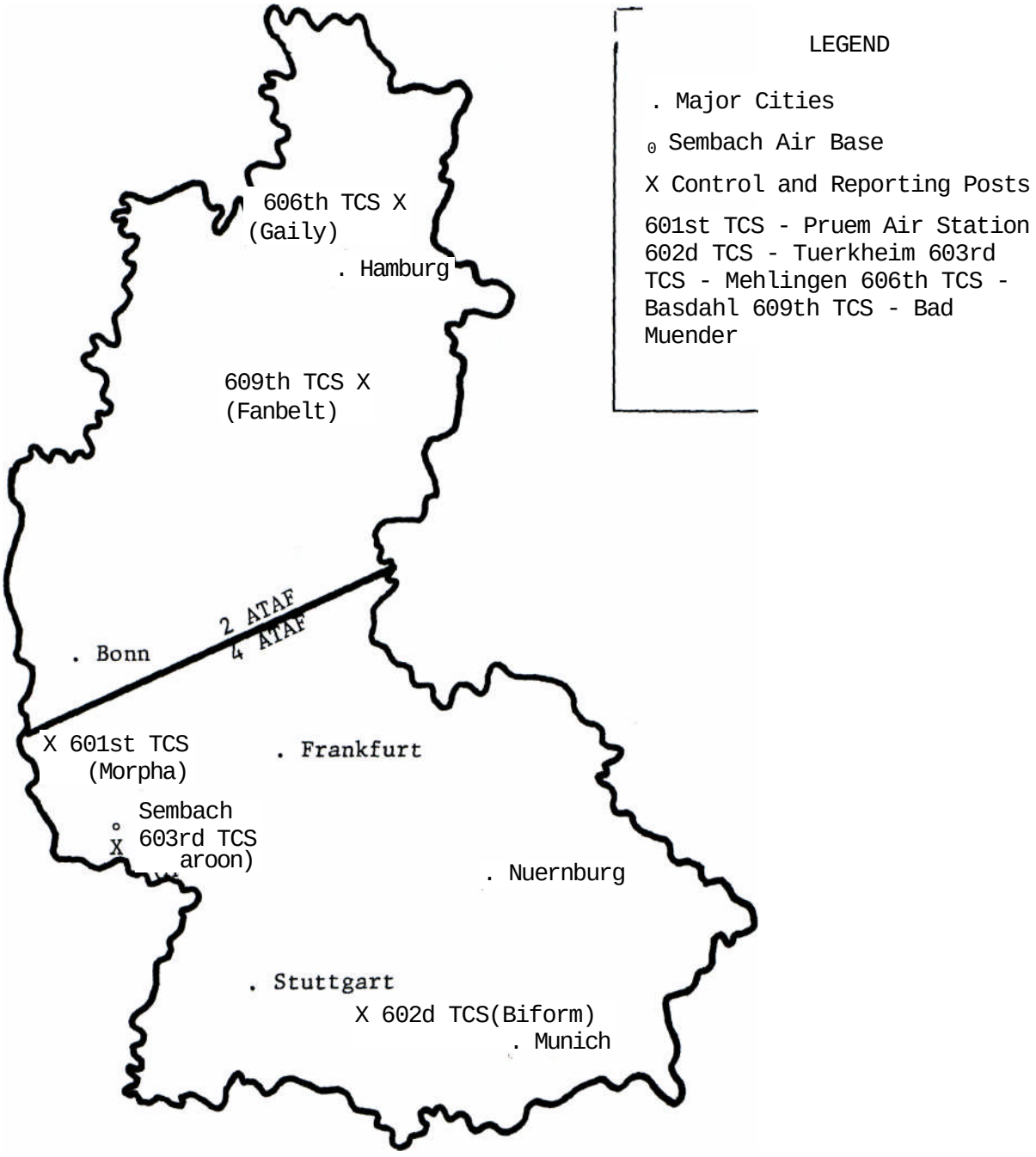
#	Operations Related
1	TPS-43E Radar Set
2	GSQ-120 Radar Data Transfer Sys
1	TSQ-91V Operations Center
2	UPX-23 Friend/Friend ID Sets
1	GRM-94 Maintenance Van

#	Communications Related
2	TSC-60 HF Side Band Radios
1	TSC-62 Technical Control Van
3	TRC-87 UHF Radio Vans
2	TTC-30 Telephone Switch Vans
8	TRC-97A Microwave Radio Relays

#	Transportation Related
57	M-35A 2½ Ton Trucks
2	M-151 Jeeps
43	M-720 Mobilizers
5	A1B Fuel Trailers
15	M-101 TRC-97A Trailers
5	Water Trailers
12	M-885 Pickup Trucks
1	M-816 Wrecker

#	Power Production Equipment
17	A/E24U-8 Power Plants
12	EMU-12 Generators
32	EMU-30 Generators

Appendix I (Cont)



3. CRP locations in West Germany and their call signs.

APPENDIX II

FORWARD AIR CONTROL POSTS

1. Brief Description: To provide radar control of offensive and defensive air operations and filler gap surveillance within an assigned area of responsibility; to provide extended radar coverage in the forward battle area; and to maintain a highly mobile deployment capability to meet changing tactical situations. Air support radar teams of the 611th, 619th, and 632d TCFs are to provide all weather day/night precision guidance for tactical bombing operations and to pro vide navigational assistance as required.

2. Major equipment items assigned to the average FACP:

t Operations Related

1 TPS-43E Radar Set
1 TSQ-61V Operations Central

1 Transportation Related

11 M-35A 2*s-Ton Trucks
2 M-151 Jeeps
9 M-720 Mobilizers
2 A1B Fuel Trailers
1 M-101 TRC-97A Trailer
2 M-107 Water Trailers
1 M-885 Pickup Truck
1 M-816 Wrecker

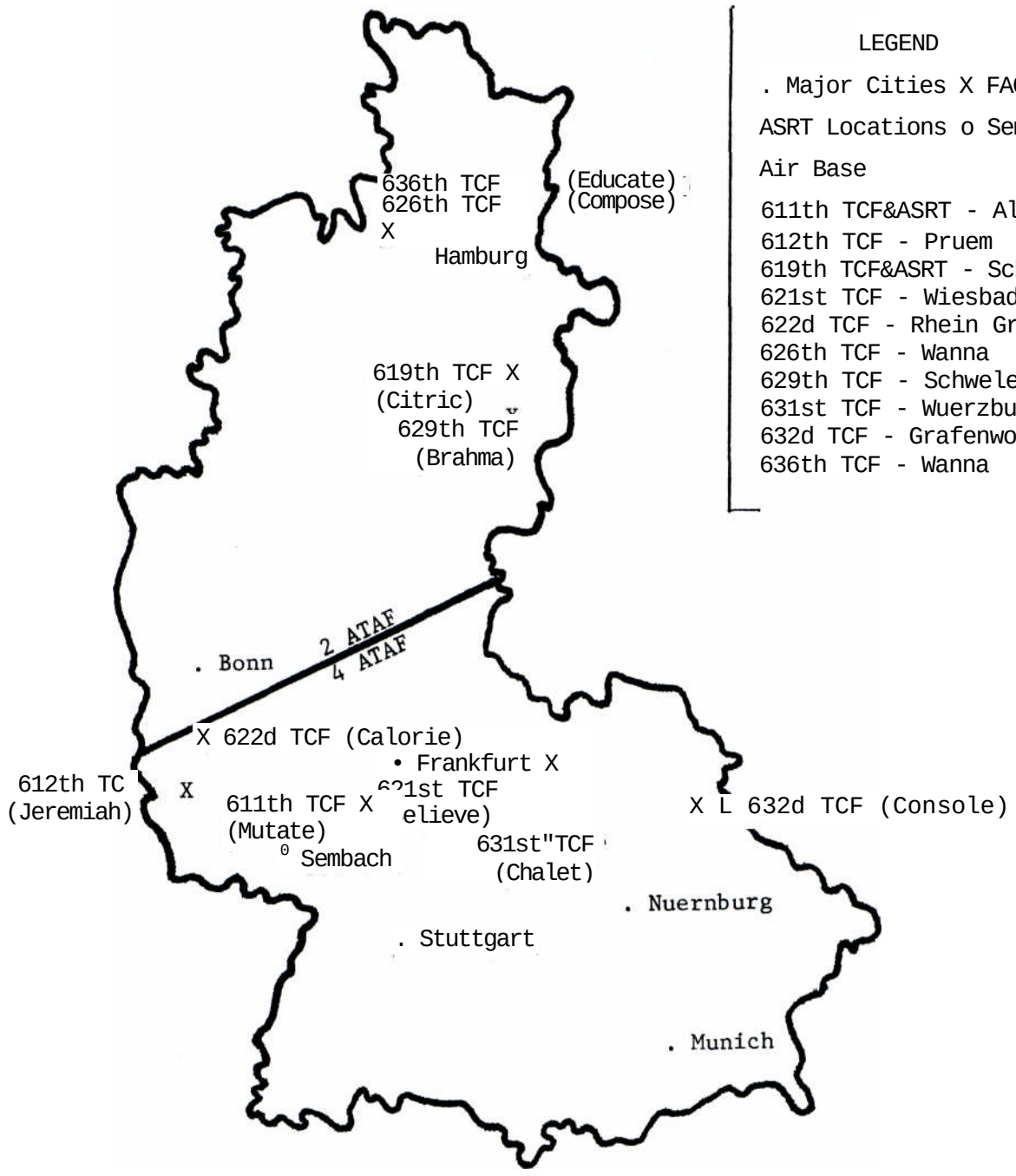
1 Power Production Equipment

3 A/E24U-8 Power Plants
2 EMU-12 Generators
1 MC2A Generator
1 MEP-16 Generator

f Communications **Related**

1 TSQ-53 Communications Set
1 TRC-97A Microwave Radio Relay

Appendix II (Cont)



3. FACP and ASRT locations in West Germany and their call signs,

APPENDIX III

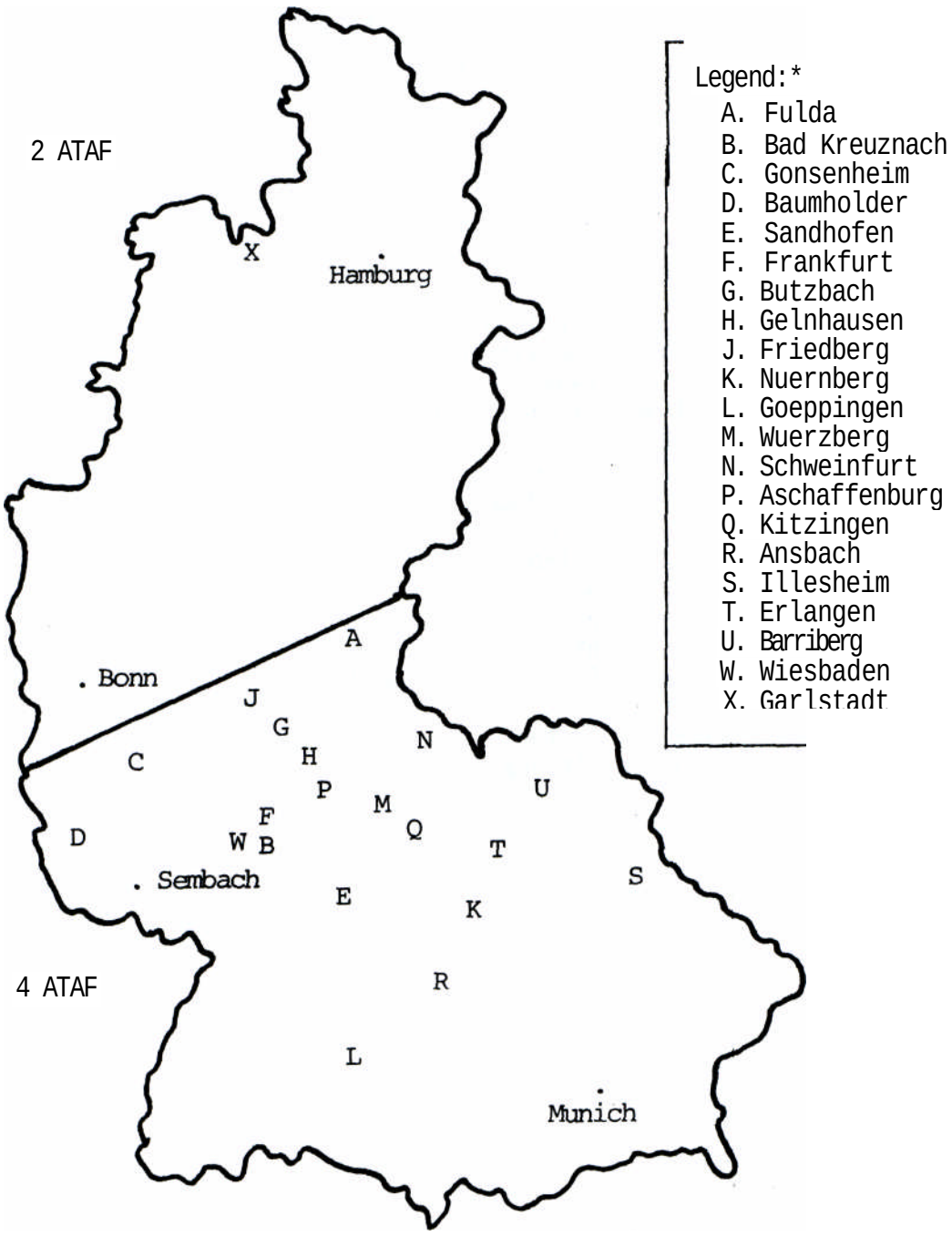
FORWARD AIR CONTROL POSTS

1. Brief Description: Two-man teams who travelled with US Army units in the field at the battalion level in requesting air support for strikes against ground targets. This team also fulfilled forward air control requirements wherein they passed on targeting information to attacking aircraft; either directly or via radio relay using OV-lOAs.

2. Major TACP Equipment:

618T	Transmitter-Receiver
Wilcox 807	VHF-AM Transmitter-Receiver
VRC-46	VHF-FM Transmitter-Receiver w/Amp
AN/ARC-51BX	UHF-AM Transmitter-Receiver
6RC-155	Radio Pallet
AT-1040-43	HF Antenna (whip)
GRA-4	HF Antenna (Doublet)
C-6903	Radio Control with Speaker
AN/6RA-39	Remote Control Set
AS-1404/PRC	UHF-AM Antenna
AN-2060/VRC	6RC-125 Power Supply
AT-912/VRC	VHF-FM Antenna
MX-2799	GRC-125 Antenna Match Unit
M-151A1	Jeep
M-416	Trailer *(%-ton)*
PU-632	Gasoline Generator

Appendix III (Cont) 3. TACP locations in West Germany.



** Operating Location "V" is located at Camp Ederlie in Italy.*

GLOSSARY

(Acronyms Commonly Used In the Tactical Air Control Process)*

ACMI	air combat maneuvering instrumentation
ACSE	ATOC communications support element
ACT	air combat tactics
AC&WS	aircraft control and warning squadron
ADNC	air defense notification center
ADRU	air defense radar units
AEW	airborne early warning
AFAC	airborne forward air controller
AGM	air-to-ground missile
ALO	air liaison officer
AMC	airborne mission commander
ARC	armored personnel carrier
ARM	antiradiation missile
ASO	air surveillance officer
ASOC	air support operations center
ASRT	air support radar team
AST	air surveillance technicians
ATAF	Allied Tactical Air Force
ATO	air tasking order
ATOC	allied tactical operations center
AWACS	airborne warning and control system
AWC	air weapons controller
AWCT	air weapons controller technician
BAI	battlefield air Interdiction
CAS	close air support
CMP	combat mission profile
CP	contact point
CRC	control and reporting center
CRP	control and reporting post
CTOC	corps tactical operations center
DACT	dissimilar air combat tactics
DEF	defensive
DTOC	division tactical operations center
EAF	emergency action file
ECCMT	electronic counter-counter measure technician
ECM	electronic counter measure
EOC	emergency operations center
EW	electronics warfare

*Most of these acronyms are not used in this study. They are included to help the reader understand terms used in any future correspondence he or she comes across concerning the tactical air control system.

Glossary (cont)

FAC	forward air controller
FAC-A	forward attack coordinator-airborne
FACP	forward air control post
FEBA	forward edge of the battle area
FFAC	forward FAC
FOL	forward operating location
FORRK	fiber optic radar remoting kit
GCI	ground controller intercept
GDBS	ground directed bombing system
GEADGE	German air defense ground environment
GFAC	ground forward air controller
GLO	ground liaison officer
GSU	geographically separated units
HF	high frequency
IF	infrared
IFF	identification--friend or foe
IP	initial point
IRCM	infrared counter-measure
LATN	low altitude tactical navigation
LOFEZ	low fighter engagement zone
LOS	line-of-sight
MCRP	master control and reporting post
MOB	main operating base
MPC	message processing center
NATO	North Atlantic Treaty Organization
NADGE	NATO air defense ground environment
NOA	non-operational active
NOSC	NATO operations support cell
PCB	programming center Birkenfeld
RDTS	radar data transfer system
RF	radio frequency
RLO	reconnaissance liaison officer
RWRS	radar warning receiver system
SIF	selective identification feature
SIDS	status information display system
SOC	sector operations center
SOTAS	stand-off target acquisition system
SRWBR	short range wide band radio
TAC	tactical air control
TACDEN	Tactical Air Command, Denmark

Glossary (cont)

TACP	tactical air control party
TAGS	tactical air control system
TAR	tactical air reconnaissance
TARN	tactical air request network
TAS6	tactical air support group
TASS	tactical air support squadron
TCP	tactical control flight
TCG	tactical control group
TCS	tactical control squadron
TCW	tactical control wing time on
TOT .	target temporary reserved
TRA	airspace
UHF	ultra high frequency
VFR VHP	visual flight rules very high frequency