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AAA UNITS ACTIVATED AT FORT BLISS

Following is a list of units that have been activated at Fort Bliss. This contains those units previously reported in the May-June issue of the Journal:

Brigades:

31st AAA Brigade
34th AAA Brigade
35th AAA Brigade

Groups:

5th AAA Group
10th AAA Group
11th AAA Group
12th AAA Group
16th AAA Group
19th AAA Group
22d AAA Group
68th AAA Group
80th AAA Group

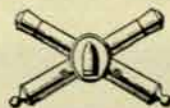
Battalions:

4th AAA AW Bn (Mbl)
5th AAA AW Bn (Mbl)
30th AAA AW Bn (Mbl)
32d AAA AW Bn (Mbl)
39th AAA AW Bn (Mbl)
60th AAA AW Bn (Mbl)
450th AAA AW Bn (Mbl)
3d AAA AW Bn (SP)
8th AAA AW Bn (SP)
11th AAA AW Bn (SP)
15th AAA AW Bn (SP)

21st AAA AW Bn (SP)
34th AAA AW Bn (SP)
50th AAA AW Bn (SP)
59th AAA AW Bn (SP)
62d AAA AW Bn (SP)
82d AAA AW Bn (SP)
213th AAA AW Bn (SP)*
443d AAA AW Bn (SP)
41st AAA Gun Bn (90mm)
67th AAA Gun Bn (90mm)
68th AAA Gun Bn (90mm)
69th AAA Gun Bn (90mm)
70th AAA Gun Bn (90mm)
78th AAA Gun Bn (90mm)
95th AAA Gun Bn (90mm)
504th AAA Gun Bn (90mm)
71st AAA Gun Bn (120mm)*
75th AAA Gun Bn (120mm)
79th AAA Gun Bn (120mm)
96th AAA Gun Bn (120mm)
501st AAA Gun Bn (120mm)
502d AAA Gun Bn (120mm)
518th AAA Gun Bn (120mm)
519th AAA Gun Bn (120mm)
526th AAA Gun Bn (120mm)*
88th Abn AA Bn

*Activated in September 1949

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The purpose of the Association shall be to promote the efficiency of the Coast Artillery Corps by maintaining its standards and traditions, by disseminating professional knowledge, by inspiring greater effort toward the improvement of materiel and methods of training and by fostering mutual understanding, respect and cooperation among all arms, branches and components of the Regular Army, National Guard, Organized Reserves, and Reserve Officers' Training Corps.

The JOURNAL prints articles on subjects of professional and general interest to personnel of all the components of the Coast Artillery Corps in order to stimulate thought and provoke discussion. However, opinions expressed and conclusions drawn in articles are in no sense official. They do not reflect the opinions or conclusions of any official or branch of the Department of the Army.

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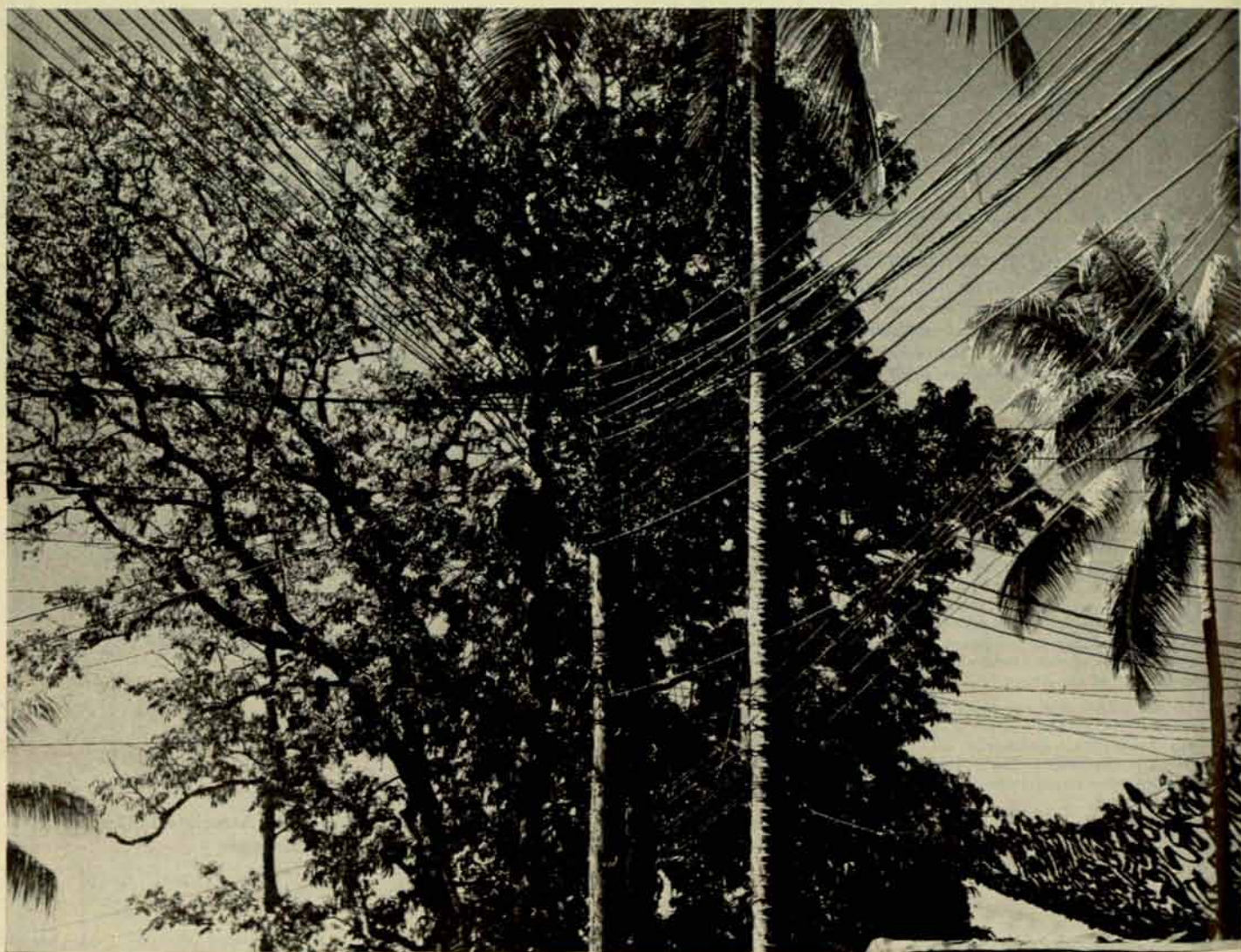
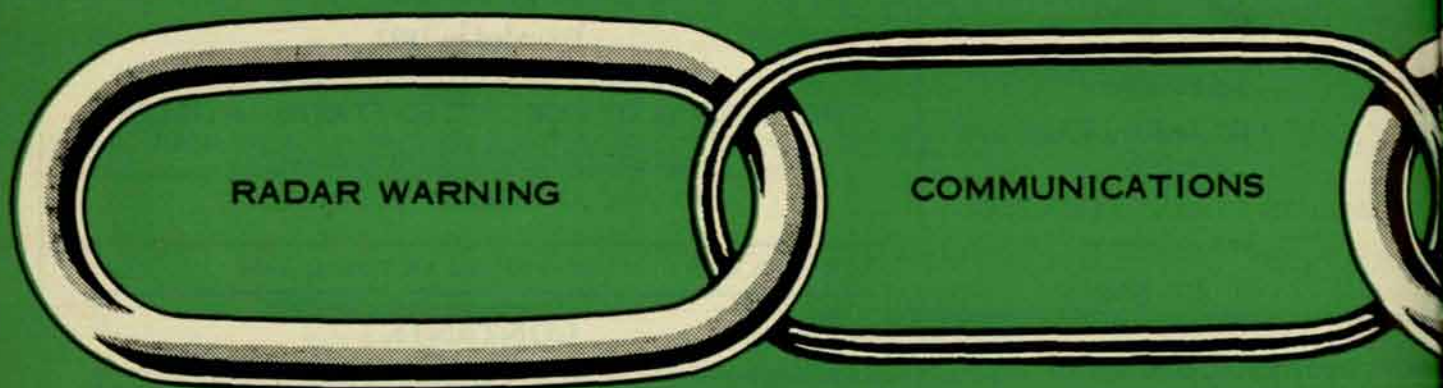
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THE WEAK LINK IN THE

By Major Peter W. Pedrotti, CAC



The main lines of the 16th Signal Battalion leading to the Warfare Office of the 6th Army Headquarters, Finschhafen, New Guinea.

ANTI-AIRCRAFT ARTILLERY CHAIN*

COMPUTERS

GUNS

Communications is, and has been, the most neglected of the vital functions of Antiaircraft Artillery ever since the dawn of military aviation, which gave birth to this precocious stepchild of the Coast Artillery Corps. We have done and are doing everything possible to keep our guns, computers and radar equal to the task of defending our cities, harbors, vital industries and field armies against air assault; and yet, these improved weapons and equipment of today are dependent on a communication system which has seen little or no improvement since the days of the 3" gun, R A Corrector and Sound Locator.

Many factors have worked together to influence this stagnation of our communication system. It is not the intent here to cast blame, for, as in the case of responsibility for Pearl Harbor, we are all to blame; but rather to point out these factors as a guide in arriving at an immediate solution to the problem of a better communication system for Antiaircraft Artillery. We cannot afford to sit back and wish for a push-button AAA defense to jump up overnight and save us in the event of war.

In retrospect, these are some of the principal causes of our present dilemma:

a. No true test of American Antiaircraft Artillery was made prior to 1941. Annual target practices could not be expected to prove the effectiveness of our AAA defense system. Further, the fact that prior to 1938 there were only six understrength AAA regiments scattered from Corregidor to New York, meant that no test of a communications system for a concentrated AAA defense was ever undertaken to prove how badly off we really were, and each of the six regi-

ments went along thinking only in terms of small-scale communications systems.

b. Because of this, no direct thought was ever given to the design of signal equipment for the specific solution of AAA requirements. Prior to World War II, the term "AAAIS" was used very loosely with no direct definition given to it and no clear explanation as to who and what constituted AAAIS or how it was to be carried out. This resulted in our entering the war with everyone in AAA applying his own interpretation and solution to the situation; and FM 44-8, which was finally written in 1944, only tended to legalize the confusion. Perhaps the worst feature of FM 44-8 was that it fixed the responsibility for AAAIS on the AAOR commander yet failed to give him authority over



T/5 Donald B. Hinckley, Armour, South Dakota, AAA searchlight battalion, radio operator, checks communication with a battery headquarters. In the background is a searchlight that produces artificial moonlight.

*The opinions or assertions in this article are the private ones of the author, and are not to be construed as official or reflecting the views of the Army.



Lieutenant Colonel Gerald E. Dubois, Boone, Louisiana, artillery battalion commander, and Captain L. W. Houle, Minneapolis, Minnesota, receiving information for firing mission, from their observer on top of Mount Chiaia, Cassino Area, Italy, 34th Division Sector.

the training or operation of the agencies supplying him his information; i.e., gun unit radar, searchlight radar, and AW Bn. visual OP's. The natural result was that warning going out to the troops was of little value because the AAOR plotters spent most of their time trying to decipher the jumbled data coming to them from people who had no idea of what was expected from them.

c. Worst of all, we built our communication systems upon the premise that AAA defenses were static. This was not a premise based on reasoning so much as it was on circumstance. Our first AAA defenses were established in the Zone of the Interior immediately following Pearl Harbor, and because we had inadequate organic equipment, the Bell Telephone Company came to the rescue and solved our communication problem for us. So, with no one investigating our expenditures of \$3.50 per mile, per pair, for rented telephone service (which amounted to over \$25,000 per month for the AAA defenses of Washington, D. C. alone), we became almost entirely dependent upon commercial agencies for our communications and gave too little heed to what we would do when our allied offensive would carry the requirement for AAA defense beyond the geographic limits of the Bell Telephone System. The answer is summed up in the statement of an AA General who served in the ETO, that "AAA broke down into isolated commands." Though he was not at the time referring to the weakness of our communications, that is exactly what his statement implied. It is therefore the belief of the author that any communications system for AAA must be based upon the worst possible situation, with the natural conclusion that if it will operate in a moving combat army, it will work better for static and semistatic situations—and not inversely.

At the close of the recent war, AAA took a nose dive with the rest of the Armed Forces and by early 1948 was reduced to a strength of active units below that of 1937. This meant that little planning was done to improve the immediate AAA requirements. Now, with AAA on the upswing to meet the threat of an atomic bomb-guided missile invasion which, in all probability, will come unannounced, we find ourselves replacing the Navy as the nation's "First Line of

Defense." It therefore follows that we must get, and keep, an up-to-date communications system which will meet our particular needs.

A proposed plan for communications in AAA units in the combat zone outlined herein has been prepared by the AA and GM Branch, The Artillery School, in conjunction with Army Field Forces Board No. 4 and has been brought to the attention of AAA commanders of units at Fort Bliss. It has been designed to correct the defects of the past within the capabilities and limitations of equipment presently available to AAA, or which can be expected in the very near future; for, as has been pointed out, we cannot afford to stand by and hope that a push-button system is near enough at hand to preclude concern over our present antiquated communications.

Although the plan is generally concerned with the improvement of our communications through a revision of AA T/O&E's with present-day equipment, the plan pays particular attention to answering the following questions: What does AAA require in the way of communications? Whose job is it? And what men and equipment must they have to accomplish the job?

First, AAA needs communications for carrying on the normal functions of command and administration. The responsibility for this is a normal function of command and is no different in AAA than in any other combat arm, except that echelons of AAA comparable to the other arms are generally dispersed over greater areas and therefore require more wire and more powerful radio equipment to span the distances. T/O and E requirements for field wire are based on the following table of average distances between each echelon and its subordinate units:

Brigade to group	20	miles
Group to battalion	15	miles
Battalion to battery	5	miles
Gun battery to section	.1	mile
AW battery to platoon	3	miles
AW platoon to fire unit	.75	mile

The only special item of telephone equipment required for command wire nets is the TP-9, vacuum tube amplified telephone, which permits voice communications over twice the wire distance of the EE-8. This telephone is recommended for T/O and E's as follows:

Brigade	4
Group	3
Battalion	2
Battery (Lettered)	1

The transmission range of radio sets for command nets is based on the maximum expected distance between echelons. Table below shows these distances with the presently known set best suited to meet the requirement:

Army Arty to brigade	—50 miles (SCR-188)
Corps Arty to group	—75 miles (SCR-188)
Div. Arty to AW Bn (SP)	—50 miles (AN/GRC-9)
Brigade to group	—75 miles (SCR-188)
Group to battalion	—50 miles (SCR-188 or AN/GRC-9)
Gun battalion to battery	—25 miles (AN/GRC-9)
AW battalion (MBL) to battery	—25 miles (AN/GRC-9)
AW battalion (SP) to battery	—25 miles (AN/GRC-3-8)

*AW battery to platoon (AM)—25 miles (AN/GRC-9)
 AW battery to platoon (FM)—15 miles (AN/GRC-3 -8)
 AW platoon to fire unit—10 miles (AN/GRC-3 -8)

Although many of the above-mentioned sets do not have the range characteristics necessary, they are the best available and must be carried on our T/O and E's until sets which meet the range requirements with power, packaging, weight and operating characteristics suitable to our needs, have been designed.

Along with the rest of the Armed Forces, AAA must meet the growing need for transmission of records and reports by means other than voice. To meet this need, AAA requires a field teletypewriter such as the AN/PGC-1, which may be operated on either wire or radio. This teletypewriter, which weighs 110 lbs., complete, is recommended in the plan for all AAA units down to and including all battalions. Thought was given to including it in AAA gun batteries to facilitate rapid and accurate transmission of meteorological messages, but because a teletypewriter requires considerable technical training, particularly when operating under field conditions, it could not be justified at that low echelon.

A means of communications which T/O and Es for AAA units have never made adequate provision for, are messengers. Messengers, with vehicles, are recommended as follows:

Brigade	4
Group	3
Battalion	2
Battery	1

Communications for AAAIS reflect the greatest changes which the plan proposes. These changes are the result of an attempt to set forth a clear definition of AAAIS, its mission and responsibilities.

First, what is AAAIS—Antiaircraft Artillery Intelligence Service? It is, or should be, a system by which the firing elements of an AAA defense may receive warning of impending hostile air activity from AAAIS means, when early warning fails, in sufficient time to deliver effective fire. There is not, and never will be, enough manpower in the army to provide 24-hour continuous full manning crews for AAA weapons. It is, therefore, the primary function of AAAIS to permit gun crews to eat, sleep and perform all other necessary personal and military duties not directly connected with firing of their weapons, and still be capable of engaging hostile aircraft, providing the members of the crew remain within prescribed limits of time and distance from their weapon. The plan assumes radars in automatic weapons as well as heavy gun units for providing accurate location of targets. This definition of the mission of AAAIS is further dictated by the fact that a single AAAIS system must, under the present capabilities of aircraft and airborne missiles, provide warning of activity over a wide radius and to as many as one thousand firing elements.

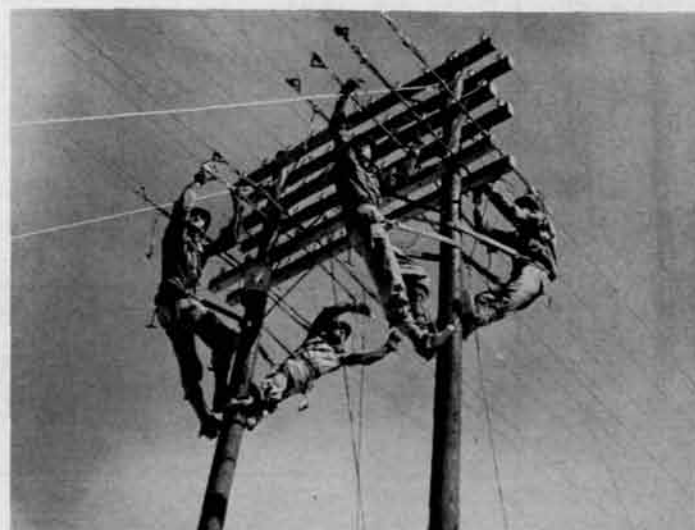
Although AAAIS is dependent upon many sources of information involving many people and employing much and varied equipment, the system resolves itself to a function which is purely communications. It is therefore reasonable to assume that all communications, including equipment

and personnel, which contribute to AAAIS, are part of a single mission, and should be under the control and supervision of one, and only one, officer, the Operations Detachment Commander. As much of the equipment and personnel involved in the mission of AAAIS as is practicable, should be assigned to the Detachment T/O and E under the Detachment commander.

This change in the interpretation of the mission of and responsibility for AAAIS is directed in the proposed plan toward expanding and strengthening the duties of the Anti-aircraft Operations Detachment commander. He is charged, under the present T/O and E 44-7, with the mission of collecting, evaluating and disseminating AAIS. Yet, he has inadequate equipment to receive information at the AAOR from all available sources, to say nothing of the fact that he has no men or equipment to send to the sources of information to insure himself that available data gets to the AAOR and in usable and understandable form. In short, he has been charged with a mission, and not given the men or equipment to carry it out. His present T/O and E does not even provide adequate personnel for 24-hour operation of the AAOR. The plan proposes the addition of five (5) radio teams of five (5) men, each equipped with a mobile, 100-mile range radio set (SCR-399 at present), to the operations detachment. They are dispatched by the operations detachment commander to search radar sets within the AAA defense. There they take data from a radar plotting board and radio it to the AAOR in a manner prescribed by the AAOR commander. In addition to reading and reporting radar data, each team would be equipped to operate as a visual OP when terrain situation obstructs a normal avenue of approach for hostile aircraft from radar. For this operation, each team has a remote control unit for the radio, field wire and binoculars.

Each radio team, of necessity, would transmit data on an independent frequency to the AAOR. This means that the AAOR must have a radio receiver to tune to each frequency.

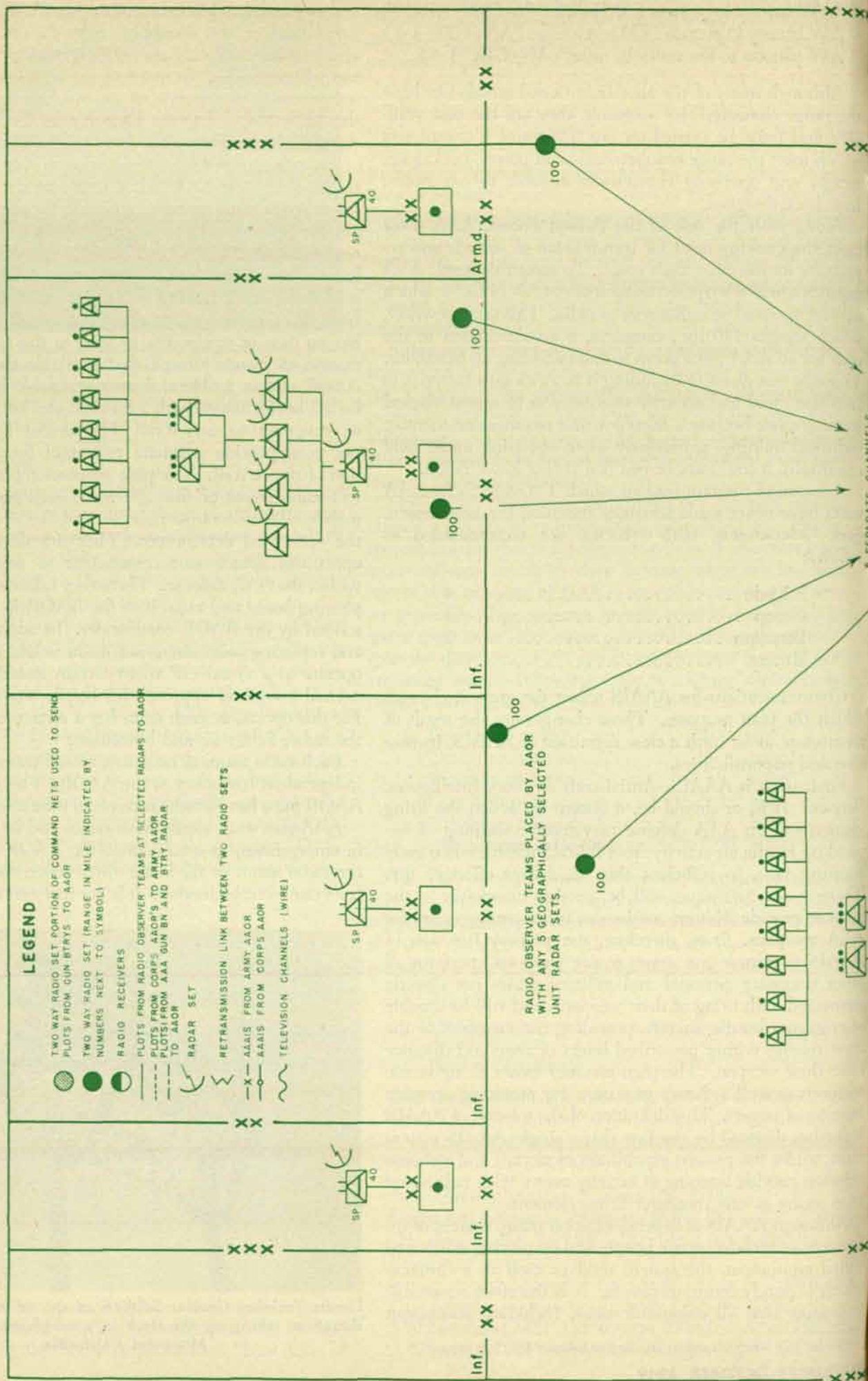
AAA gun units would have radios and be prepared, only in emergencies, to send data to the AAOR to supplement the radio teams or fill in for them when they are moving from one radar to another. It is not foreseen that this would

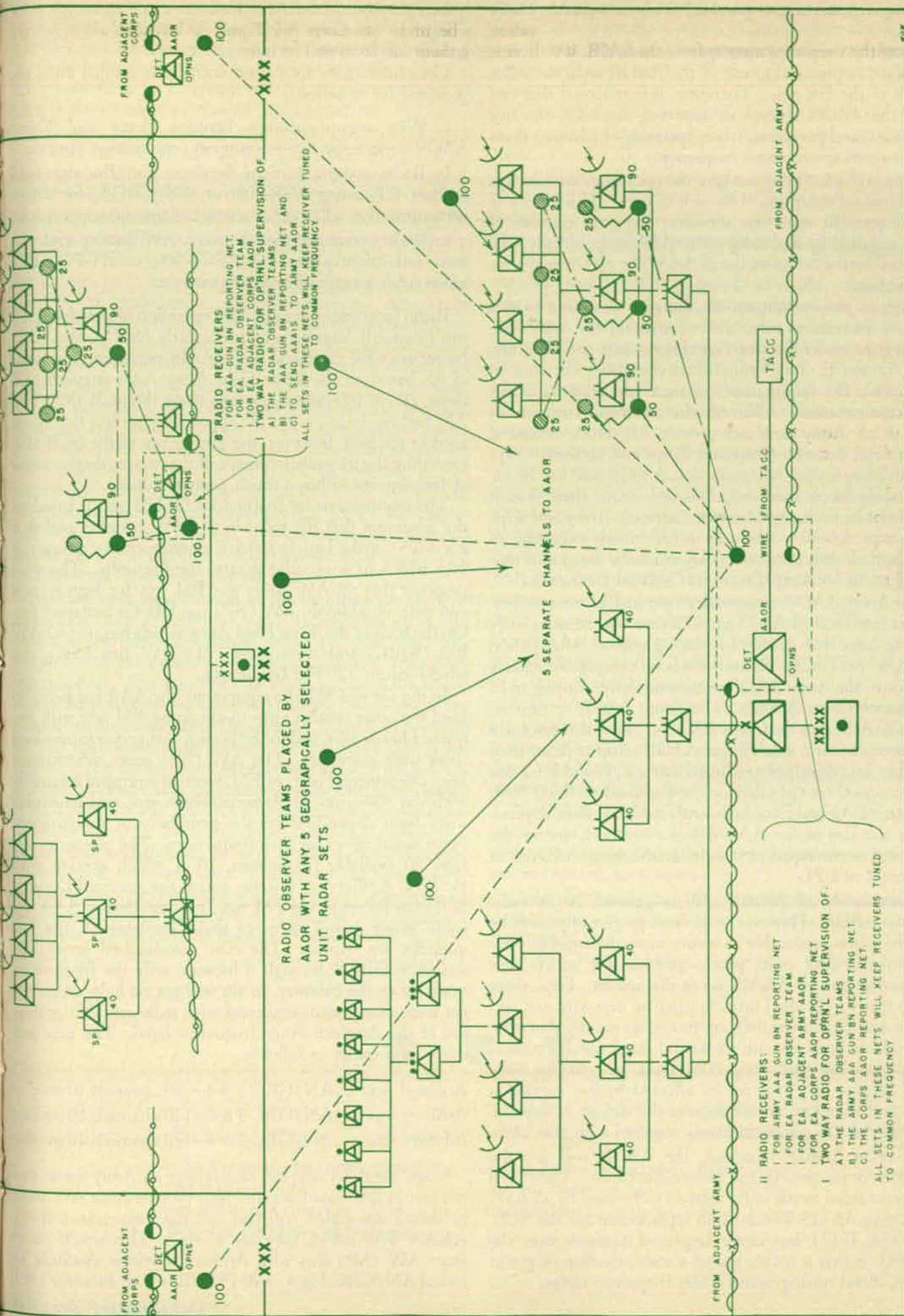


Desert Training Center. Soldiers of the 2d Signal Armored Battalion, taking up the slack in a telephone line near Iron Mountain, California.

*To be used when platoon is attached to Infantry for close support.

AAA RADIO COMMUNICATIONS PLAN AAAS COLLECTION BY AAOR'S





often be required, and is provided solely as a precautionary system.

To control these reporting agencies from the AAOR, it is considered impractical to use in the AAOR separate radios in each of the five nets. Therefore, it is proposed that one set at the AAOR control all reporting agencies—the five radio teams and gun units, when operating—by having them tune receivers to a common frequency.

Many will ask, "Why not give the operations detachment five additional radar sets of its own to use?" This is indeed a valid question until one considers the great number of radars required by and assigned to AAA units already. To add more for the exclusive use of AAAIS would oversaturate the situation.

Since, as pointed out earlier, the plan discussed in this article is intended to solve the requirement for AAA communications under the worst conditions; in a combat army, the T/O and E of the antiaircraft operations detachment must reflect the requirements of men and matériel under those circumstances. Although the command structure of AAA in an Army does not provide for direct command within AAA between Army and Corps and between Corps and Division, it does not mean that AAAIS will not be exchanged between those echelons any more than that it should not be exchanged between adjacent Army and adjacent Corps AAOR's. Only by a continuous exchange of AAAIS in all directions will AAA avoid the dangerous mistake of again breaking down into "isolated commands."

The Army AAOR is normally operated as near as possible to the Tactical Air Control Center and receives early warning from that agency by placing trained AAA liaison officers in the TACC. Since there is no comparable agency in a Corps, the Army AAOR must send early warning to its subordinate Corps AAORs. The Army AAOR in turn receives AAAIS from the Corps AAOR's. All of this results in a requirement for a much larger AAOR setup at Army than at Corps. It is therefore concluded that a T/O and E for one is not practical for the other; so the proposed plan sets forth a separate T/O and E for each, with the belief that, depending on the size of the AAA defense involved, one or the other will serve equally well in establishing AAOR's in the Com Z and ZI.

Dissemination of AAAIS will, in general, be by radio from the AAOR. However, wire lines to gun units will be installed when practicable to insure more dependable communications. AW units pose a problem for which wire communications for AAAIS is not the answer. First, there are too many individual units to place on one wire net; second, in a combat army they are moved so rapidly that wire could seldom keep up with them; and third, present tactical doctrine teaches that since AW units will engage only "seen" targets, they will not be affected by fire restriction orders and therefore do not require the degree of dependability of AAAIS communications required with gun units.

For radio AAAIS broadcast, the AAOR will use the SCR-399 for the present and foreseeable future. The R-174 is recommended as the radio receiver to be used by all units monitoring AAAIS broadcast, in replacement for the SCR-593. The R-174 has many improved features over the SCR-593 in that it makes use of a wide selection of power sources, direct tuning over a wider frequency range.

For purposes of AAAIS, Division AAA units are considered to be under the Corps AAOR and all broadcast concerning them will be informative only.

Communications for liaison with other combat arms are provided for as follows:

a. Wire communications between Army and Corps AAOR's and respective fire support coordination centers.

b. Radio communications between gun Bn and field artillery CP, using SCR-608, or AN/GRC-5, for direct communication when AAA is assigned ground support role.

c. Radio communication between AW battery and platoon and infantry Bn, using SCR-300, or RT-70/GRC, when AAA is assigned close support role.

Radio frequencies required for operation of nets for AAA run into fairly large figures, particularly for FM nets. AM frequencies for command and AAAIS nets come to a total of 85, based on the Type Field Army AAA strength. Of these, 29 are 100-mile range nets using the SCR-399. The AM net requirements are not appreciably greater than were used in the past; however, the greater use of the SCR-399, extending the transmission range of the nets, curbs the re-use of frequencies within a much greater radius.

The requirement for frequencies for FM nets is based on the argument that the radar in the AW batteries makes it necessary for the battery to have an independent frequency over which to send radar data to the fire units. The plan proposes that all AW units use FM sets for battery nets and that, in addition, AW (SP) use FM for battalion net. On the basis of the Type Field Army which has six (6) AW Bns (MBL) and twenty-one (21) AW Bns (SP), this would require 129 FM frequencies.

In the use of FM radio equipment, the AAA has been behind the other combat arms in obtaining FM sets with frequency bands allocated to the branch—when we came along there were none left. The AW (SP) units, which have been the principal users of FM, were all equipped originally with the 500-series, or Armored Force sets, and have ever since been dependent on the generosity of an Armored Force signal officer for their frequencies. The 500-series sets have 80 available frequencies, 10 of which overlap with the Field Artillery's 600-series, and as the Armored Division SOI calls for some 144 FM nets, not considering AAA, we could never expect them to make available all the frequencies we require. The new standardized series FM sets, AN/GRC-3 through 8 increase only the frequencies available to the Infantry, so we will get no help unless we get some of our units equipped with radio sets that operate out of the Armored Force frequency band. The new sets cover frequencies as follows:

Armored sets . . . AN/GRC-3 & 4—80 channels 10 overlap
Artillery sets . . . AN/GRC-5 & 6—120 channels 10 overlap
Infantry sets . . . AN/GRC-7 & 8—170 channels 10 overlap

Since the AAA operates throughout an Army sector and not just in the front lines, the plan proposes that AW units be issued sets which will best suit the requirement of the echelon with which they are serving. This would mean that: AW (SP) Bns with Armored Division Artillery be issued AN/GRC-3 & 4, AW (SP) Bns with Infantry Divi-

sion Artillery be issued AN/GRC-5 & 6, AW (SP) Bns with Corps Artillery be issued AN/GRC-7 & 8, and AW (MBL) Bns with Army Artillery be issued AN/GRC-5 & 6. Only by this or some similar method of issuing FM sets on a ratio basis by battalion will AAA have any hope of getting the required number of frequencies.

Although the frequencies required for operation of AAA nets have been increased by the plan, there is little or no increase in the over-all number of radio sets required. What is more important, the over-all personnel strength of AAA units is reduced by the plan. The enlarging of the operations detachments, addition of teletypewriter operators and maintenance men, and increase of wire crews and messengers have been more than offset by the deletion of AAAIS OP personnel from AW battalions. Also to be noted regarding personnel, is the fact that the plan advocates the reducing to a minimum the number of code CW operators. Since AAA operates, of necessity, almost entirely on "voice," only one code operator, SSN 776, per CW radio set, for emergency operation, is provided on the proposed T/O and E's. The remainder are all radiotelephone operators, SSN 1599. Present T/O's go so far as to require an intermediate speed operator, SSN 740, for operation of FM radios which have no CW operation. Since the normal time requirement for training a code operator, SSN 740, is about 500 hours of code practice, a great saving in valuable training time and equipment will be realized by eliminating CW operators where they are not needed.

Another vital consideration in the requirements of AAA communications is television, and its employment is discussed in the plan. It is freely recognized that radio television is far too expensive in equipment and frequency consumption. The use, then, of television by AAA would be limited to wire transmission capabilities. Since one of the greatest requirements for television in AAA is believed to be well within these capabilities, the insistence that attention be given to development of wire television for AAA is deemed justified. This requirement is the mutual exchange of data between the AAOR's and commensurate Air Force Direction Centers. Since the distance between these installations will, of necessity, be very small, the use of a television system to replace voice channels for the transmission of the volume of information which must pass between these installations is not only feasible and desirable, but necessary if AAA is to cope with the aircraft of today. With this tele-

vision in operation, one word—calling the other man's attention to his television screen when important action breaks—is all that would ever be necessary to indicate a clear and complete picture, but which otherwise might require 5,000 words.

Although the requirement discussed above is the primary consideration in the use of television, the same requirement exists for the interexchange of data between all adjacent AAOR's, and is requested in the plan with the proviso that a means of wire transmission be provided to span the anticipated distances without going to the expense of equipment exceeding the capabilities of combat operations.

Discussed thus far are only a few pressing needs of AAA communications and proposed solutions. As has been pointed out, the solutions are predicated on combat zone situations, since they will always pose the greater problems. Nevertheless, we cannot forget that AAA is the only combat arm of the Army Field Forces which is employed operationally outside of the combat zone. While that fact, on the one hand, allows us to enjoy the benefits of commercial communication systems, our own or captured, it also places a greater burden on AAA communication personnel who must understand these commercial systems as well as military systems, if full benefit of the commercial system, supplemented by army equipment, is to be realized. We must coordinate with the Signal Corps and commercial agencies for advice and assistance. They must understand our problems and requirements and we theirs at all times if their research and development agencies are to provide the answers in time of emergency. We cannot wait until the shooting has started, as we did in the past war, to run to the Signal Corps and Bell Telephone Company for help. The next time, it may be too late.

It is with these thoughts in mind that the communications plan referred to in this article was prepared. If it does nothing else than bring our problems to the attention of those who have the know-how to solve them, we will have accomplished our mission.

Nevertheless, it must be recognized that we are in agreement among ourselves as to what we want and that we are willing to accept the advice and assistance of others in matters of communications.

Only then will we have strengthened the Antiaircraft Artillery chain to where each link will bear up equally under the stress of war.



So far peace has been something elusive. Twice in our own lifetime we had it in our hands. Twice we let it slip away. Now we have it again within our grasp and this time we must be determined not to let it go.—Hon. Louis Johnson, Secretary of Defense.

The Air Defense of the United States

National Guard Troops Provide Large Per Cent of Manpower for Air Defense System

By Lieutenant Colonel Floyd A. Lambert, USAF

Over fifty per cent of the manpower for the Air Defense System of the United States is provided by National Guard antiaircraft, fighter and aircraft control and warning units. These units must be ready upon very short notice to take their places alongside the units of the Regular Services that operate the air defense system in time of peace. The citizen soldier that belongs to one of the National Guard air defense units is prepared not only to report for duty at his station on a few hours' notice but also to perform his assigned duty at once with wartime efficiency. At a time of crisis national security may depend on him and his comrades, as individuals and as trained units, more heavily than on the members of other types of Reserve or National Guard units.



SUMMER TRAINING OF COLORADO NATIONAL GUARD

The entire 86th Ftr Wg, Colorado National Guard was given annual field training this year from 11 to 26 June at Casper AFB, Casper, Wyoming. F-51 Fighters are shown preparing to "Scramble" on an intercept mission under GCI control of the 159th Aircraft Control and Warning Group, Colorado National Guard.

The authorities responsible for the air defense of the United States are confident that the National Guard units in the air defense system will measure up to the especially high standards required of them. They have good reason to do so. The duties of the citizen soldiers volunteering for air defense duty, require them to achieve and maintain, as individuals, and as members of a unit an exceptionally high degree of technical competence. Fortunately, it is also a kind of duty that has a special appeal to qualified citizens. In many cases the air defense duty is directly related to their profession or hobbies as well as is the protection of their own homes.

Many National Guardsmen in air defense units have achieved recognition professionally in the various engineering fields and in many other subjects related to air defense. These are the principal reasons why the spearhead of the air defense system will be made up of manpower of the Regular Services with the National Guard units trained, ready and eager to provide reinforcements upon short notice.

National Guard organization provides the taxpayer the most returns for his tax dollar. Although the National Guardsman is required each year by law to attend only 48 weekly drills of two hours duration and to attend summer camp for two weeks, he often devotes much more time than this. Four-hour drill periods are frequent and many units hold drills on week ends which have a duration of eight hours or more. As soldiering is related to his civilian job, he enjoys his military training.

Their wives cooperate by forming National Guard women's auxiliaries and often plan women's socials for armory drill nights instead of staying at home alone. The most successful organizations usually have an active social program that parallels the military program. It gives the National Guardsmen a feeling of belonging to a huge family. The associations made in National Guard organizations, more often than not, develop into lifelong friendships. A well-known example of this is President Harry S. Truman and the affection and esteem held between him and his old friends with whom he served in the Missouri National Guard.

Not only the taxpayer benefits from the maximum utilization of the National Guard in the air defense system, but the Armed Services as well. Manpower ceilings are imposed by Congress upon each of the Armed Services and if there were no National Guard organizations, the Armed Services would have to reduce the scale of their present functions to the extent necessary to provide the manpower necessary for the air defense system. The air defense planners have made maximum use of the National Guard troops, and even more of them would be utilized were it not necessary for them to remain on their civilian jobs until actually needed. Regular Service personnel are therefore required to operate the installations defending the foremost target areas, with National Guard units in reserve ready to expand the system in depth when needed.

The air defense system in its simplest form is nothing more than an organization of sentinels and gunners. Some of the gunners use fighter aircraft for mobile gun mounts, but they are gunners just the same. The sentinels are equipped with the most modern types of radar equipment, but they are nothing more than sentinels on watch guarding the air approaches to the United States. The sentinel function in the air defense system is performed by Regular Air Force and National Guard Air Force aircraft control and warning groups. Forty per cent are Regular Air Force and sixty per cent NGAF. The National Guard Bureau began the reorganization of these units early in 1949.

The radar operating squadrons were formerly in aggregate strength of about four hundred officers and airmen. In practice, this was found to be too large. Consequently it was decided to reduce the size of each and to activate twelve additional squadrons without changing the total strength. Consolidations were also effected to produce more efficient units and to utilize newer and more advanced types of radar and communication equipment. The Air Force is procuring some advanced types of radar equipment for the National Guard to operate, for which a different type organization is required. The new equipment outclasses the old as jets do conventional aircraft. The twelve States to be offered new NGAF aircraft control and warning squadrons are: Alabama, Arizona, Florida, Maine, Missouri, New Jersey, Oklahoma, South Carolina, Tennessee, Utah, Virginia, and Wisconsin.

The NGAF is authorized a total of 27 fighter and light bombardment groups as compared to 48 for the Regular Air Force. Twenty-four of the NGAF units are fighter groups. In the Regular Air Force, 14 are strategic bomber groups, six are photographic reconnaissance groups, and the remaining 28 groups are for air defense and tactical support of ground and naval forces. From this it can be seen that over fifty per cent of the fighter forces in the air defense system are provided from the NGAF. The fighter groups of the NGAF are being trained in both air defense and tactical support tactics because it is expected that if the United States is attacked by air, the NGAF fighters will see action first in the air defense system and later in support of ground forces. All of the NGAF groups are completely organized and many have reached 100 per cent of their authorized strength. At present each group is equipped with F-51, Mustang fighters, F-47, Thunderbolts, or F-80, Shooting Star jet fighters. The NGAF Fighter



DUMMY DRILL DURING AIRCRAFT TRACKING MISSION

A detachment of the 260th AAA Gun Battalion, D. C. National Guard is shown conducting drill during field training exercises at Camp Pendleton, Virginia Beach, Va. This detachment with the rest of the Battalion later moved to firing positions on the beach and fired upon sleeves towed by B-26 aircraft. One B-26 pilot and his crew from the Delaware National Guard were so impressed with the shooting done by this Battalion that they made a trip out from the airport to personally convey their congratulations. It was on 20 July 1949, the day after seven courses were fired at tow target sleeves traveling between 200 and 300 miles per hour at approximately 10,000 feet altitude. On this occasion the target sleeve was shot down on four out of the seven missions flown.

Groups are all to be eventually converted to jet fighter type aircraft.

The antiaircraft artillery units of the National Guard are not a part of the NGAF but of the National Guard ground forces. Their training is a responsibility of the Regular Army. It is an interesting fact that the authorized strength of the National Guard antiaircraft units is approximately equal to the authorized strength of the National Guard Air Force. The authorized aggregate strength of the fourteen National Guard antiaircraft brigades is 62,487 as compared to 59,290 for the twenty-seven NGAF groups with supporting units. The National Guard antiaircraft units are growing rapidly and it will not be long before they reach one hundred per cent strength. In June 1949 the actual strength of these units was approximately fifty per cent authorized strength. There are only a few antiaircraft units which have not been activated and given Federal recognition. The fourteen National Guard antiaircraft brigades are composed of forty-three antiaircraft groups, which command sixty-four gun battalions and thirty-three automatic weapons battalions. The fourteen brigades are independent units which are available for deployment throughout the United States as part of the air defense system. The National Guard has twenty-seven other automatic weapons battalions but since each of these is an integral part of a National Guard division, they are not included in the figures given.

The principal duty of National Guard units in peacetime is training. The training of NGAF units is supervised by the Regular Air Force. This function is accomplished by

detailing at least one USAF officer and two noncommissioned officers as Regular Air Force instructors with each squadron size unit. The Regular Air Force instructors advise and assist the unit commander in the conduct of training throughout the year. For the annual two weeks' summer camp the Regular Air Force takes charge of the units as though they were in federal service and conducts maneuvers, called field training.

In the case of the aircraft control and warning units, the annual field training will be conducted at Regular Air Force radar stations and air defense control centers. The fighter groups are given their training at air force bases. The major portion of the training is directed toward an Operational Readiness Test (ORT). The ORT, which is supervised by the air inspector, is a four-day maneuver in which actual combat conditions are simulated. Bomber aircraft formations representing enemy bombers attack targets at any hour of the day or night during the test, and the NGAF aircraft control and warning and the fighter units are given a score on their effectiveness in turning back the attackers. The score given is intended to be indicative of the unit's actual combat effectiveness. All Regular Air Force units are being tested in this manner according to the same standards. The score given to them is comparable to the scores given to similar NGAF units. These ORT scores are considered very important, since they are the index as to whether or not the units are ready for combat. The ORT test is not to be used to "skin" a unit, but is to be used constructively for its improvement.

The NGAF fighters will be tested simultaneously by the Regular Air Force with the aircraft control and warning units when the permanent radar installations now being constructed are completed. Actual interceptions will be made under GCI Radar Control and credit will be given for aircraft shot down. The aircraft destroyed will be calculated from hits recorded by gun cameras. In addition to the ORT, the fighter units will demonstrate their skill in flying and gunnery by actually firing at targets on aerial gunnery ranges. The fighter units will fire upon all types of targets and will be given scores according to the actual hits counted. The units receiving the highest gunnery scores will be awarded trophies. This type award creates a competitive spirit among the NGAF units, and, as a result, many additional hours will be spent in preparation for their field training exercises.

The weekly training of the National Guard antiaircraft

units is conducted by Regular Army instructors detailed to duty with the National Guard AA units in essentially the same manner as the regular Air Force provides USAF instructors for NGAF units. The antiaircraft training requires greater use of the imagination, as actual combat conditions are much more difficult to simulate than with Air Force units. In the case of fighter units, the firing may be scored by use of gun cameras, but this system is not practical for antiaircraft firing.

Nothing short of actual firing on aerial targets will suffice for training antiaircraft units. It is necessary for them to go to remote firing ranges to conduct their annual two weeks' field training exercises. It is very desirable for the AA units to take their regular places in the air defense system and take part in the Operational Readiness Tests given to their Air Force counterpart, but it is not possible owing to safety restrictions on antiaircraft firing which must be observed in peacetime.

There is one possibility, however. For purposes of conducting annual field training exercises, it could be assumed that the aerial gunnery ranges are the targets for enemy attacks. The enemy raiders when over these imaginary targets, could release tow targets to be fired upon by the antiaircraft units. In this way they could be integrated into the air defense system and take part in the operational readiness tests given to the NGAF units during their annual field training exercises. This is a problem which it is believed will be worked out probably by the beginning of the next year's field training. The Continental Air Command is already at work on next year's field training. The command has issued instructions that all NGAF fighter wings will be given summer training as complete units. Each fighter wing will perform the functions of an Air Defense division defending an assigned area against air attack. The inclusion of gunnery ranges as gun defended areas is a possibility.

In a future issue an article will appear on the contribution of civil defense to the air defense of the United States. In the event of another war, civil defense organizations will perform important functions in neutralizing the effects of air attacks. Decontamination of large areas may be necessary to partially neutralize the results of chemical, bacterial and radiological attacks. This task, in addition to fire fighting and enforcement of air raid precautions, will be largely a civilian function.



Inspector (Chief) of Antiaircraft

By Lieutenant Colonel Milan G. Weber, CAC

JOURNAL readers are encouraged to comment on the need for a Chief of Branch. Your views are wanted for publication.—Ed.

I think Colonel Case deserves high praise for the excellence of his article, "Inspector Of Antiaircraft."*

I feel that the elimination of all of the duties of the branch chiefs was a backward step. Some of these duties should be retained. The success of our invasions of foreign soil was due largely to our Infantry and Marine officers specializing previously in the study of the necessities of such invasions. Similarly, the ability of the Field Artillery to pinpoint concentrations and to seek out and destroy enemy positions was due to officers who specialized previously in the study of the problems concerned.

Nowhere did the long period of specialization between wars pay larger dividends than in antiaircraft artillery. Surely, there could not have been much wrong in a system of training and development which enabled the antiaircraft artillery to take in its stride the sudden and unpredicted arrival of the V-1's and the jet planes. A system which enabled an antiaircraft artillery commander to guarantee safe passage of an entire army through a bottleneck near Avanches in the face of determined air opposition should not be passed off lightly.

These are *results* of the previous specialization. The system has been proved in the fiery crucible of war. As to the future, I can see nothing but an increasing trend *toward* the necessity for specialization, rather than away from it.

Please don't get me wrong. All of the arguments are not in favor of complete specialization. We cannot work in our little cubbyholes, disregarding completely the rest of the forces. The war also taught us that all of the elements of the Armed Forces must work as a team.

Let's be frank about it. The Coast Artillery Corps was probably guiltiest of all in trying to be apart from the rest of the Army. I think we have learned our lesson, *i.e.*, the best specialist in the world is no good unless his specialty can be fitted into the pattern of things. An excellent forward passer is valueless unless his passing can be fitted into the work of the other ten men of the football team. While I consider that a branch inspector (or chief or whatever else you choose to call him) is necessary, I also believe that that chief will fail in his duties unless he works wholeheartedly toward making his specialty fit harmoniously into the rest of the Army, or better, into the rest of the Armed Forces.

The General Staff of the Army is essentially an agency which makes or recommends decisions. It sets the policies. It does the planning. It is not an operating agency. In most

cases, it acts as an arbiter between the various operating agencies. It does all of this for or in the name of the Chief of Staff.

It follows that the General Staff, to make or recommend proper decisions, should have available to it the best possible advice. Furthermore, this advice should be as directly available as possible. Also, this advice should be, as far as practicable, available to *all* of the General Staff. This reasoning leads to the conclusion that the expert advice should be available as close to the top as may be practicable.

Now then, there are hundreds of agencies which can offer advice—sound and important advice—to the Chief of Staff. It is obviously impossible to place all of these advisors directly under the Chief of Staff. There must be some decentralization. There must be some assembling and coordination of this advice before it reaches the top. However, I hold to the theory (and perhaps I may be accused of being very naïve for holding to it) that, stripped down to its bare essentials, the purpose of the Army is to provide trained and equipped combat troops when and where needed. Everything else is secondary. Therefore, advice on the status and needs of these combat troops should be available directly and instantly from a senior, well-qualified source.

Accordingly, I feel that the place for the senior officer of each combat branch is on the Special Staff. Because he is a specialist, he should not be incorporated into the General Staff, but he should be available to the entire General Staff as well as to the rest of the Special Staff and to the Services. He should be consulted and coordinated with whenever appropriate. His level should be not lower than the Directors of the General Divisions although he may wear two stars instead of three.

Having given you my views on where the senior officer of each combat branch should be placed, the next question is "What should he do?" My own opinion is that he should be a staff officer—nothing more, nothing less. In other words, he should go out and inspect activities of his branch in all subordinate echelons, but he should do so for the Chief of Staff. He might issue orders, but only after the fullest coordination with the General Staff and then only in the name of the Chief. He should command nothing except his own immediate section. (I might digress here to let you know that I am strongly of the opinion that unity of command is essential. I believe that there should *never* be a dual command in any area. Regardless of how technical the work is, we should stick to unit of command. I say this because I am convinced that only by a strict adherence to this principle can true teamwork be attained. A team must have only one leader.)

His duties on the staff would be to insure that the necessities of his branch are given full consideration in every plan, every research or development project, every personnel

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policy, every intelligence directive, every table of organization. In actual practice, he would probably write appropriate paragraphs or appendices of many of these documents. Help like this, coupled with sound recommendations where appropriate, would be most welcome to the General Staff.

Nor do I think that his own staff section should be necessarily small. There must be no sacrifice or compromise insofar as consideration of the needs of the combat branches is concerned. If cuts are to be made, they should be made in some of the relatively worthless twigs and outshoots we have allowed to grow on the organization tree in Washington. If combat branches are really important, let them be well taken care of. Speaking now for antiaircraft alone, if the air needs of a nation are sufficiently important to warrant one-third of the armed forces, surely we should not try to be too skimpy in providing advice and guidance for measures against enemy air forces.

Some may say that a Special Staff officer would have no power and that he should also be a commander. A good Special Staff officer would have more power because, by issuing fully coordinated orders in the name of the Chief of Staff, he would be imposing his will on the *Commanders* of the lower echelons. If the Special Staff officer is also a commander, most of his orders would cut across the estab-

lished chain of command and would be read and respected only by the *branch representative* of the next lower echelon. In every case of a real showdown (and such a situation cannot but lead to many such showdowns), the channel to the subordinate over-all commander would win out.

Also, it may be said that the office of a Special Staff officer would not become a "home" for visiting branch officers in Washington. This will depend entirely upon the staff officer. If he shows that he can get things done in the staff and truly represents his branch in Washington, one of his main problems will be to find time for his own work because much of his time will be spent in conferring with visitors. If he is not efficient and personable and, hence, not a worthy representative of his branch, his office will be void of all visiting firemen, whether he be a commander or not.

These, then, are my personal views. I think that they could well lead to an organization which would be not only acceptable to, but welcomed by, the General Staff. It could be blended harmoniously into the present organization. Although my views differ in some respects from those of Colonel Case, the differences are in detail only, and the end objective is the same. Given a choice of the present organization or the one mentioned in the article, I would buy the latter—lock, stock and barrel.



Annual Coast Artillery Family Reunion

Officers and ladies of the Coast Artillery Corps in Washington, D. C., and vicinity have established a two-year-old tradition that members of the Corps stage an annual social party.

Friday, 18 November, is the date for the 1949 get-together which is scheduled for the Army Navy Country Club.

Present and former members of the Corps who expect to be in the vicinity of Washington on this date and who desire to attend the reunion should notify the office of the *Antiaircraft Journal*.

THE GROUP S2 ORGANIZES THE AAOR

By Major Chester Morrill, Jr., CAC, D.C.N.G.

Even a big-time operator is "on the spot" if the Commanding Officer orders him to set up the AAOR, within the limitations of present and recent T/O&E's of the AAA group. When the group is operating apart from a brigade headquarters as a separate organization, it may need the AAOR, especially for a "combined defense."

"AAOR" is an esoteric concept anyway. It means Anti-aircraft Operations Room. It is operated according to FM 44-8, using equipment called AN/TSA-1, acquired under Changes 1 to T/O&E 44-12 dated 1944 but no longer shown in the 1948 tables. So, what is it?

Air Forces would call our AAOR a small Air Defense Control Center. The members of an Operations Detachment of the AAA Brigade would call it a small Operations Center AN/TTQ-2. The boys in the battalions call it a set of overdeveloped plotting tables.

The mission of any AAOR is both positive and negative. Positively, in combat it may exercise control of fire (not fire control, which is in the battery, at the gun), and it may act as a fire-direction center (for surface gunnery). Negatively, it issues the hold-fire or cease-fire order for the Air Beacon or combined defense system. In all cases, the AAOR provides coordination between and among battalions, and it is an arm of the CO for the purposes of information, liaison, and supervision. It keeps records on a limited basis and checks with Air Forces and Navy as necessary.

Relationships with other staff officers and with organization commanders must be harmonious. S3 figures in the big picture of operations and planning; the executive supervises the whole staff, and the various battalion and unit commanders put all the messages into effect. The group and battalion communications personnel provide the wire and radio nets; without them, you do not operate.

Our Group's AAOR equipment (which should not belong to us, if you abide by the 1948 T/O&E—the latest) consists of four tables (each 4 feet by 4 feet with demountable legs) secured together by catches and bolts to create one board 8 by 8; plus one platform hinged in the middle and guaranteed to support two bodies, or your money back. Incidentally, the whole caboodle weighs almost 600 pounds, including the miscellaneous paraphernalia which are tied to the lower inside parts of the tables and the platform. These odd lots include one clock, various paintbrushes, cans of paint, rolls of acetate, scotch tape, and allied items.

When this collection is ready for shipment it consists of two cases, each weighing over 200 pounds (and each containing two of your tables with trivia attached, packed top against top), plus a third case which is your platform, folded like a rectangular wooden suitcase weighing 134 pounds ready to go. These cases are numbered conveniently and they present a challenge to any two men to carry them,

upstairs or downstairs, awkward and unhandy as such articles are.

There is no good reason for discussing equipment first, as the main pain is the personnel equation. S2 has the task of prying his men loose from the operations and intelligence section of group headquarters battery, of which S2 is not the chief nor is the S2 sergeant the senior NCO.

As to intelligence work, there is no career-guidance sequence within this unit. From corporal plotter to master sergeant intelligence is a jump which is not in the cards for any given trained individual. Having dissected the column of the T/O which applies to the S-3-2 department, the S2 must find ways to train his men or at least tell them about their jobs before they start working. In the interests of proper orientation, the S2 should not put the chest set on a man with no introduction to the job at all.

Finding men who can work on an operations board should not be difficult, but it definitely is. There are only a few people who have ever seen this phenomenon actually in operation. The manuals and the school tell you what it is but never show you one with men working. Certain items which you would say are important are not issued with the equipment, and there are no warnings or directions to tell you what is not issued or how such items are made. (See TM 11-2581.) A situation board, a journal, and a set of azimuth arms to help Mr. Plotter find the point on which to place the target stand, have to be improvised with the guidance of the field manual and the assistance of your friend who has a brain in his head (you ought to have at least one such mentor and instructor). The men may have to make the equipment which they have never seen and which they do not understand. They must be expert telephone operators, craftsmen, and clerks with a flair for quick map-reading and prognosticating which way the targets will travel.

Having found the three cases of equipment and the four to six men to form the nucleus of the AAOR, and assuming you have no Assistant S2 on whom to dump the detail, your next query is space. A small wall tent is much too small, and a concert hall is too big. The happy medium is a part of a building (preferably shared with S3 and his section) with commercial-type electricity if available and an uninterrupted expanse of 20 feet long, 12 feet wide, and 9 feet high.

Assuming you are not now out in left field or in the quadrangle, you can start setting up. Teamwork is necessary here. The first time, with complete maps of a 100-mile area measuring 8 by 8 with grids a la FM 44-8, you need about four hours (20 man-hours) to get "solid." If one of your men has ordnance experience so that bends and kinks in metal parts can be rectified as they appear, and if one of your men has signal experience so that jacks and lines can

be serviced the same minute they go bad, and if one of your men is a draftsman who can make signs and charts, you have indeed hit the jackpot personnelwise, and your big troubles are over. But don't think turnover won't hit you. Good men are hard to find in every section, and you cannot alienate S1 by refusing all his requests for transfer of your enlisted men. He might put your name on the duty roster for Saturday night, or have the CO route complaints and investigations to you. The headquarters battery commander is a man to get along with, for somewhat similar reasons concerning administration, property, and so forth.

Drill regulations and SOP'S for AAOR are not to be found, except in training center literature, which must be

revised and buttressed with new findings. Right face, left face, and to the rear march with chest sets constitute a possible IDR, but more urgent is the need for SOP and SOI which he who runs may read. Never underestimate the power of the uninformed operator who might snafu the detail.

You have conquered all the worlds except the ultimate. All you have to do now is to make the AAOR an asset to the Air Beacon or combined defense system—a pride and joy of the old man, a thing of beauty, and (ideally) an object of art. That requires patience and fortitude, as the old song says, and now you know how the group S2 organizes the AAOR.



There are other factors besides our own armed strength and that of our friends that help maintain the peace today. We have, of course, the United Nations. Not yet as potent—nor as persuasive a factor for peace as military strength, it is nevertheless a body that we cherish and support. We in America have placed great faith in the United Nations. We believe in its ultimate success as an instrument of peace. Already it has proved of great value as a forum for the frank and free discussion of vital world problems. It will be worth a great deal to all people everywhere on the day when all will be ready to park not only their physical but also their psychological weapons outside the door, and come to the council table in a spirit of good will and compromise. But until some such manifestations become crystal clear, however, we in the United States have no alternative as a free nation but to be

“Strong in will,
To strive, to seek, to find, and not to yield.”

Only by adhering to such a code can we keep out of war. Only by keeping awake to reality and preparing accordingly can we reach the ideal goal which in the inception of our republic was set for the Military Establishment by George Washington.—Hon. Louis Johnson, Secretary of Defense.

SHOULD THERE BE A NATIONAL DEFENSE STAFF CORPS?

By Colonel Robert Alan, U.S.A.F.

"Study should be given to the proposition that each year a number of officers of proven experience, knowledge, and judgment be withdrawn from their respective services and given commissions in the Armed Forces." (Gen. Eisenhower's Final Report, 7 February '48.)

As long ago as 1940 Representative Maas introduced a bill "To create a National Defense Staff Corps, and for other purposes." The bill never was reported out of committee. Again in 1941 Representative Maas introduced the same bill, which again met the same fate. Where Mr. Maas conceived the idea remains a mystery. There is no mystery, however, about what the Army thought of the bill—the Army took a dim view of it. The Navy apparently made no comment. The Air Force, at that time still just an organizational gleam in the eye of Hap Arnold, held its peace.

A National Defense Staff Corps, however, is once again interesting and timely. Herbert Hoover has made his recommendations for the revamping of the National Military Establishment, and the Congress is now considering them. Mr. Eberstadt, who headed Mr. Hoover's national security task force, has suggested that the staff of the Joint Chiefs of Staff—the Joint Staff—should be authorized an increase over the present 100 officer limit. Some wit has opined that under the present system the Services are merely "coordinated impediments to each other." These considerations bring to mind the question frequently raised in connection with inter-service difficulties: wouldn't a National Defense Staff Corps solve many problems? Let us consider the question.

To avoid confusion at the outset, it should be made clear that the matter under discussion is the desirability of a special corps of officers, not of a U. S. General Staff. The organizational form within which over-all direction is imparted to the National Military Establishment is not a part of this consideration. However, it is related in that the officers of any National Defense Staff Corps would be the occupants of whatever top level joint berths might exist. For instance, if there were a United States General Staff, the National Defense Staff Corps would certainly man it. Under the present organization the Staff Corps might logically provide all the officers of the Joint Staff and the key officers of the Munitions Board, the National Security Resources Board, the Military Liaison Committee to the Atomic Energy Committee, the Personnel Policies Board, the U. S. Military

Representation to the United Nations, the commanders and key staff officers of the six unified commands, and the key U. S. representatives of a few distinguished international bodies such as the Canadian-U.S. Permanent Joint Board on Defense.

Thus a National Defense Corps is envisaged herein as a group of officers separate from and independent of the Army, Navy and Air Force. Its officers probably would be derived in equal numbers from the three Services, to which they would never return. Surely they would wear a separate uniform, have a separate promotion system and undergo special intensive schooling. Perhaps they would be promoted only after comprehensive examinations, and would alternate periods of duty on the high staffs with periods of duty with the Services. They might be selected originally at about the fifteenth year of service from all officers who elected to compete for vacancies, with selection depending as much on personal attainment and demonstrated ability as on mere academic excellence. It seems reasonable to suppose that the greatest energy, both mental and physical, would be demanded of them. Doubtless they would travel widely to work at every opportunity with varied elements of the Army, Navy and Air Force as well as with the political, economic and civic segments of our national makeup. Of such men, it appears, should the National Defense Staff Corps be composed. It should be truly an elite corps.

With officers of this caliber on the highest staffs many advantages might accrue to the nation. It is said that in a National Defense Staff Corps would repose that judicial viewpoint now so conspicuous by its absence; that gone would be those uncompromising fighters for the Service viewpoint. Other observers advance the thought that with the military budget so large it may make a shambles of the national economy, a National Defense Staff Corps would provide the impartial, analytical assistance needed by the Secretary to determine what the balance should be among land, sea and air elements. Here, they say, would be men who would replace lofty-worded platitudes with substantial accomplishment, who would discard the obsolete, husband the essential and ring in the new. No longer bound by Service loyalties and fears, they would go far in reducing any extravagant use of men, money and skills. Preferential treatment and special advantage for one Service would vanish. Funds for unnecessary or duplicating activities, or for the maintenance of unduly extravagant standards would be cut; and if the funds requested for the over-all military establishment could not be obtained, then with unerring accuracy the Defense Corps ax would fall on the less vital requirements.

Moreover, proponents say, a permanent National Defense Staff Corps would earn the confidence of the Services—which confidence is sometimes lacking in the frequently changing members of the various joint staffs, boards and committees. In addition, they point out that a National Defense Staff Corps would be a small, compact group wherein one man could do the work which now requires three men—one Army, one Navy, one Air.

Furthermore, it is suggested that officers of a National Defense Staff Corps would symbolize real unification. As the very incarnation of three in one, they would appear before committees of Congress, fill the international staff positions, and represent the Services in contacts with other governmental departments, industry, labor and the public. In short, it is alleged, they would drive home the fact that unification was indeed a reality.

Finally and somewhat defensively, it is maintained that such a corps of officers would not, as some aver, draw the antipathy of the Services. In the first place, since every officer of every Service would have an opportunity to compete for assignment to the National Defense Staff Corps, those not selected would hold no resentment toward those who were selected. Secondly, the surpassingly fine performance of the Staff Corps would soon breed the fullest professional esteem. Thirdly, their long hours of duty, intensive training and constant absence from home would appear undesirable to the bulk of officers.

There in a nutshell is the proposed National Defense Staff Corps—together with the arguments generally advanced in its behalf. One should remember at this point that whether the Staff Corps operates in the present National Military Establishment framework, or in a large planning, operating and administering U. S. General Staff, or in some intermediate form of staff is beyond the scope of this discussion. The desirability of the Staff Corps itself is our problem.

Let us proceed now to examine this corps. With respect to personnel, it seems probable that there are not enough first-rate officers available to meet the requirement. Instead of the select group envisaged, the National Defense Corps would probably be composed largely of men even as you and I—normal officers whose greatest attainments would be reliability and a capacity for hard work, rather than that subtle insight and great comprehension so desirable in any select group at the pinnacle of military endeavor.

With respect to Service bias, is it probable that a man who has been thinking service-wise for fifteen years will cease to think that way? It seems far from certain that a National Defense Staff Corps officer would have the impartiality which surmounts Service loyalties and old friendships. With respect to thinking, what would prevent the views of the Staff Corps outlined above from becoming inbred? The same men would serve as the nation's military planners and policymakers for at least fifteen years. They would average about forty years of age upon assignment to the Staff Corps. Although frequent tours of duty with the Services, designed to keep the Staff up to date, might be prescribed, experience indicates that such duty might be avoided by one subterfuge or another, for as men grow older they are—generally speaking—more prone to prefer the relative comforts of a stable staff life to constant travel, inspection, or participation in

field maneuvers, just as they are prone to have less and less liking for additional study, preferring to rely on experience and judgment to carry them through. Limited experience, however, often proves to be a dangerous guide, while judgment frequently errs through lack of up-to-date knowledge and adequate vision.

Perhaps the greatest example of the shortcomings of a group such as a National Defense Staff Corps is to be found in the infamous General Staff Corps of the Prussian Army. It will be recalled that here were men of great intellectual attainment, unsurpassed physical vigor, and superlative professional accomplishment who dedicated their lives to being high staff officers and commanders. Frequently they are held up as models for us to follow. Yet competent students of the military have shown that Von Moltke the Elder at Sedan was victorious not because of his own genius and fine staff, but because of the fatal flaws in French leadership and staff; that with the failure of the Schlieffen Plan to produce a quick victory in 1914, the much-praised German General Staff was thrown into stunned and lasting perplexity, indecision and error; that it was “mechanical and doctrinaire,” rigid, unable to accommodate itself to a fundamental change in the character of warfare. And so it might be with us if we lacked a constant infusion of new thought at the highest level. A National Defense Staff Corps, superlative as it is in concept, might well prove in practice to be quite ordinary, if not defective.

Let us now, however, admit that in this opinion we may be wrong. Let us agree that the National Defense Staff Corps will prove to be everything proponents claim. Is such a corps then desirable? Only, I say, if we are to act in the face of our personal experience, as well as to believe that the lessons of history are fine intellectual exercises for students, but of no value to the practical man. History is lurid with the usurpation of power by such groups as a National Defense Corps. We know that the German General Staff, at the heart of which was the General Staff Corps mentioned above, became the decisive policymaking body in Germany, paying lip-service only to political leaders. In the ancient Mediterranean world it was not uncommon for a closely knit group to establish governmental control by oligarchy or dictator. Such acts gave rise to many of the finest philosophical reflections on the subject of power and those to whom it should be entrusted. Recall the words of much-studied Machiavelli, than whom there have been few closer observers on men, power and government: “. . . we should notice also how easily men are corrupted and become wicked although originally good and well educated”; “. . . republics should make it one of their aims to watch that none of their citizens should be allowed to do harm on the pretense of doing good, and that no one should acquire an influence that would injure instead of promoting liberty.” To Caesar himself Sallust attributes these words, “That all evil examples have their origin in good beginnings.” A National Defense Staff Corps, pure as it might be, would have within itself the potential of dictatorship.

Recall also from your own experience the oft-remarked change in men with much high staff duty. We see a man enter humbly on his high responsibility—self-effacing, aware of his ignorance and uncertain of his competence. A few years later we encounter the same man. After a few words

it is clear that humbleness and awareness of ignorance are gone forever from him. Having read and written many important papers, studied many books and observed the handling of affairs of consequence, he has now become like an eternal spring from which flows all knowledge, strength and guidance. For him, "the bell of decision is always tolling." Rarely visiting troops, he has "forgotten more about field soldiering than you will ever know." There is no longer any reason for him to grope until he finds guidance, no need for him to penetrate into the heart of things to see exactly what is demanded. To him the naked truth stands instantly revealed. He feels infallible when in fact he is frequently just another staff officer unsuited to the office—glib, positive, a deadly enemy of learning and truth.

There in brief is my view of a National Defense Staff Corps officer after a few years with any such distinguished body—a man politically dangerous, militarily unsound, and personally insufferable. Let us thank God that our system is such as to bind these piercing intellects with so many strands of involved procedure and limited authority that they can never hold unquestioned sway, and lead us to ruin.

To me it seems far better to leave things as they are, to carry on guided by "the greatest good of the greatest number, decided by the common sense of most after the consultation of all," than to forget what has happened so often in the past. The worst thing we can do appears to be to establish a National Defense Staff Corps, bemusing ourselves with "It can't happen here."



Antiaircraft Artillery Technical Instruction Teams Soon To Be Formed

The Department of the Army is formulating a plan for the organization of Antiaircraft Artillery Technical Instruction Teams in the immediate future.

These teams of AAA specialists performed duties during World War II which made them indispensable in the training of AAA units throughout the war zones of the world.

As a result of strong requests from field commanders, these teams will once again be organized to assist in the training of Regular Army and civilian component AAA units wherever they are stationed.

The current allotment of authorized officer personnel at the AAA and GM Branch, The Artillery School, is to be increased by fifty-six officers, to provide the necessary personnel for these teams.

A special 26-week course of instruction will be established at Fort Bliss for the qualification of officers selected for these teams. It is expected that the first course will begin on or about 31 October. The objective of the course will be to qualify officers to conduct demonstrations and instruction in current and anticipated tactics, and in the more efficient

use of matériel and communication equipment, to include developments in these fields.

It is expected that many, if not all, of the necessary officer personnel are presently on duty at Fort Bliss and that a considerable number of the instructor personnel at the AAA & GM School will be qualified for temporary duty with one of these teams. However, school instructors are not expected to be assigned to teams for more than two periods of fourteen weeks each during one year.

Preparation of schedules for the employment of the instruction teams is to be handled by the Chief of Army Field Forces who will dispatch the teams within the Zone of the Interior and to overseas theaters.

A total of fifteen teams are to be formed and they are to be organized as follows:

Eight gun teams, each comprising one radar specialist and two gunnery and matériel specialists; six automatic weapons teams, each consisting of one radar specialist, one communication specialist, and three gunnery and matériel specialists; one AAAIS-AAOR team consisting of two communication specialists, one for AAAIS and one for AAOR.

Rockets As Antiflak Weapons

By Colonel Earl W. Thomson, CAC-Res.

In the early years of the war in the European theater our Strategic Air Forces did not believe it efficient to attack German heavy flak positions with a view toward decreasing their fire prior to the transit of the main bombing forces. In those days the bomber losses due to enemy fighter activity were greater than those losses incurred from flak. However, after D-Day the Tactical Air Forces began to attack flak positions, particularly those on flak towers. In the Pacific in 1945, coordinated attacks on flak positions by dive or low-level bombing, strafing, and rocketing were being used as a method of decreasing flak losses to the vulnerable heavy bombers.

In the summer of 1945, the Flak Intelligence Section of the Joint Intelligence Center, Pacific Ocean Areas, under the editorship of Major William Workman, CAC, published a memorandum on Antiflak Action. In the preparation of this, Major Workman consulted the headquarters of Army, Navy and Marine Air Forces, and summarized not only what was being done, but also what could be done to further reduce the losses from flak. The classification of this memorandum was secret, as it contained much material on methods, airplanes to be used, and weapons, in order to secure a maximum fire power on the flak positions at the proper time. One of the weapons discussed was the aircraft rocket, which had been developed by American scientists and services during the war. Major Workman recommended extensive use of aircraft rockets.

The following excerpts from *Rockets, Guns and Targets*,

edited by John E. Burchard, relate the effectiveness of air rockets in silencing antiaircraft batteries:

"The devastating effect of *rockets against the antiaircraft batteries* and upper decks of one (Japanese) naval auxiliary was well demonstrated. This particular vessel, just prior to this attack, had shot down one medium bomber, killed a man in another, and fired with such accuracy at other bombers that none of their bombs hit the target, which was at anchor. Two other aircraft attacked this vessel fore and aft with sixteen rockets of which thirteen were hits. . . . Small fires were started on deck, upper works were blown about, and *no more AA was observed from that vessel on that day or the succeeding day* . . .

"The USS *Hornet* reporting the first operation in which she sent out rocket-firing F6F's, stated that the rockets proved to be a very effective weapon against a variety of targets, *but principally ships and AA positions*. A task group reported its conclusion that *the rocket fighter is the best aerial weapon against land batteries and AA guns*."

It is evident that the use of aircraft rockets, against flak positions in antiflak action, is efficient and deadly. The conclusions are therefore dual:

(1) Air Force—Standing Operating Procedure in anti-flak action must include the use of aircraft rockets, just prior to attacks by bombers.

(2) Antiaircraft Artillery—Plan a defense, both active and passive, against the use of rockets fired by low-flying fighter bombers.



New Rocket Beats V-2

Navy and civilian scientists have developed and flown a solid propellant booster rocket with a ground level thrust far greater than that of the German V-2, according to Dr. Ralph E. Gibson, director of the applied physics laboratory of Johns Hopkins University. Dr. Gibson said that the new rocket was designed for use with long-range guided missiles.

Instead of being used directly to propel explosive warheads through the skies, Dr. Gibson explained that the new rocket would be employed in launching supermissiles rely-

ing on the new ram jet engine of the Navy for a propulsion force.

The Navy engine, which has no moving parts, must be boosted to speeds close to that of sound before it will operate efficiently and after that the faster it travels the more efficient it becomes. Missiles and test vehicles powered by ram-jet engines have attained speeds of 2,000 miles per hour in Navy tests.

Selection of AAA Target-Practice Ranges

By Major K. C. Coe, CAC

General: This article summarizes the essential considerations to be given the selection of an AAA Target-Practice Range. The remarks contained herein are based upon past experience and developed theory.

Careful consideration must be given to the following elements which affect the selection of an AAA target-practice range site:

- a. Accessibility.
- b. Terrain.
- c. Proximity of other ground installations, air lanes and water bodies.
- d. Land area requirements.
- e. Tow-craft flight patterns.
- f. Firing point characteristics.
- g. Acquisition of land.

Each of the above elements is discussed in succeeding paragraphs.

Accessibility. The site selected must be accessible, with the shortest supply line possible. When tracked vehicles equipped with iron lugs are involved, non-hard-surfaced roads must be available.

Terrain. The firing line must be situated on level ground in such a position that mountains, high hills or peaks do not interfere with radar operation or with tow-craft flight patterns for the courses to be flown. Mountains near the firing line or along the course of the target may also result in overcasts and lack of target contrast. Distant points on high, discernible promontories are desirable as orienting or datum points.

When a firing line or range is situated on a shore line or near a sizable body of water, the presence of fog will often be a major determining factor in site selection or conduct of fire. A study of the average hours of fog (or clouds) per day must be made for the area under consideration to determine whether sufficient fog-free hours will be available for the conduct of the target practice.

Proximity of Other Ground Installations, Air Lanes and Water Bodies

The primary consideration to be given military installations concerns the proximity of other firing points. It is particularly essential that firing points be sited so that tow-craft flight patterns do not enter the field of fire of any other firing point or interfere with each other under conditions that defy reasonable coordinating practices. It is equally essential

that impact areas do not interfere with the occupation or use of other range firing points.

The proximity of air carrier routes, civil or military installations, road nets, public works, populated areas, and availability of land as well ballistic corrections for local conditions and the necessary safety factors may reduce the usable safe field of fire appreciably. When possible, testing laboratories or proving grounds using radar frequencies should especially be avoided to preclude the necessity for radar silence periods that might reduce firing and training time.

Aircraft towing at low altitudes or for automatic weapons must not be required to fly over populated areas; commercial or military installations such as factories, power lines, camp sites and forts; over airports or through air carrier routes (air corridors). Towing aircraft may cross air carrier routes at high altitudes, provided authority is granted for specific altitudes by the Civil Aeronautics Authority (CAA).

Wherever possible AAA ranges should be sited so that fields of fire do not enter an air carrier route. When an established air carrier route crosses a range, the entire range may be declared a *Controlled Firing Area* greatly increasing the problems of safety and fire control. It is anticipated that Special Regulations 385-310-1 and Air Force Regulations will be revised to include regulations for controlled firing areas. In the vicinity of airports or other facilities, where activity in navigable air spaces is frequent and continuous, it will be a distinct advantage if the air space above an AAA range is declared a *Danger Area*. The procedure relative to such a declaration may be determined through contact with the district engineer, local CAA Board or the Army headquarters concerned. It is pointed out that in the event firing is temporary, intermittent or occasional and can be conducted without restricting air navigation, Danger Areas in air space over AAA ranges will not usually be declared.

The extension of impact areas over water is sometimes necessary. In these areas, established sea lanes or the presence of pleasure and fishing craft offshore will complicate the problem of safety. Each situation will require study in order to determine whether fire can be conducted efficiently without restricting navigation. A seacoast type radar, AN/MPG-1, will be required for surveillance. When fire cannot be conducted without restricting navigation, the Secretary of the Army may prescribe regulations for the use and navigation of waters endangered or likely to be endangered by firing or target practices. Such regulations usually declare the required water area a *Danger Zone* or *Area* and may do so

either permanently or for the period fire is to be conducted. The declaration of a Danger Zone will benefit the organization commander greatly in that the aid of the U.S. Coast Guard can then be enlisted to exclude marine craft. Reference is made to Paragraph 8, SR 385-310-1 in connection with water traffic.

Land Area Requirements

Land Area requirements depend to a great extent upon the following factors:

- The field of fire.
- Arrangement of firing points.
- Safety.
- Ballistic corrections for local conditions.
- Number of firing points.
- Bivouacs and other facilities.

The safety limitations of Paragraphs 15 and 19, SR 385-310-1, and the normal diversity of target courses in slant range and altitude make it impracticable or unsafe to fire upon towed targets through arcs of 6400 mils. A normal impact area will include a portion of the 3200 mils arc on one side of the baseline. The minimum usable arc, or zone of fire, must permit the required number of rounds per crossing course required by current target practice doctrine to be fired.

The maximum usable arc approaches 3200 mils, however, safety regulations and matériel limitations take effect near the extremes of such an arc, making its full use undesirable. A desirable compromise between the minimum field of fire required and the maximum usable safe field of fire for each cannon should include an arc of 1600 to 2000 mils with the bisector of the arc perpendicular to the base line. The effect that other ground installations within impact range may have upon a usable safe field of fire is discussed in a preceding paragraph.

There are two satisfactory arrangements of firing lines in the same vicinity that permit simple coordinating procedures and offer the least conflict. In the first arrangement, firing lines are sited in prolongation with impact areas on the same side of the base line. Several organizations may then fire at each crossing course flown in a "race track" or "cross and turn" pattern. Incoming courses must be flown separately for each firing point. In the second installation envisaged, firing lines are placed "back to back" with fields of fire in opposite directions. In this arrangement incoming courses may be towed by the same aircraft in a pattern similar to Figure 2. The approximate minimum distance between firing lines must be about 200 yards to allow installation of organizational equipment necessary to the target practice.

It is also possible to site firing points facing each other with slightly overlapping impact areas. However, to eliminate conflicts between impact areas and limitations on the maximum fuze range at which courses may be flown, firing lines so situated must be a minimum distance apart equal to the maximum ground impact range (corrected for differential effects and including the prescribed range safety factor) of the largest caliber weapon to be fired at one point plus three-fourths of the corrected maximum ground impact range of the largest caliber weapon to be fired at the opposing firing point. (See Figure 3.)

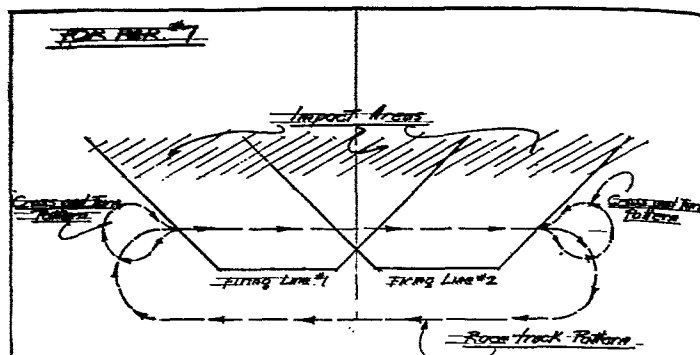


FIGURE 1
FIRING LINES IN PROLONGATION.

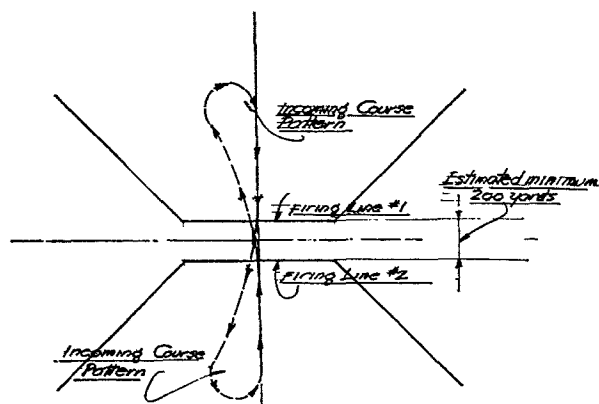


FIGURE 2
FIRING LINES BACK TO BACK.

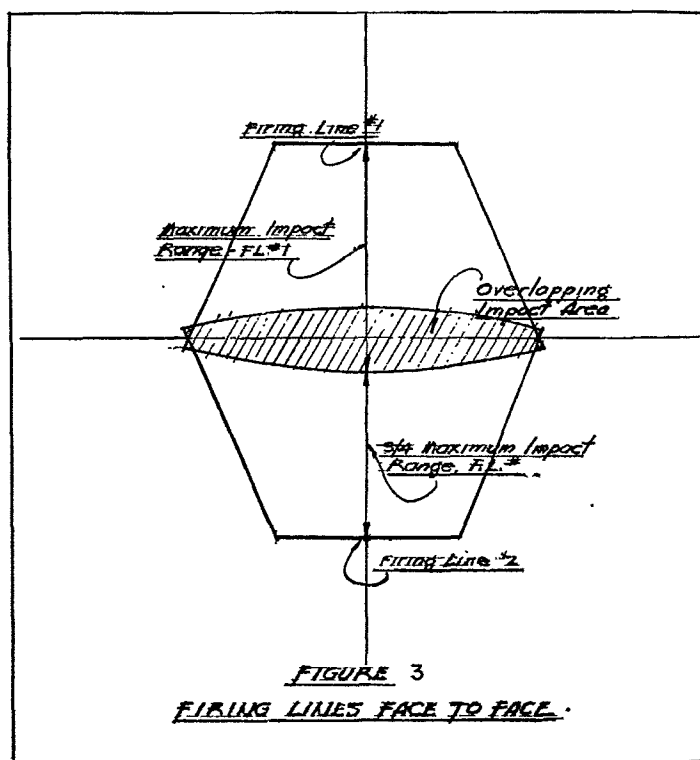


FIGURE 3
FIRING LINES FACE TO FACE.

Table II, SR 380-310-1 prescribes that a danger area be extended 1,000 yards on each side of limits of fire and 1,000 yards in extension of the maximum ground impact range indicated in the firing table appropriate to the AAA weapon. Maximum ground impact range must be corrected for local ballistic conditions. In connection with the determination

of lateral safety zones, 90mm shell fragments have been known to strike nearly 4,000 yards at right angles to the line of site under certain conditions involving high angles of elevation, cross winds and the use of VT fuzes. One hundred twenty millimeter shell fragments have been known to spread nearly five miles. It is therefore recommended that firing limits be fixed to afford the maximum possible clearance (not less than 1,000 yards) between horizontal angular limits of fire and nearby populated areas.

The differential effects that change horizontal range must be considered in determining the *corrected* approximate maximum ground impact range. In order of importance, the differential effects to be considered are those caused by air density changes due to increases in height of site above sea level, tail winds, muzzle velocity and powder temperatures. As an example of the importance of these corrections, a 20% decrease in density increases 120mm ground impact range 3,400 yards. Differential effects from other causes are of negligible importance. The wind and density characteristics peculiar to the locale and season should be verified by records obtainable from civil or military weather stations if possible.

The land area required in the impact area and danger area may be determined for any given AAA cannon firing point by an analysis (SR 385-310-1) expanded to include the entire firing line and applied to an appropriate map or overlay. The center portion of the danger area boundary farthest from the firing line will fall along a line equal and parallel to the firing line at a distance equal to the *corrected approximate maximum ground impact range*, plus 1,000 yards. Arcs centered at the right and left cannon positions connect this portion of the impact area boundary with the right and left outer limits of the danger area.

The number of battalion firing points desired is dependent upon the number of organizations to conduct target practice in a given period and the time required for one organization to fire. The number and arrangement of firing points affect the amount of land area required.

Adequate space for bivouac areas, camp sites and any observation posts that may be necessary must be considered in the land procurement project.

Flight Patterns

Careful study must be made of the possible desirable flight patterns before selection and installation of firing points. Preceding paragraphs discuss generally the effect that adjacent firing areas, populated areas, air carrier routes, arrangements of firing lines and terrain may have upon flight patterns.

Prevailing winds normal to the courses to be flown may force tow-craft to fly at an angle which increases the difficulty of maintaining the target on its course. In the event that strong prevailing winds cannot be avoided, firing lines should be sited so that the largest number of courses to be flown are least affected. Usually, crossing courses are more numerous than incoming courses. Tow target pilots should be consulted as to their desire in this matter.

The approximate turn-around areas required for towed targets increase generally with the indicated altitudes and may be increased or shifted by prevailing winds. Approximate turning radii for B-26 or B-29 tow-aircraft vary from

2,200 yards at low indicated altitudes to 6,000 yards at an indicated altitude of 30,000 feet. Local tests should be made to determine flight pattern characteristics.

An additional feature to be considered is that a tow-aircraft does not usually start its "turn-around" until the target has left the field of fire. Targets may be towed from two to ten thousand feet behind tow-aircraft. This places the "turn-around" starting point a considerable distance outside the field of fire, depending upon the length of the tow-cable. In the interest of safety, the start of a "turn-around" is usually made toward the firing point.

Firing Point Characteristics

Firing lines should be located on level ground. An adequate field of fire, free of all obstruction to flight patterns as well as radar and visual observation, is a prime requisite.

Firing lines should generally face north so that glare from morning and evening sun can be avoided.

Base end stations should extend from 5,000 to 10,000 yards from the firing line, depending upon the use of an O₃ station. It is pointed out that the use of multilateral spotting is a training center practice for the purpose of obtaining both visual and camera records. Unilateral spotting with radar is the present doctrine for fire adjustment.

Length of firing line depends upon the weapon being fired. In automatic weapons battalions, the usual arrangement is to emplace all firing weapons twenty-five to thirty yards apart. Though the twenty-five-yard interval is satisfactory, the safe field of fire increases with the distance between weapons and mutual interference between weapons decreases. The use of a thirty-yard interval is therefore recommended where space permits. Usually a thirty-yard interval between weapons, an automatic weapons battalion will require a minimum of 1,950 yards of firing line. An interval of twenty-five to thirty yards is satisfactory between 90mm guns. Here again, mutual interference between guns decreases as the interval increases. A 90mm battalion with guns at thirty-yard intervals requires a minimum firing line of 510 yards. If intervals greater than thirty yards are left between batteries, the firing line length increases correspondingly. It is recommended that 120mm guns be spaced thirty to thirty-five yards apart. A firing line for a 120mm battalion with guns spaced at thirty-five yards, with no greater interval between batteries, will require 595 yards. All firing lines should be cleared of debris or other obstructions. A radar line should be established and cleared approximately fifty yards in rear of gun firing line, or as near as radar operational limitations permit. Road nets must be established to allow free access to and from all positions. Loose soil on firing lines must be treated to eliminate dust clouds due to concussion.

For guns, battery directing points and at least two datum points, not less than thirty degrees apart, should be established by survey.

Acquisition of Land

The acquisition of land is the responsibility of the Chief of Engineers. Directly under the Chief of Engineers is the Division Engineer, then the District Engineer. The actual mechanics of acquisition is delegated to the District Engineer of the district in which the particular land is situated. The request, covering all facts bearing on the problem, should be submitted to the Army Commander.



VS-300, with Igor Sikorsky at the controls, was first successful helicopter in Western Hemisphere.

Military Future Of The Helicopter^{*}

By Igor I. Sikorsky

Helicopters in general may be regarded as vehicles of transportation having the least number of limitations with respect to their uses. A ship or boat is limited to water, an automobile to a reasonable road and even the tank requires certain types of surface and is not able to traverse a real forest, steep hills, deep swamps, deep snow and a number of other surfaces. Finally, the airplane is free in the air but calls for huge well-surfaced fields for its take-offs and landings. Furthermore, the airplane is excellent and unparalleled with respect to high speed but it cannot be operated below a certain minimum speed which, in most modern aircraft, is usually in excess of 100 mph. Then, too, the airplane is limited in its ability to operate in close

proximity to the earth, particularly in mountainous country.

The helicopter, on the other hand, is totally free from every limitation of this nature. It can be operated from any small space where there is room enough to store the aircraft. It can fly as low and as slow as it may be desired and it can actually follow any contour of ground over which it flies. It can stop in the air at any altitude at any time. Finally, by direct landing, or should this be impossible, by the use of hoisting slings, helicopters can contact and deliver or remove personnel and cargoes from virtually any spot on the surface of ground or water, regardless of practically any possible obstacles.

These characteristics will ascertain the usefulness of the helicopter for a vast variety of important military missions.

^{*}Reprinted with permission from the August issue *Marine Corps Gazette*.

It would therefore be right to state that, in evaluating the characteristics of the helicopter, we would seldom have to compare it with the efficiency or lifting capacity of other vehicles since most of the missions undertaken by the helicopter would cover such cases wherein no other vehicle would be able to render any service whatsoever.

In line with this discussion it is desirable to review, briefly, the performances that could be expected from helicopters in the near future.

(1) *Speed*—I believe that the most practical types of helicopters will remain in the reasonably slow category of, say, between 100 and 150 mph operating speed. In special cases where much greater speed would be necessary, we may expect the appearance of the so-called "convertible helicopter"; i.e., a craft that takes off as a direct-lift and, while underway in the air, becomes in one way or another transformed into a plane. Such an aircraft is entirely feasible and velocities up to 300 or 400 mph or even more can be expected from it. However, it will always remain considerably less efficient than either the pure helicopter or the pure airplane and therefore its use will probably be limited to special cases where speed, combined with helicopter characteristics, is an absolute necessity.

(2) *Size*—I believe that helicopters with a gross weight of 50,000 lbs. and a lifting capacity of between 30 and 50 per cent of this figure can be designed and constructed in the near future. The higher of these two figures could be obtained with jet-driven helicopters that may be expected to have a structural weight of about one-half or even less of their gross weight. However, jet-driven helicopters will, in all probability, be practical only for very short ranges of, say, up to a 50-mile round trip. For much longer ranges, conventional helicopters, with engines or turbines supplying power which is transmitted by adequate reduction gears to the rotors, will be more efficient. As time goes on, still larger helicopters could be produced and it is too early at present to determine any limit in size.

(3) *Range*—With respect to flight range we can visualize, roughly, three cases. For shortest distances, the jet-driven helicopter may have its advantages, although the conventional engine-driven helicopter will undoubtedly also be used extensively. Further intensive experimentation is still necessary to determine the practical value of the jet-driven machines. For medium ranges of from 100 up to 1000 miles total distance and eventually probably up to 2000 miles, the conventional engine-driven helicopter will prove best. For much longer ranges, such as distant rescue missions, it is possible to visualize some assistance being given the helicopter. This may be in the form of refueling in the air, refueling by picking up fuel supplies dropped by parachutes from fixed-wing aircraft or, finally, by towing the helicopter. A well designed, power-driven helicopter may be towed quite satisfactorily, in which case its engine would be stopped and the rotors autorotating. In such manner the craft may be brought to its destination, accomplish its mission, and then it may either return under its own power, having saved, roughly, half the distance of flight, or it may re-establish contact with the towing plane and be towed back. Further study is needed to determine whether the jet-driven helicopter would prove satisfactory for towing

as the jets at the end of the rotors would offer substantial resistance which may, to some extent, impair their autorotation characteristics.

Taking these facts into consideration, it will be possible to outline briefly some of the military missions which the helicopter could accomplish.

(a) The first job of the helicopter would be for communication purposes, covering short and medium distances, under the greatest possible variety of conditions. This would include communicating between airports and various places where men, equipment or cargoes would have to be transferred. It would include all types of transportation and messenger services which, as a rule, would be much quicker than by any other means and which frequently may be the only means of traveling quickly between any two points.

(b) Helicopters would undoubtedly prove very valuable for observation and fire control under a great variety of conditions. They will eventually become necessary equipment for every artillery unit, every motorized division, every groups of tanks, etc. In such cases, helicopters would always remain with the unit they would serve and hence be available always. The question of their vulnerability remains open as yet. While their slow speed is a disadvantage, yet their ability to follow closely the ground contour, ability to move in behind hills or groups of trees, ability to change rapidly the direction of flight and to descend vertically will, in all probability, compensate for that disadvantage and cause them to become a thoroughly practical instrument for such work.

(c) While the helicopters are still young, yet their outstanding services as an instrument of rescue and emergency evacuation have already been proved without a trace of doubt. It can be rightfully stated that, for such missions, helicopters would, in most cases, prove to be the most convenient and most comfortable for the injured and, in many cases, would prove to be the only craft capable of accomplishing a rescue.

(d) One of the most important helicopter uses in the future would be for landing operations. In most cases it would obviously be preferable to use helicopters of medium or large size that could carry a substantial number of men with their equipment, or carry pieces of artillery, motorized vehicles, tanks, and other military loads. In the present era of atomic bombs, helicopters may be particularly valuable in that they would be able to carry out such operations with vessels moving at normal speed far out at sea, thus avoiding the dangerous concentration of vessels and the need of their being stationary. A further great advantage would be the possibility of landing men and equipment, not on a few appropriate beaches which, as a rule, would be watched and protected, but inside the country, always choosing the exact time and spot and therefore having the benefit of initiative and surprise.

In concluding, I must stress the fact that the above examples outline only a small part of helicopter potentialities. As time progresses and further techniques of operation become developed, parallel to the improvement of the helicopter itself, a large number of other missions which the helicopter would be able to accomplish, will become established.

HONOR ROLL

****88th Antiaircraft Airborne Battalion**

16 April 1949—Lt. Col. Page E. Smith

****11th Antiaircraft AW Battalion (SP)**

12 May 1949—Lt. Col. Roy A. Tate

****228th Antiaircraft Artillery Group**

8 July 1949—Colonel David W. Bethea, Jr., S.C.N.G.

****107th Antiaircraft Artillery AW Battalion (M)**

8 July 1949—Lt. Col. Thomas H. Pope, Jr., S.C.N.G.

****260th Antiaircraft Artillery Gun Battalion (M)**

28 July 1949—Lt. Col. Given W. Cleek, D.C.N.G.

****305th Antiaircraft Artillery Group**

25 August 1949—Colonel John S. Mayer, N.Y.O.R.C.

***713th Antiaircraft Artillery Gun Battalion (M)**

8 July 1949—Major W. B. Pollard, Jr., S.C.N.G.

678th Antiaircraft Artillery AW Battalion (M)

8 July 1949—Lt. Col. M. T. Sullivan, S.C.N.G.

THE LIST GROWS!

First Organized Reserve Corps unit to reach the 100% mark is the 305th AAA Group of New York City.

Read the criteria printed below and join the Honor Roll of Antiaircraft Journal supporters.

1. To qualify for a listing on the JOURNAL Honor Roll, units must submit the names of subscribers and total number of officers assigned to the unit on date of application.
2. Battalions with 80% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than 20 officers.
3. Brigades and groups with 90% or more subscribers among the officers assigned to the unit are eligible for listing, provided that the unit consists of not less than seven officers.
4. Units will remain on the Honor Roll for one year even though they fall below the 80% requirement during the year.
5. Lists of subscribers and statement of number of as-

signed officers must be submitted annually by units in order to remain on the Honor Roll.

6. Battalions with 90% of officers subscribing will qualify for one star placed after the unit's designation on the Honor Roll. Battalions with 100% subscribers will qualify for two stars.
7. Groups and brigades cannot qualify for one star but may qualify for two stars by having 100% subscribers.

(Units of all components will be listed together in the order of their percentages, beginning with the unit with the highest percentage.)

(Each unit listed on the Honor Roll will be given a one-year complimentary subscription to the JOURNAL.)

(Name of unit commander and date unit initially qualified for the Honor Roll will be listed with the designation of the unit.)

The Light That Did Not Fail

By Lieutenant Colonel John T. Snodgrass, GSC (CAC)

Clearly demonstrating the inimitable versatility of the Coast Artillery Corps, this article is a challenge to our readers to "Top This One"—Let the JOURNAL publish your unusual solution in 1,000 words or less.—Ed.

Relax. There is nothing controversial in this article. It contains no instructional material to claim your attention and is unconcerned with current professional matters on which an alert officer should keep himself posted. No combat statistics are included and nothing is offered in the way of advice or example to assist young lieutenants in shaping their careers.

On the other hand, inasmuch as the New York city subway would appear to be just about the last place to expect to find an antiaircraft artillery searchlight, this report of moving a section through the underground tube into position aboard a subway train, might prove of interest to those artillerymen still possessed of some residual nostalgia for the old long horns and wash tubs.

Also, now that the patent rights for the manufacture of artificial moonbeams have been sold to the engineers, it is only fitting that the account of a little known, and heretofore unpublicized, incident should be recorded before this most brilliant piece of antiaircraft equipment fades from memory into the limbo of obsolescent military paraphernalia along with powder horns and curry combs.

The actual subway episode occurred way back when, in the piping days of peace before Pearl Harbor, during a maneuver conducted by the then 1st Interceptor Command. The 62d, under Colonel (now Brigadier General-Retired) Rodney H. Smith, was participating as part of a provisional brigade, organized to put on the triple A part of the show. Because neither the brigade Staff nor any of the other units were able to put in an appearance until just prior to commencement of the exercise, it fell to the lot of the 62d, being on location, to make the ground reconnaissance and select positions for the entire brigade.

It was during this process that the searchlight battery commander, Captain (now Lieutenant Colonel) George A. Lorimer, having run out of parks and cemeteries as quiet spots for other people's sound locators, was rapidly being reduced to vacant lots on downtown street corners for his own pickup lights. In those days Brooklyn street corners were all right for carry lights and had the added advantage of providing an admiring audience for the gloom piercing crew. But, as for a pickup light, in these preradar days, the horns could track streetcars and busses to perfection and to the exclusion of planes overhead. Past experience indicated that an elevated train was as high a target as was ever tracked by a downtown sound locator.

While endeavoring to find a suitable position to close a gap in the sector assigned to the 62d, persistent reconnaissance on the part of the A Battery commander was rewarded by the discovery of an ideal location. It was a perfect position, free of ambient sounds in the midst of the surrounding hubbub of the never-resting city. There was

even a grassy plot for emplacing the equipment. But of all places, it was located in an aboveground storage yard for subway cars.

A noisy spot in the daytime, but once the rush hour trains had been shuttled in for the night, all activity ceased, and the yard was as quiet as a tomb. It was insulated from the surrounding street sounds by a high brick wall. However, the virtue of this splendid isolation also proved to be a fatal defect. For the only means of entrance was either through the yardmaster's office or by rail from the tunnel.

Since the trucks could not get into the yard to place the equipment in position, and as the power plant and lights were too large for the doorway to be manhandled through the office, the situation looked hopeless. The only alternative appeared to be a return to the streets with the substitution of one more carry light for one less pickup section. As this was unacceptable to Battery A as not being in accord with "Can Do" practice, further efforts were indicated.

In the course of a continued search of the hinterlands of Brooklyn, it was noted that for some distance the Coney Island bound subway trains operated above the ground at street level as an ordinary railroad while the tracks were in the process of changing altitude from the tunnel to the elevated terminal at the famous beach resort. Inasmuch as that railroad yard had become as desirable as a bunch of ripe grapes high on the vine and obtainable only by some means other than the mere possession of a nonexistent ladder, this observation led to a conference with the transit company's superintendent. Backed by a discussion with artillerymen, this cooperative official offered an acceptable solution to the problem.

At the appointed time, which incidentally was on a split second basis, the trucks met a work train which had been sandwiched into the scheduled flow of passenger trains at a designated spot on the ground level stretch of track. The power plant, lights, sound locator and the other equipment were quickly loaded on an empty flatcar. The train then proceeded into the subway tube for subsequent underground switching to back it into the storage yard.

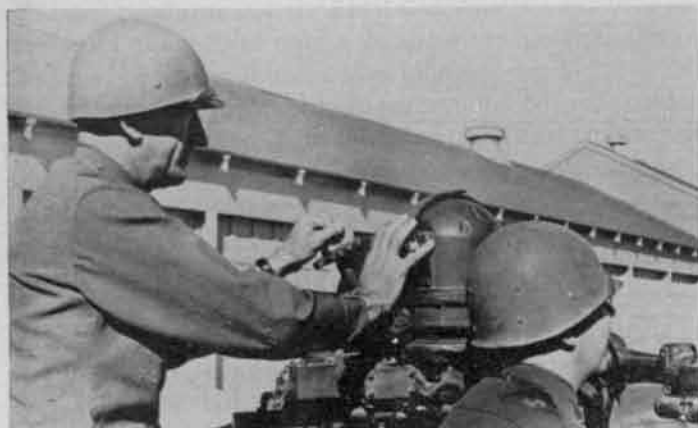
During the week of the maneuver the section functioned successfully with the stillness of the nights punctuated only by the intermittent sobbings of the air pumps periodically restoring the brake pressure on the standing trains. At the conclusion of the exercise the rail movement was repeated in reverse and the regiment received its searchlight section back on the highway from the brief sojourn in a railroad environment.

Thus was concluded the operation of the railroad mounted searchlight section. Subway soldiers, indeed!

Brief On Computing Sight, M19

By Lieutenant Colonel Pat M. Stevens, III, CAC

At about the midperiod of combat in World War II, the computing sight, commonly called Weiss, was issued for use on the 40mm AA Gun. This freed the troops, with command permission, of the director and power plant load in the gun sections. This sight did not prove entirely satis-



Location of operating personnel on Computing Sight M19.

factory, especially against jet-propelled aircraft during the latter part of the war. Therefore, the Antiaircraft Artillery Board and the Ordnance Department proceeded with the development of a better sight, which is now being procured as the M19.

The Computing Sight, M19, for use with the 40mm Automatic Gun Carriage is a course and speed sight. It is similar to the older M7 sight except that an angle of climb or dive feature has been added. The sight support bar consists of a single tube mounted in two large trunnion bearings. This tube is rotated about its own axis for vertical deflections which are transmitted from the computer by a single parallelogram link. Azimuth deflections are introduced by means of a steel tape inside the main support tube. This tape transmits deflections from the computer to pulleys which carry the optical sights. The computer is mounted on the gun trunnion in such a position that the sight operator can be comfortably seated while setting the necessary speed, course, and dive angles. The computer is a compact, weatherproof unit. Course angle is set in by means of a single handwheel located in front of the opera-

tor. Dive angle is inserted by tilting an arrow mounted on a yoke above the computer, and speed is introduced through two knobs on the side of the computer. Within the computer, gearing is confined to a single rack and pinion, the other motions being introduced by means of positive slides.

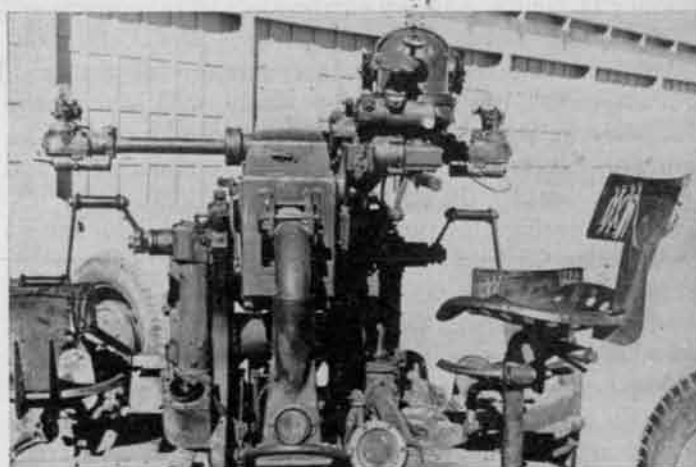
In the User Test by the Board, this sight delivered a great deal more hits and line of sight shots per round fired than was possible with the sight which it replaced.

Some major advantages of this M19 over the replaced M7 and the M7A1 Computing Sights are:

(1) The location of the various controls provides greater convenience for adjustment of fire and the sight setter is provided with an adjustable seat and the interference between the sight setter and the Azimuth Tracker has been eliminated.

(2) The M19 is capable of engaging targets flying at speeds up to 700 miles per hour in level flight, diving at 85 degrees, or climbing at 60 degrees.

(3) Only a small portion of the vibrations caused by gunfire affect the pointing devices. A target can be as effectively engaged at the higher rates of fire as at the lower. The elimination of backlash and vibration of the pointing devices (Reflex Sights M24 and M25) makes the Computing Sight, M19, a far more accurate system of fire control than the previous models.



Rear view of Computing Sight M19 mounted on 40mm gun carriage M2A1.



Hypervelocity Guns And Control Of Gun Erosions*

By Orville H. Kneen

"When victory has been won and the whole story of these scientific accomplishments can be told, it will indeed be a thrillingly interesting recital."

Dr. Karl T. Compton, President of Massachusetts Institute of Technology, a leader in scientific enterprises during the war.

The Quest For A Super-Gun

In the past two centuries the gun has become the nucleus around which armies, fleets and aircraft have revolved. Until recently it was a long-lived weapon, partly because, whether large or small, it was loaded and fired by hand. The barrel lasted about as long as the rest of the gun. (Guns have been relined since about 1907.—Ed.)

The trend of modern warfare has completely changed this. For many years gunners have been calling for higher and higher muzzle velocities. Velocities could readily be increased by firing larger powder charges, but this rapidly increased the erosion of the gun bore as well. The demand for greater striking power in land artillery and naval guns had to be met by increasing the weight of powder fired, at the cost of reducing the gun life. Since World War I, higher velocities in all calibers of guns have made even the improved gun steels unsatisfactory at the gun-bore surface.

Rapid-fire guns, in small sizes and more recently medium-sized guns, have added to the accumulating problems of the gun designer. Barrels began to wear out at an almost prohibitive rate as the rapidity of automatic fire was increased and as it became necessary to fire longer bursts. In World War II the need for better guns soon became apparent. Antiaircraft guns were fired until their smoking barrels blistered the gunners' hands.

Early in 1941 Dr. James Bryant Conant, President, Harvard University, then a member and later Chairman of the National Defense Research Committee (NDRC), returned from his mission to Britain with the conviction that gun erosion was "one of the outstanding problems from a defense standpoint" because of its bearing on hypervelocity.

*Excerpts of "Rockets, Guns and Targets." Edited by John E. Burchard, one of an eight-volume official record, "Science in World War II," which describes the ordnance activities of the National Defense Research Committee of the Office of Scientific Research and Development. Courtesy of Atlantic Monthly Press, in Association with Little, Brown and Company, Boston, Mass.

The NDRC, having decided that investigation of gun erosion and hypervelocity was needed, created a new section in Division A, designated as Section A. On June 13, 1941, Dr. L. H. Adams accepted its chairmanship. The assignment given to Section A-A was named "Erosion and Special Factors in Gun Design," with the term "Special Factors" used to camouflage the real and main objective of hypervelocity.

Adams was Director of the Geophysical Laboratory of the Carnegie Institution of Washington. Dr. Vannevar Bush was President of this Institution, the Trustees of which had offered to make available to the Government, without charge, the services of its staff members and the facilities of its various departments to aid in solving defense problems.

The gun-erosion problem impressed Adams as one that the Geophysical Laboratory was much better able to handle than an outsider might suspect. Its staff of some twenty investigators included chemists, physicists, and geologists. The experiments they had been conducting in an effort to learn the secrets of mineral formation had involved the use of high temperatures and high pressures, two of the principal characteristics of the powder gases in a gun. Above all, they were well schooled in the methods of scientific research.

Erosion A Factor

Visits were made to Aberdeen and Dahlgren Proving Grounds and to Watertown and Watervliet Arsenals as part of the education of civilian scientists, few of whom knew anything about guns when they started their project. By the end of the summer the Section was beginning to develop a clearer picture of the interior of the gun barrel. Also, some possible answers were being formulated for the hitherto baffling question: Why do gun barrels wear out?

The better the answer to this erosion problem the longer the gun would last. More important still, if erosion were decreased the gun could be made more powerful and, it was hoped, still have a useful length of life. This involved a thorough investigation into the causes and prevention of erosion, with the objective of laying the groundwork for higher muzzle velocities. The search for the fundamental knowledge of gun erosion thus became, in effect, a long-range quest for a super-gun.

Any sportsman who has used a high-powered rifle knows how erosion proceeds. But no one could tell the civilian "gun scientists" how it was caused. They were aware that the sharp-edged rifling of a new gun (shallow spiraling grooves down the bore that impart high spin to the projectile) gradually becomes worn, especially where it starts

just ahead of the chamber. When this section of rifling is obliterated, the projectiles are no longer given the proper rotation and fail to fly true to the course for which they are aimed.

When that point is reached, the barrel usually must be discarded, perhaps even the entire gun. Two major factors determine this end of accuracy-life for a given gun: the rapidity with which it is fired and the size of the powder charge. Accuracy-life varies greatly; the firing that a 16-inch gun will withstand is less than 200 rounds, medium-sized guns some 700 rounds, while the machine-gun barrel of 1941 would stand up for several thousand rounds, provided that the firing was done in short bursts and the barrel was cooled off between bursts. But the machine gun of that day would not stand a continuous burst of more than 170 rounds—less than ten seconds of firing.

The demand for higher muzzle velocities had been met over the years by repeated improvements in ballistics and in gun design, but was never fully satisfied; for as soon as a higher level of performance was reached, there came an urge from the forces in the field to have it increased still further. But there was always a limit, the limit imposed by erosion.

The gun designer, who had come to accept erosion as being as inevitable as old age in mankind, was forced to adopt a compromise between high velocity and long life. He could not have them both in one gun. From experience he knew that if a projectile heavy enough to be effective was fired with a muzzle velocity exceeding about 3000 feet per second, the life of the gun would be distressingly short. But even that speed—over 2000 miles an hour—though greater than that of the average projectile, is not enough for the purposes of modern war.

Increased Velocities

The guns developed by our Army and Navy by the time we entered the war were superior in many ways to those used in World War I. The muzzle velocities of many of them had been increased; but still, with one exception, they were all less than 3000 feet per second, in order that their lives might be reasonably long. A few officers had advocated higher muzzle velocities by using heavier powder charges, feeling that the advantages of increased velocity outweighed the penalty of shorter gun life. The Germans in North Africa gained successes in the summer of 1942 by stepping up the powder charges and producing higher velocities, at the cost of gun life.

Section A-A, in the interest of speed, was ready to have its investigators follow every possible clue that held hope of solving the basic erosion problem, or of aiding its solution in any degree. At the suggestion of the Ordnance Department, within two months of his assignment to the job, Adams had planned extensive and difficult investigations on the pressures, temperatures and composition of gases produced by firing; type of steel used in guns; rotating bands of projectiles. A series of studies was projected—chemical, physical and metallurgical—to determine the actual mechanism of erosion.

For these studies the latest and most modern techniques were to be applied, such as the use of radioactive tracers to determine the types of chemical reactions. Some of these techniques had not previously been adapted to use for gun-

bore studies, and their application called for ingenuity and resourcefulness.

Some practical ordnance men recommended early that NDRC's long-range studies (aimed, they then felt, at future uses rather than for the war that was imminent) include development of gun steels with increased resistance to erosion. Section A-A might have responded by preparing to analyze, test, and if possible improve any type of steel ever made, or any ferrous (high iron-content) composition that resourceful metallurgists could devise.

Improved Materials

But the insistent question kept arising: Why use steel? The gun designer seemed to have all the answers to that question; gun steel was the only material with the strength and elasticity to resist indefinitely the explosive and impact forces of firing, and at the same time the availability and workability required for a gun barrel material. Gun steel was ideal, it might be conceded, save for one defect—thin layers on the bore surface were continually being carried away under the successive thermal and chemical attacks of the white-hot gases that follow the projectiles down the gun bore.

That defect was fatal to the gun barrel. It was Section A-A's job, then, either to find a gun steel or some other material that would not give way under powder-gas attack, or to develop some method of protecting the steel. So attractive were the possibilities of devising protection for the gun-bore surface that groups subsequently were assigned to the study of platings and coatings, while separate investigations were begun on the subject of liners.

On December 9, 1942, with the major reorganization of the NRDC setup, Section A-A became Division I, the "Division of Ballistic Research."

It was also felt during these first weeks of planning that perhaps some practical devices or methods would show up or could be developed from older ideas. These might be shortcuts leading to useful ways of achieving the primary objective of hypervelocity, that is, projectile velocity of 3500 feet per second, or higher, without undue barrel erosion.

A promising idea, later perfected by the division, was the old "sabot projectile," first used in a crude way by the French nearly a century before. Its purpose was to permit firing projectiles in larger-caliber guns, the "sabot" or carrier filling the space between projectile and gun bore, and being dropped after leaving the muzzle. The lighter projectile acquired higher velocity from the same powder charge.

Still another partially developed device for stepping up the velocity of a projectile was the tapered-bore gun. A lightweight projectile having "skirts" is squeezed down to a smaller caliber as it travels through the tapered bore and thereby acquires better ballistic characteristics. This ingenious principle had been known for over half a century, and had been tried with limited success by the German Gerlich and other inventors. The division's pioneer work with a 57/40mm tapered-bore gun firing skirted projectiles was successful in developing a muzzle velocity of 4200 feet per second.

The resistant-materials program involved the close co-operation of some 15 of the division's contractors. The

"spark plug" who fired the enthusiasm of these contractors—even when their efforts seemed to be of no avail in making refractory metals behave—was Dr. J. F. Schairer. Through his tireless efforts which involved spending half his time traveling from one laboratory to another, each one of this group of contractors was kept fully informed of the progress being made by the others. Through his grasp of the ramifications of this exceedingly complex metallurgical program, he was able to pick up information at one laboratory and relay it to another which could use it.

Liner For Barrels

Wherever men came to grips, the excellent—but short-lived—caliber .50 machine gun was in the thick of the fight. Good as it was, it still did not meet the fighting man's ever-rising demands on land, on the sea, or in the air. As the machine gun assumed increasing importance, Division I felt impelled to concentrate not a little of its resources upon this vital gun, in the effort to augment its power and extend its life. A new liner pointed the way to worth-while improvement of the caliber .50 barrel.

Shortly after the history-making liner test, a division conference held at the Crane Company in Chicago turned into an idea-crystallizing session of great importance to the division and its war effort. As a result of the showing, the division made the vital decision to "freeze" the liner design for an aircraft barrel on the basis of tests then under way, and to produce 200 barrels equipped with these new liners, for immediate demonstration to the Armed Services.

These lined barrels proved to be as good as represented. In September 2000 lined barrels were ordered, to be rushed to active theaters for combat test. Some production troubles remained to be beaten, but in the end—and in time to help many a gunner in the Pacific theater—every obstacle was overcome. The liner proved a phenomenal solution to the machine-gun barrel's major weakness. Some of the new barrels were flown to Saipan, and there were demonstrated to astonished aircraft gunners.

Both the lined and the nitrided and chromium-plated caliber .50 barrels were adopted as standard by the Ordnance Department in January 1944. Later Division I, through the co-operative efforts of the Geophysical Laboratory, the National Bureau of Standards, and the Crane Company, was able to offer to the Services an even better barrel that combined a liner with choked muzzle chromium plate. These barrels, which could withstand thirty times as many rounds as would ruin ordinary steel barrels fired on the same schedule, were about to be produced on a large scale when production contracts were canceled by the Army immediately after V-J Day.

In larger guns, which are not fired so rapidly as machine guns, the temperature of a thin layer of steel at the bore surface becomes very high during the firing of even a single round. The white-hot powder gases melt thin films of metal, which are blown away by the rush of the gases. This slow attrition of powder-gas erosion ruins the rifling, particularly at the beginning of the bore just ahead of the powder chamber. In order to combat this condition a bore-surface material must have a high melting point as well as inertness to chemical action by the powder gases.

Antierosion Techniques

The super-gun has to withstand a combination of hypervelocity with rapid fire. Erosion is thereby intensified to such an extent that most materials fail, although satisfactory under either condition alone.

By the spring of 1944, when erosion and other studies were well advanced, it was felt that the division might well incorporate in a gun of medium caliber all its ballistic knowledge, and at least some of its various antierosion techniques, such as gun-bore coatings and liners. A special committee of division members headed by Rose made a thorough study of the project, even considering the possibilities of a gun with 6000-feet-per-second velocity for anti-aircraft use.

Discussion during succeeding division meetings revolved around the question of whether such a super-gun could be developed in time for use during the war. The conclusion was that it might, and the decision was made to go ahead.

Ideas crystallized on a muzzle velocity of 4000 feet per second as the goal for a 90mm gun, termed the A-Z Project. A Project-Control Committee was appointed, NDRC approval was obtained, money set aside, data analyzed, and definite plans laid.

The project was moving along steadily when the war ended. Ballistic calculations were completed, designs made for a suitable pre-engraved projectile (projectiles with a band of teeth in place of copper rotating band), a number of gun tubes had been forged by the Midvale Company, and machining had begun. In September 1945, as the division started terminating its long and difficult undertakings, the A-Z Project was taken over by Army Ordnance Department.

Super-Guns Made Possible

Division I ended its program feeling that it had made important pioneering advances into the field of fundamental gun-barrel reactions, a field in which there had previously been only limited investigation. Demonstrating the resourcefulness of scientists in unfamiliar spheres, its ballistic studies have laid the foundation for a much closer approach to "exactness" in calculation and in barrel design. Its investigations have uncovered the chief factors that cause erosion and these have been evaluated.

New gun-barrel materials and propellants can now be rapidly appraised in relation to gun erosion. Their utility under different firing conditions, including those of very high velocity, can be determined with some precision.

With this basic knowledge super-guns can be designed and constructed in every size and type required for the nation's defense. With the bore made erosion-resistant, the new type of gun will be by far the world's most powerful, as well as the most durable.

A source of great satisfaction to the division was the final acceptance of its hypervelocity objectives for all sizes and types of guns. After a general conference held July 19, 1945, Adams reported:

"The Ordnance Department appears now to have a keen interest in hypervelocity guns and projectiles, and looks forward to employing generally muzzle velocities of 4000 feet per second or more."

Quest For Hypervelocity

The methods described in the previous chapter were primarily devised to increase the life of a gun firing at high velocity and in long bursts or at high rates of firing. Each of them might readily enough contribute to the production of a new hypervelocity gun; but they had collateral advantages even if the goal of hypervelocity was not attained.

The division sponsored two other projects, however, which were aimed directly at the production of hypervelocity. Neither method was new; neither was currently popular; in both cases the work of the division demonstrated that the original proponents of the ideas had been far from foolish. The basic principle of both devices was to discharge from the muzzle of the gun a projectile smaller than the bore. One achieved this result by providing discardable parts (sabot); the other provided a tapered bore with a deformable projectile, changing its diameter with the diminishing diameter of the gun barrel. In either case the powder charge was able to produce higher velocity since it was expended upon a smaller diameter and a lighter projectile.

The Sabot Projectile

"Sabot" is French for "wooden shoe," and in an ordnance context means the part used to fill the space between a small projectile and a larger gun bore; it is made detachable and is to be dropped as the projectile leaves the muzzle. Such devices were used as early as 1848 in order to adapt special projectiles for use in available guns; they were generally made of wood (hence sabot). In World War I the French used sabots to adapt 37mm ammunition for use in the 75mm gun. This gun had a low rifling pitch and the light projectiles were unstable in flight and none too accurate.

Compared with tapered-bore projectiles, those which employ sabots have two disadvantages. The discarded parts may scatter at the muzzle and be dangerous to friendly personnel in front of the gun; the discarded parts have absorbed a substantial portion of the total energy and hence do not leave all of it in the projectile for application to the target.

On the other hand the sabot projectile has some advantages as well. It can be used in a standard gun interchangeably with standard ammunition without special precautions. (An adapter can be placed in a standard gun to provide a tapered bore but this has the hazard that if it should not be removed and if then standard ammunition should be used the results would be disastrous.)

The division's final conclusion was that the sabot projectile offers a practicable method for obtaining high velocities from conventional guns, with satisfactory performance as to accuracy. At least for emergencies these qualities should be potentially useful, as they would enable gun crews to switch rapidly from standard to high-velocity ammunition. During a sudden tank attack, for example, this quick increase in fire power and penetrative ability could be of real military value.

Tapered-Bore Gun And Deformable Projectile

One of the earliest Division I contracts was made as of April 15, 1942, for the design, development and manu-

facture of a 57/40mm hypervelocity gun using the tapered-bore principle.

Early types of hypervelocity guns included the Gerlich tapered-bore gun developed and used by the Germans, and the Janacek tapered adapter applied to a straight-bore gun, developed during the early stage of the war by the British under the code name "Littlejohn." Each of these uses a skirted, deformable projectile adapted to change with the diminishing diameter of bore between breech and muzzle. The tapering bore squeezes the skirt to a considerably smaller diameter, and the projectile, being abnormally light, attains much higher velocities than the conventional projectile.

Tests had been made as early as December 1932 at Aberdeen Proving Ground on a tapered-bore rifle invented and offered for test by H. Gerlich; a velocity of 4400 feet per second was obtained. Later the Ordnance Department had built a caliber .30/.24 rifle along the same lines, achieving 4100 feet per second. Accuracy was not up to our Army standard, and the idea was abandoned. But the Germans applied the Gerlich invention to larger guns, and by 1942 their 28/20mm tapered-bore guns which had velocities over 4000 feet per second, were reported to be doing great damage to the Allies in North Africa, particularly against tanks.

In the Gerlich gun the tapered transition from the initial large caliber to the emerging small caliber occupies most of the length of the gun and the bore is therefore necessarily rifled throughout its length. The production of such guns is laborious and expensive in man and machine-production hours. Our ordnance men were unable to comprehend why it was adopted by the Germans in preference to the Janacek design, which presents much simpler production techniques requiring neither special machinery nor laborious operations.

The Jones and Lamson studies assumed that if projectiles could be developed to stand the shock of deformation the tapered section could be made quite short; rifling it then would be unnecessary, because of the negligible loss of spin, and the Janacek adapter would be preferable to the single-piece rifled and tapered gun tube, because of the greater simplicity of manufacture. The adapter can readily be applied to any standard gun tube of suitable rifling pitch, and possesses the additional advantage that it is readily replaceable when worn out by the violent friction developed during the "squeezing" of the projectile.

The deformable projectile was designed with the same general objective as was the sabot projectile, that is, to attain hypervelocity by reducing the diameter and weight of the projectile, and in addition achieving maximum penetration of armor by a design whereby the mass is concentrated toward the center of the projectile. Two deformable skirts were attached to, or machined integrally with a steel sheath which contained a hard, high-density core, such as tungsten carbide. In addition, a steel or aluminum windshield was attached to improve the flight characteristics.

As compared to the sabot projectile, the deformable projectile offers two definite advantages: (a) it has no extraneous parts to scatter in front of the gun; (b) all the initial

momentum of the projectile is retained, resulting in better ballistic characteristics in flight.

It was clearly established that the best way to build a tapered-bore gun was to make it in two parts. The main part could be a standard gun of suitable rifling pitch. The special part would be small, easy to handle and easy to machine. Thus, the need for expensive, slow, special production machinery was eliminated.

There remained only the problem of joining the two parts in such manner that they could be readily assembled in the field without special tools. This step was not difficult. Attachment of the adapter to the gun was accomplished with a loose coarse thread and suitable centering and steadying bearing surfaces. When the designs had been completed, it was found that performance was perfect when the parts were merely screwed together by hand and, rather surprisingly, it was found that they could be unscrewed by hand even after the firing of many rounds.

The Company's work resulted in velocities of 4200 feet per second with carbide-cored projectiles, and 5200 feet per second with lightweight solid steel projectiles, within the rated maximum powder pressure of the gun. Penetration of armor at such velocities proved very high. Accuracy was superior to that of the sabot projectile, chiefly because the tapered-bore projectile is accurately guided as it leaves the gun.

The Pre-Engraved Projectile

Division I's initial interest in pre-engraved projectiles (projectiles with a band of teeth in place of copper rotating band) started early in 1942. From the published history of the big gun that the Germans had used in firing on Paris during World War I it was realized that pre-engraved projectiles represented one means of withstanding the excessive engraving stresses produced in conventional rotating bands, under hypervelocity conditions. The conventional copper rotating band that is satisfactory at ordinary velocities is not strong enough at velocities above about 3500 feet per second.

The proposed plan to decrease erosion by the use of pre-engraved projectiles in a chromium-plated bore was not considered a practical solution of the problem by the representatives of the Army and Navy. They pointed out that the trend in armament was for rapid-fire guns, even for calibers as large as 120mm. For such guns it would be necessary to devise some means of mechanically orienting the pre-engraved projectile during loading, so that the teeth on the projectile would engage with the grooves in the barrel. In the tests at the Franklin Institute each projectile was carefully inserted by hand; but such a procedure was out of the question in battle for any except large-caliber guns.

During rapid firing, it had been pointed out, a single case of misalignment would be fatal. This potential danger led to a study of loading mechanisms and the possibilities of indexing pre-engraved projectiles. Visits were made to Army establishments to study rapid-firing antiaircraft guns in actual operation, and certain tests were made there to deter-

mine just what had to be done in order to index the projectiles.

In the spring of 1945, before the 37mm gun had yet been fired with pre-engraved projectiles, Division I decided to make use of this method of erosion control in the design of the special 90mm hypervelocity gun.

Although the Division has not completed the solution of the problem of correct orientation of the projectile during loading, it considers this problem capable of solution. In view of the great reduction of bore friction to be obtained by the use of the pre-engraved projectile, particularly in the chromium-plated bore, it is evident that this device offers a useful approach to future design of hypervelocity guns with reasonably long life.

The application of gun-erosion knowledge to actual gun design, as in the hypervelocity gun, was analyzed by Rose, division member. He pointed out that the division's advances in ordnance knowledge should be important in two ways: first, in influencing favorably the ballistic performance of future guns; and second, in making possible the production of guns with increased military value.

The ballistic improvement will result in higher muzzle velocities. There is, of course, considerable cost in money and in weight to this increased velocity and firing effectiveness. The present muzzle velocity is close to 3000 feet per second for antiaircraft use; 7000 feet per second might be obtainable at very high cost. Velocities of 3500-4500 are obtainable at rather reasonable cost in expense and weight but even that involves increasing the caliber length of guns; the present standard length of 35 to 60 calibers must be increased to from 80 to 100 calibers. This increases the weight of the barrel, which must go up greatly to yield 4500 feet per second without using new materials.

This means, in effect, boosting the weight of the gun tube and mount. Specifically the powder charge of a 120mm gun must be used to propel a 90mm projectile. Therefore a 90mm gun's weight must be increased to that of a 120mm gun. This entails increased cost of ammunition, also higher pressures, new forgings, new projectiles, involving less explosives in the projectile, which reduces the range of destructiveness.

Swords Into Plowshares

Just as the bow and arrow enabled men to acquire food on the hoof, and later led to the harp, the violin, and the piano, so may the remarkable gun materials, techniques, and processes developed by Division I investigators aid peacetime industry in ways that are already definable.

Although the complex reactions occurring during the firing of a gun are not paralleled by any present industrial process, the fundamental knowledge which has been gained of such reactions will enable designers to transform future high-pressure equipment, such as internal-combustion engines and high-speed turbines, and to improve high-compression technology generally.



U. S. Coast Artillery Association President Assigned To Command Fourth Army

Lieutenant General Leroy Lutes, Director of Staff of the Munitions Board, Office Secretary of Defense, has been named to command the Fourth Army, succeeding General Thomas T. Handy, the Department of the Army announced recently. General Handy was recently named as Commander in Chief of the European Command.

General Lutes will assume his new command at Fourth Army Headquarters in San Antonio, Texas, effective on the completion of his present duties with the Munitions Board, approximately October 15. He has been detailed to the Office of Secretary of Defense as Director of Staff of the Munitions Board since the passage of the National Security Act in 1947.

When the Army Service Forces were organized in 1942, General Brehon Somervell, the Commanding General, selected General Lutes to be his Director of Operations. In that capacity, General Lutes prepared the over-all general logistic plans for the support of the Army throughout the world.

Previously, General Lutes had been active in other theaters. Early in 1942, he established the First Joint Logistical Staff in the South Pacific, and in 1943 he served in Italy, China, India and Africa. He flew the Atlantic eleven times, the Pacific five times, and flew also to Brazil and to Africa.

Upon the retirement of General Somervell, General Lutes was detailed as Commanding General of the Army Service Forces. At the war's end, he was responsible for the plans and operations which resulted in the return and demobilization of all overseas forces. He was then detailed as the first Director of Logistics of the General Staff of the Army.

When the National Security Act was passed in 1947, General Lutes was detailed to the Office of Secretary of Defense as Director of Staff of the Munitions Board, the agency which, among its other duties, supports logistically the strategic plans of the Joint Chiefs of Staff and coordinates all procurement for the three Military Departments.

General Lutes was awarded the Bronze Star Medal in Europe in January, 1945; the Legion of Merit, in September, 1945; the Distinguished Service Medal in October, 1945; and the Oak Leaf Cluster in lieu of a second Distinguished Service Medal, in July, 1946—all for contributions in the field of supply. His service was recognized also in the award of the Most Excellent Order of the British Empire, degree of Honorary Commander, by the King of England, in August, 1946.

At the time he was detailed from the Army to the

Munitions Board post, General Lutes received from General Eisenhower this expression:

"... with you goes the gratitude of the entire Army for your personal contribution to the supply of the war-time Army, deployed beyond the two great oceans. As Commanding General of the Army Service Forces in the postwar period, your judgment, foresight and rich experience have been invaluable assets to the efficient

and orderly conduct of global demobilization, the scope and speed of which involved unprecedented logistical problems.

"Never has the Army produced, in the whole logistics field, an officer of greater brilliance or one more outstanding than yourself. Personally and officially, I will keenly feel the loss of your daily counsel and advise. But I also feel that in your higher position the Army will continue to benefit from your unusual qualifications and abilities."

Leroy Lutes was born in Cairo, Illinois on October 4, 1890. His first military service was in the original Coast Artillery regiment of the Washington National Guard in the Puget Sound area in 1906.

Later he attended Wentworth Military Academy and was the honor graduate in 1908. He accepted a commission as second lieutenant of Infantry in the Illinois National Guard on March 3, 1914; was made a captain on August 3, 1914, and served in that capacity in the Federal Service from June 29, 1916, to March 3, 1917.

Following his National Guard Service, he accepted a commission in the Regular Army, as a second lieutenant of Infantry on March 26, 1917; was promoted to first lieutenant on April 14, 1917; to captain (temporary) on August 5, 1917; and to captain (permanent) on July 1, 1920. He was transferred to the Coast Artillery Corps on March 1, 1919. His promotion to the grade of major took place on September 1, 1933; to lieutenant colonel on July 1, 1940; to brigadier general (temporary) on November 1, 1941; to major general (temporary) on October 25, 1942; to lieutenant general (temporary) on June 5, 1945. Appointed brigadier general, RA, on June 22, 1946, with rank from December 1, 1945. He was appointed major general, RA, on January 24, 1948, with rank from April 7, 1942.

After being commissioned in the RA, he first was assigned to an officers school at Ft. Leavenworth, Kansas, and on July 8, 1917, was ordered to join the 21st Infantry, serving along the Mexican border at Tecate, Calexico and San Diego, California, until January 1, 1918. He later served with the 38th Infantry at Camp Greene, N. C., and the 24th Infantry at Camp Furlong, New Mexico.

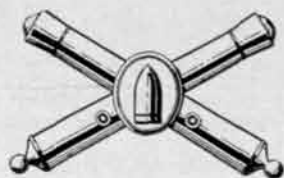


ANTIAIRCRAFT JOURNAL

Membership Listing

U. S. Coast Artillery Association

As of 10 September 1949



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The 178th Antiaircraft Artillery Operations Detachment, Georgia National Guard, of Savannah, Georgia, commanded by Major Harry L. Dickey. The Detachment is a unit of the 108th Antiaircraft Artillery Brigade, Georgia National Guard, commanded by Brigadier General Joseph B. Fraser. The Headquarters of the 108th AAA Brigade is located at Savannah, Georgia.

Left to right, front row: Sergeant Edward T. Reynolds, Corporal Iler D. Denmark, Lt. Max F. Harper, Lt. Sidney T. Cox, Lt. Col. Harry W. Elkins, Ass't Inspector General, Third Army, Major Harry L. Dickey, Detachment Commander, Captain Leonard F. McGreevy, Private First Class Robert S. Cooper, Private First Class Maurice S. Goldman, Jr., Private Norman R. Kniphfer, Sergeant James L. Reynolds.

Second row: Corporal Robert A. Exley, Private William R. Smith, Corporal Charles E. McCallar, Private First Class Walker T. Harrod, Jr., Corporal Charles F. Fridge, Jr., Recruit Charles K. Bishop, Jr., Recruit James H. Clemmons, Recruit James E. Tuten, Private First Class James W. Fields.

Third row: Master Sergeant Edward R. Davis, Army Sergeant Instructor, Sergeant First Class George A. Martin, Jr., Corporal Bobby F. Bragg, Corporal George L. Cochran, Corporal James A. Denmark, Corporal Ray L. Shepard, Private First Class Herman E. Lasseter, Private First Class Herbert D. Bearden, Sergeant Edward C. Candeto, Sergeant James H. Plummer.

Members of the Detachment not in the picture are: Corporal Edward H. Lee, Corporal Lee J. Kuhr, Recruit David A. Byck, III, students, members of the ROTC and Sergeant William F. Dyer who snapped the picture.

Georgia AAA Unit Wins Eisenhower Trophy

The 178th Antiaircraft Artillery Operations Detachment, Georgia National Guard, of Savannah, Georgia, was awarded the "Eisenhower Trophy" for the year 1948 for being the outstanding Army National Guard Unit in Georgia, the National Guard Bureau in Washington, D. C. announced on 6 September 1949.

To be eligible to compete for this award it is necessary for a company sized unit to attain 100 per cent of authorized strength during the year of competition and thereafter maintain an average of 90 per cent of their authorized strength. The training of the unit is judged on the basis of Inspector General's reports covering annual field training and annual armory inspection, also the qualification of members with individual and crew served weapons.

To win the trophy, the 178th AAA Operations Detach-

ment attained 100 per cent strength on 23 August 1948, maintained 98.33 per cent of their authorized strength during the entire year and had an over-all percentage of 91.19 attendance at armory drills.

This outstanding Georgia National Guard unit is one of the two units comprising the Georgia Hussars of Savannah, Georgia. This old historic military organization was organized as a troop of mounted rangers by General James Edward Oglethorpe, founder of the colony of Georgia, in February 1736.

Named for former Army Chief of Staff General Dwight D. Eisenhower, the trophy is awarded annually to the outstanding company-size Army unit of the National Guard in each State. A 15-inch replica of the original cup is retained permanently by winning units.



National Guard And Organized Reserve Training Activities

SOUTH CAROLINA GUARD AT CAMP STEWART

By Lieutenant Colonel Julian S. Albergotti, CAC

The 228th AAA Group, under the command of Colonel David W. Bethea, Jr., held its annual encampment at Camp Stewart, Georgia, from 26 June to 10 July.

The movement to camp on 26 June by all units was made by organic motor transportation plus about 30 vehicles loaned by 51st Infantry Division, S.C.N.G. The entire movement was made without incident and in accordance with published march tables. In several instances the march was in excess of 300 miles. The usual amount of trouble was experienced with vehicles but all were able to get into camp under their own power. The movement to Camp Stewart alone was an achievement worthy of note.

Arrangements for the move were being perfected up to the hour of departure due principally to shortage of vehicles necessary to move all equipment and personnel. Ten M-4 tractors had been issued to the 713th AAA Gun Battalion for towing 90mm guns only a few days before movement to camp. Also two new 584 radars had arrived without the truck tractors. These last minute preparations posed many problems. Nevertheless drivers were trained; the tractors towed their guns and radars as scheduled. The problem of procuring 80 octane gas for M-4 tractors and half tracks in the small towns of South Carolina was not a simple one. It should be remembered that the Guardsmen worked at their civilian jobs through Saturday, 25 June.

In moving out for summer encampment it was essential to carry practically all property issued to the units as the distance was too far and time did not permit return to the armories for items needed after reaching camp. The training schedules had been drawn up on the premise that all guns, radars, directors, power plants, field ranges, vehicles, radios, wire communication equipment, training aids and records would be initially and readily available.

The 713th AAA Gun Battalion moved eight 90mm M1A1 guns towed by M-4 tractors, four SCR 584 radars, one M9A1 director, four M7A1 directors, seven M7A1 power plants and all the necessary cables to enable it to set up firing units.

The 678th AAA AW Battalion moved sixteen 40mm guns and six M-5 quad 50s all towed by 2½-ton trucks.

The 107th AAA AW Battalion (SP) moved eight 40mm guns towed by 2½-ton trucks and eight quad 50s on M16 carriages.

During the first week of training the AW battalions set up their matériel in the assigned motor pools. It was in this area that all AW classes on the battalion level were conducted. The 713th Gun Battalion set up its matériel on the parade ground adjacent to its bivouac area. Tracking mis-

sions for AW and guns were flown mornings and afternoons during the entire week. Members of each section were instructed on their matériel from nomenclature and basic maintenance to fire technique.

This period of instruction was somewhat interrupted by the requirement that all personnel who had not fired a record course in small arms since joining the Guard must fire while at camp. Though small arms firing had been conducted at Fort Jackson, S. C. range during April and May, there were many who had to fire at Camp Stewart. It is hoped this problem will be solved before another summer camp rolls around. Plans are being made in the battalions to erect small-arms ranges within easy distance of the batteries so that every man can be qualified before going to camp. About thirty per cent of the men in camp had no previous military experience.

The training schedules were prepared by each of the battalions and it was planned that they would conduct their own schools. The 228th Group prepared schedules for the group level and selected personnel from all batteries of the Group. These group schools were conducted by Fort Bliss instructor personnel assisted by guardsmen. The battalion schedules outlined in detail the training to be carried on during each scheduled hour by all sections. The first week of training was to develop the individual and section into firing or battery teams so that at the beginning of the second week firing could be conducted on aerial targets.

The Fort Bliss Instruction Team carried on instruction throughout the camp period and, from the results achieved, it was evident that the instruction was well received and of a high quality. It must not be taken for granted that this team alone carried on all the instruction. Without the capable assistance of National Guard instructors, with a wealth of valuable experience behind them, the excellent job of instructing could not have been accomplished. Recommendations were made by all the battalion commanders that in the future the Fort Bliss Instruction Teams be increased in size so that more instructors be available for carrying out the procedures and doctrines as currently taught at the AAA and GM School.

The training started off Monday morning 27 June with a bang and continued throughout the two weeks without a let-up. Everyone worked hard and without complaint though the weather was extremely hot and the humidity at dripping point. Gun sections toiled long hours in the sun learning to do by doing and when the time came to fire they were ready for action.

All guns and fire control instruments were moved to the firing range on 4 July, placed in firing position and made ready for the firing missions.

The first firing was scheduled for 1000 hours by the

automatic weapons and there was no delay. All tracking and tow missions were flown by units of the Georgia and Florida Air National Guard and they did a splendid job.

One phase of training that must be acknowledged was that of the meteorological section which was headed by 1st Lieutenant Pat Mullineaux, of Lancaster, S. C. Lieutenant Mullineaux, a former cub pilot and observer for Field Artillery, had never seen a meteorological set before going to Camp Stewart. He had, however, been hard at work digging into the technical manuals and instructing his section for several weeks before going to camp. His enthusiasm and recently acquired knowledge, dug from the manuals, had completely imbued his section and they were ready for their mission. Met. messages were prepared and submitted to the battery commanders immediately before all scheduled firings as if the section had been operating for a long time.

The overcast skies interfered with the 90s but did not interrupt the scheduled firing for the automatic weapons and by Wednesday evening the 107th AAA AW Battalion (SP) had expended all their allotted 40mm ammunition, 2,342 rounds. The 678th AAA AW Battalion having more 40mm guns and more personnel continued firing through Thursday and expended 3,632 rounds. The two AW battalions with the machine-gun sections of the 713th Gun Battalion fired a total of 68,887 rounds of caliber .50 ammunition.

During the AW firing, three targets were shot down. Two targets were completely shot away leaving only the ring and bridle attached to the cable. On all the targets dropped, numerous 40mm and caliber .50 holes were found. In only one instance did the 40mm projectile burst on impact with the sleeve. Only one unusual malfunction occurred during the 40mm firing. In this case a ruptured cartridge case prevented the next round from loading. In some manner there was primer action which caused the next round to ignite while in the receiver, which created a flash, slightly injuring four men.

In view of the weather conditions, it was apparent that all 90mm firing would have to be done either early in the morning or late in the afternoon. On 7 July, after waiting practically all day for the skies to clear, firing began about 1600 hours and continued until 1945 hours. Seven hundred forty-two rounds were fired of which 51 were VT fused. Two targets were shot down and numerous hits observed.

Remarks were heard that afternoon from all sources as to the effectiveness of the fire. As the target crossed from right to left on one course every burst seemed to be on the target and in a perfect line. As the target approached from the left on the next course seven rounds seemed completely to cover the target and down it came. Another sleeve was streamed as quickly as possible and it lasted for only about three courses. It came down from a hit on the bridle. The target during the preceding courses had been flying at an altitude of 10,000 feet and a horizontal range at midcourse of six to eight thousand yards. Another sleeve was run out and the slant range shortened to make the target visible to the trackers. This excellent firing continued until the last round was fired. It was with a feeling of confidence that the members of the 713th Gun Battalion left the range that day. Not one word was heard about having to stay out so

late and everyone knew that his many hours of painstaking work had been well spent.

It is the opinion of the writer that if all National Guard units will bite into their mission with the vigor, aggressiveness and eagerness to learn as did the South Carolina units, preparation for M Day will be a certainty.

REPORT OF 226TH ANTI-AIRCRAFT ARTILLERY GROUP FIELD TRAINING, 1949

"Objective reached—mission accomplished." That's the report the 226th Antiaircraft Artillery Group, Alabama National Guard, can make as a consequence of its two-week annual summer field training session at Camp Stewart, Georgia, July 17 to 31.

Traveling in a convoy of 200 vehicles, the group made the 500-mile trip to Camp Stewart, bivouacking en route, participated in a full training program and returned to home stations with Inspector General Department ratings of "excellent" for the individual battalions and "superior" for the group as a whole.

Each group staff section prepared a Standard Operating Procedure as a guide for battalion staffs, and a Group Master Training Schedule. Thus the units were able to organize scheduled operations by the date of the first phase of the training period, the motor convoy movement on July 16-17.

Each battalion conducted its own convoy, making one overnight bivouac each way. No unusual difficulties were experienced during the operation, and convoys arrived at their destinations within 30 minutes of scheduled time.

It was felt that this operation was indeed one of the highlights of the training period, as 1400 men on 200 vehicles were convoyed 1000 miles without accident or injury.

Firing on towed sleeves began at 0800 Monday. The 464th AAA automatic weapons battalion had 12 40mm guns with director control and 12 quadruple mount caliber .50 machine guns on the line. The 104th AAA automatic weapons battalion (SP) had 8 40mm guns firing along with 8 quadruple mount caliber .50 machine guns on half-tracks. The firing continued Monday afternoon, with the 711th AAA gun battalion employing 8 90mm guns and four caliber .50 machine guns. All AA firing was completed by 1700 Tuesday, and a total of eight sleeve targets had been shot down.

The motor convoys departed on schedule Saturday morning and completed the movement to home stations without incident.

FIELD TRAINING OF THE 260TH AAA GUN BATTALION, D. C. NATIONAL GUARD, JULY 10-24, 1949

By Lieutenant Colonel Given W. Cleek, CAC, DCNG

The 260th AAA Gun Battalion (M) of the District of Columbia National Guard departed from Washington,

D. C., on 10 July 1949 in two march serials. All heavy equipment (90mm guns, radars, generators, and M-9A2 director trailers) left in the first serial at 0400. The second serial, consisting of personnel, left at 0630. Radio control on both convoys was maintained by use of SCR-543's mounted in ¼-ton trailers towed by the lead and last vehicle of each serial.

Strength of the battalion at camp was 210 EM, 22 officers and warrant officers. Thus, the five batteries averaged about 40 men. For training purposes, the four lettered batteries were organized into a provisional firing battery, with each of the batteries furnishing one gun, with crews rotating. A composite range and radar section was used.

Equipment taken to camp consisted of four 90mm M1A1 guns; two M-9A2 directors; one M-7 director; 5 SCR-584 radars; and five generators, M-7. The M-9A2 directors had not been used before departure for camp and personnel trained in their use were practically nonexistent. However, upon arrival at Camp Pendleton, Lieutenant L. R. Cain, a member of the instruction team from Fort Bliss, Texas, and enlisted personnel with him, conducted classes on their emplacement and operation.

The SCR-584's were emplaced, one for use as a safety air-sea surveillance set and the other for fire control.

A base line 8,300 yards in length was surveyed by the battalion operations section. B.C. scopes were used to observe deviations at both O₁ and O₂.

After the equipment was set up, oriented, and synchronized, calibration fire was conducted. An assumed muzzle velocity, based on the data in the gun books, was found to be too low. The initial rounds fired were reported over in range both from O₂ and the radar. After the calibration corrections had been determined and applied, a TSP at 5,000 yards range and 4,000 yards altitude was fired. The range deviations from O₂ were as follows:

Rd	Over	Line	Short
1	8		
2		—	
3		—	
4		—	
5			6

The first towed mission for the battalion was flown. During the day, seven crossing courses were flown. On four of these courses the target was shot down. On these courses 330 rounds of ammunition were expended, or approximately 12 rounds per gun per course. These courses were flown at an altitude of 9,000 feet; indicated air speed, 200 mph; and slant range of from 7,000 yards to 9,000 yards.

National Guard tow planes had old-style launching devices for sleeves which required reeling in the 5,000-foot tow cable before launching a new sleeve. This consumed considerable time but fortunately reduced the number of firing courses so that the entire ammunition allowance was not expended the first day. The shortest time in which a sleeve was shot down was 27 seconds after the Line of Metal Officers raised their red flags for clearance to fire.

On 20 July firing was conducted on incoming courses. The target was at about 10,000-foot altitude and an indi-

cated air speed of 200 mph. On these courses dead time was excessive. The crews needed training in loading and firing at high elevations, and learned that it was not all as easy as it had appeared on the previous day.

On 21 July we again fired on crossing courses while being observed by General W. H. Abendroth, newly appointed Commanding General of the D. C. National Guard. On this occasion, no targets were shot down but hits were obtained according to information from O₂ and the radar. This was further confirmed by observation by the crew of the towing plane. The target was dropped inland but was not recovered in spite of an intensive search. Thus ended the 90mm firing during field training 1949. In addition, crews from each battery fired caliber .50 machine guns at towed targets from automatic weapons firing point at Fort Story.

Exceptional cooperation from the Delaware and Virginia National Guard pilots flying the missions, as well as the Navy personnel at Oceana Air Base from which they were flying, was experienced. After the four sleeves were shot down the first day, the pilots requested permission to examine the equipment and were given a "Cook's Tour" lasting several hours while the guns in remote control were tracking a fighter mission. Excellent radio communication to the plane was maintained by a special SCR-624 radio located at the firing point.

Among others, the following points were observed as in need of further training and correction for future camps:

1. *Gun commanders and crews need further training on the checking and importance of checking, orientation, synchronization and level of the gun.*
2. *All personnel need training on firing procedure.*
3. *Ammunition chiefs should be apprised of the importance of checking fuzes when ammunition is opened, to eliminate defective fuze settings because of loose fuzes when rounds are out.*
4. *Crews on all equipment must have the necessary tools for field stripping and maintenance with their equipment. Tools locked in the battery supply room do not help maintenance.*
5. *All personnel need training on phone and radio procedure. Difficulties arose because telephone operators kept their "talk switch" on at all times, picking up extraneous vicinity noises and draining the batteries.*

The Regular Army Instruction Team was of great value; accordingly, it is strongly recommended that such teams be sent to all National Guard field training camps to stay for the full duration of the camp. Also, due to the help of a competent weather officer, furnished by Second Army, the battalion was able to get a met. section on its feet and produce dependable met. data.

Of course, that old evil—details for guard, KP, etc.—cut rather deeply at times into the various crews; however, this is a recruiting matter as full strength batteries would have sufficient personnel to handle these details. Furthermore,

field training camp should have camp overhead details handled by camp troops and not by the tactical units training therein.

RESERVE TRAINING AT CAMP EDWARDS

The 1329th Antiaircraft Artillery Training Brigade, composed of Reserve Units from the metropolitan area of New York City, on 14 August concluded two weeks of intensive antiaircraft artillery training at Camp Edwards, Mass., under the command of Brigadier General H. Russell Drowne, Jr., of New York City.

Representing the New York Reserve Units were: the 305th AAA Group from New York City, commanded by Colonel John Mayer, of New York City, and the 1352d AAA Training Group from Brooklyn, N. Y., commanded by Colonel Julius F. Mercandino of Queens, N. Y. The New Jersey units, consisting of the 1330th AAA Training Brigade, from East Orange, N. J., commanded by Colonel Herbert V. Ryan, of Belleville, N. J., and the 322d AAA Group from East Orange, N. J., commanded by Lt. Col. Robert A. Hoffman, of Glen Rock, N. J. The 311th AAA Group from Waterbury, Conn., was commanded by Lt. Col. Joseph M. Tavano, of Waterbury, Conn.

During the Summer Training period, activities were concentrated on the solution of antiaircraft gunnery problems and on the actual firing of caliber .50 machine guns, 40mm and 90mm antiaircraft guns, and on the use and operation of gun-laying radars.

Throughout the remainder of the year, while the units are at their home stations, training covers tactical and administrative subjects, such as Amphibious Operations, stressing the AA role; Convoy Operations, Tactical and Administrative movement of vehicles; and, Operation of Antiaircraft Artillery Intelligence Service. Staff Procedure is developed through the operation of Command Post Exercises at established Army posts in Metropolitan Area of New York City.

This type of training is carried out in all Reserve units throughout the country, and is geared to Regular Army and National Guard training so that all three branches can operate as a well-balanced team in time of emergency.

The actual firing of antiaircraft weapons took place at South Wellfleet, one of the two AA Artillery ranges in the Eastern United States, located on the east side of the Cape Cod peninsula.

Here the weapons were lined up, by units, on a man-made plateau almost 75 feet above the water line, and fired over the water, at sleeve targets towed by planes of the Air National Guard.

The fire of each unit was controlled from an 18-foot tower, of which there are six. These were in turn controlled

from a 30-foot Central Control Tower, which maintained radio communications with the towing planes.

ANTIAIRCRAFT RESERVE OFFICERS HELP TRAIN NATIONAL GUARD GUN CREWS IN NEW YORK

By Captain David S. Oppenheim, CAC-Res

Increased interest in the AAA reserve in the past year has resulted in more vigorous training programs originated by the reserve units themselves in a commendable effort to keep as highly trained as is consistent with the facilities and time available to them.

One such ambitious program was recently carried out by a New York City AAA reserve unit which should be of considerable interest to the Reserve Corps and the National Guard.

Officers of the 470th AAA Gun Battalion, a unit of the 305th AAA Group (ORC), were assigned the task of instructing the 259th CA Battalion, which is an attached unit of the 244th CA (Harbor Defense) N. Y. National Guard, in the employment of the 90mm antiaircraft gun for terrestrial fire.

The assignment was the result of a higher headquarters decision that this Guard battalion would train with the 90's at camp this summer instead of the 6-inch seacoast rifles which they had used in winter training. Since the men of the unit had no previous experience with any AAA weapons, the reserve officer instructors were obliged to start from scratch.

Under the direction of Lt. Col. Weir Adamson, CO of the 470th, and Maj. Edward Campbell, executive officer, instruction teams were organized to operate with two 90's which were brought in on the floor of the 244th Armory in Manhattan.

The objective was to train four gun crews from each National Guard battery concerned so that they would be familiar with the nomenclature of the gun, gun drill, terrestrial fire control, maintenance, safety regulations, and procedure necessary to put the 90 into traveling and firing positions.

Inasmuch as all this was to be accomplished in four two-hour drill periods during the month of June, it seemed that the reservists had undertaken more than they could deliver. However, as a result of fine cooperation from the National Guard officers involved, led by Lt. Col. William Harper, and because of the genuine interest and eagerness to learn on the part of the enlisted men of the battalion, the training mission was accomplished with excellent results.

No small credit should be given to the reserve officers of the 470th who took the pains to refresh themselves on subjects which have gathered dust in their memories for three or four years. The instruction was of the highest caliber, and its absorption by the troops was even better than the

most optimistic had expected. The instruction teams were spearheaded by Captains Seymour Sims, Thomas Turrito and George Donovan. Administrative details were admirably handled by Capt. John Fisk.

Subjects were taken up in the following order:

1. Nomenclature
2. March Order
3. Gun Drill
4. Fire Control
5. Maintenance
6. Classification of Targets
7. Safety Regulations

The problem of training NG Harbor Defense troops on the 90 was greatly simplified in this instance by the fact that the instruction was confined to terrestrial firing. This, of course, eliminated some of the most complicated and technical subjects connected with antiaircraft fire; i.e., fire control with director, radar, trial and calibration fire, orientation and synchronization, etc.

One conclusion that may be drawn from this assignment is worthy of special note; the fund of experienced officers in the AAA reserve is still capable of a high state of proficiency in the performance of their basic duties. Despite a three- to four-year lapse since active duty, it appears that the officers of the 470th AAA Gun Battalion could efficiently discharge the duties required of them in a difficult assignment after an astonishingly short period of preparation and refreshing.

Another noteworthy fact is the successful coordination of reserve officers with units of the National Guard for a mutually advantageous purpose. As Colonel Adamson pointed out, the assignment gave the reservists an opportunity to work again with matériel and troops for the first time since they left active service. On the other hand, the enlisted National Guardsmen profited by instruction and association with expert, war-experienced reserve officers who had "lived" with the 90mm gun in training and combat. The entire exercise would tend to prove that reserves and the Guard can work together—and possibly should more often.

As a further indication of the cooperative spirit between the two components in this case, the 244th NG commander, Col. Winslow Foster, has made arrangements for the 305th Group, ORC, and its attached units to continue to use the armory and the matériel available for their drill periods.



Available Subcourses

The Extension Courses Section of the Training Publications and Aids Department is responsible for the preparation of 22 subcourses. Three are available in the 20 series, three in the 30 series, none in the 40 series, and one in the 50 series. Applications for enrollment should be sent to The Artillery School, Fort Sill, Oklahoma, where the subcourses are administered. Applications are accepted by The Artillery School for all series, even though there are no antiaircraft artillery subcourses now available in the 40 series. There are, however, several basic subcourses required for the 40 series which are now being given.

Successful completion of appropriate Army extension courses is one method of fulfilling the requirements for promotion to grades below colonel in the combat arms. In addition, officers who desire to remain in the active reserve must obtain 30 credit hours each year. Department of Army Pam-

phlet No. 20-100 indicates the number of hours of each extension course. Under the retirement plan, however, officers of the Reserve Corps and the National Guard will receive credit at the rate of one point for each three hours of extension course instruction that has been satisfactorily completed. Any National Guard officer may retire his technical waivers by completing certain designated extension courses.

These courses must parallel resident instruction as presented at the AA & GM Branch, TAS. Consequently, the latest doctrine and techniques are presented to the student who should gain from his study a working knowledge of the equipment to be used in a future war. By this means, the civilian component officer will be better trained for his active peacetime duties.

News and Comment

General Moore Retires



Major General George F. Moore

The American general who commanded the Manila Bay defenses against superior Japanese forces until ordered by higher authority to surrender Corregidor, Major General George F. Moore, retired on 31 July after 40 years of active service. General and Mrs. Moore will reside at Burlingame, California.

A native of Texas, General Moore began his military career as a Coast Artillery officer after graduating from Texas A. & M. College. His long Army service ended after a year's service as Deputy Commanding General of the Armed Forces Headquarters for Unification and Facilities and Services. This "pilot model" organization of Army, Air Force and Navy officers, was established by the National Military Establishment under General Mark W. Clark, Sixth Army Commander, to study interservice unification of facilities on the Pacific Coast. In its first year of operation, this organization has established many practices for joint use of facilities, already expected to save \$1,000,000 yearly in cost of Far Western Area military operations.

Returning to the Philippines in 1940, for his third tour of duty there, General Moore became a brigadier general early in 1941, and assumed command of the Harbor Defenses of Manila and Subic Bays, with headquarters at Corregidor. Throughout the bitter Philippine Defense Campaign, he commanded these fortifications, and was entirely responsible for their air, sea and land defense against the Japanese attacks from December 7, 1941, until May 6, 1942, when his battered, half-starved command was ordered by the Commanding General, U.S. Army Forces in the Philippines to surrender Corregidor.

With survivors of his gallant force, General Moore, a major general since January 9, 1942, was a prisoner of war. He spent three years and four months at Japanese prison

camp in the Philippines, Formosa, Japan, Korea and Manchuria.

For extraordinary heroism at Corregidor, General Moore was awarded the Distinguished Service Cross. The citation told of "his great gallantry by continually visiting the most exposed elements of his command, giving encouragement, directing operations . . . inspiring heroic efforts of his command."

THANK YOU, SIR!

The following letter was sent by Brigadier General Joseph B. Fraser to all officers of his 108th AAA Brigade, Georgia National Guard.—Ed.

1. It is the Brigade Commander's desire that the great value to be currently derived from the contents of the *Antiaircraft Journal*, official national organ of The Coast Artillery Corps, be brought to the attention of all officers and enlisted men of this Command.

2. This magazine, published bimonthly, depicts, through interesting and noteworthy articles as well as excellent photographs, the most recent developments and progress being currently achieved throughout the Coast Artillery Corps.

3. The Editor of this magazine, during his visit to the recent Field Training Period of this Brigade, stated that the subscription goal is a subscription for each assigned officer and at least one per organization for the enlisted personnel. The Brigade Commander desires to have this goal reached in this Brigade as early as possible.

4. Yearly subscription to this publication is modest—\$3.00. Payment may be made at any time during the year. The time of Quarterly Drill payment is perhaps the most convenient.

5. It is desired that action be taken by all Commanders to educate their personnel on the great value of this magazine with a view to achieving for this Brigade the goal mentioned in paragraph 3 above.

Seacoast Service Test Section Notes

Sound Powered Telephones for Submarine Mine Operations: The Army Telephone TP-3 is proving to be as good as the M2 Telephone and has the advantages of being in one package and having no batteries in the circuit or push switch in the talking circuit.

Comparative tests were conducted with each type of telephone over combinations of land and underwater cable, increasing in length from four to 24 miles. Conversation was intelligible over the TP-3 Telephone for 20 miles. The TP-3 Telephones have been placed aboard the distribution box boats of the Seacoast Branch of The Artillery School Mine Flotilla for extended test under service conditions.

Spring Lay Wire Rope and Synthetic Insulated Loading Wire: On August 11th a group of mines was planted using samples of all types of raising rope and loading wire under test. Four mines were equipped with $\frac{3}{8}$ " wire raising rope, three with $\frac{1}{2}$ " wire raising rope, two with Spring Lay Wire raising rope, and four with Standard marlin covered raising rope. Six of the mines were equipped with Okolite loading wire, one with Okovox loading wire, four with Simplex loading wire, and two with Standard natural rubber insulated loading wire.

This group of mines will remain underwater for at least one year. Samples of Simplex wire have been continuously underwater since 26 April 1948, without failure of the insulation.

In order to test synthetic insulation under tropical conditions of heat, light and marine life, samples of loading wire under consideration have been sent to Panama for further test.

120mm Armament in Seacoast Artillery Role: All matériel to be used in the test of 120mm armament in a seacoast defense role has been received and placed in operating condition. Training of gun crews is continuing. Dynamic tests of the Director M10 are being conducted to determine the accuracy of output data for horizontal fire. Particular attention is being given to elevations of 100 mils and less, inasmuch as corresponding ranges (10,500 yards and less) will be particularly applicable in surface fire.

Ramjet Target Plane For Navy AAA Gunners

Navy's anti-aircraft gunners soon will be testing their skill against the antics of a pilotless radio-controlled, ramjet powered Martin KDM-1 target drone darting through the skies at near sonic speeds.

Until now, radio-controlled service type fighter airplanes, target pilotless aircraft, and towed targets—operating at a lower speed than will be possible with the Martin-developed KDM-1 target—have provided the "live" targets for anti-aircraft training.

A twin-engine Navy JD Bomber (Air Force B-26) will be modified to act as the parent aircraft for air launching the KDM-1 targets. A Black Widow fighter was modified for the original Gorgon launchings. Pylons will be built near the wing tips from which the targets will be suspended and carried aloft. At predetermined speed and altitude, the target engine will be fired and the KDM-1 dropped.

From that point on, the KDM-1 will be guided by remote control while being tracked by radar. Control system may be preset, but can be overridden at any time by the remote control station. Upon exhaustion of fuel, the KDM-1 noses up sharply, a parachute is released and the target drops gently into the water over which it was flying. Experience has shown that damage in such drops is so slight as to make only minor repairs necessary before the KDM-1 can again be flown.

The ramjet engine, sometimes called the "stovepipe," has no moving parts. A fuel pump used on earlier engine models will be replaced by a pressurized fuel system, eliminating the single moving part on the first ramjet. For its thrust it depends on the difference in momentum between the entering air and the exhaust gases. Gasoline fuel is sprayed into the airstream about midway in the engine and is ignited by a spark plug. Combustion is continuous until the fuel is exhausted.

27 National Guard Combat Divisions Approach Complete Organization

The National Guard is nearing completion of its 27 combat divisions under new tables of organization that provide greater mobility and fire power.

Thirteen divisions—12 infantry and one armored—have completed organization of all their 110 component units.

The 13 divisions completely organized include: the 43d Infantry Division of Connecticut, Rhode Island and Vermont; the 42d and 27th Divisions of New York; the 47th of Minnesota and North Dakota; the 37th of Ohio; the 38th of Indiana; the 31st of Alabama and Mississippi; the 45th of Oklahoma; the 44th and 33d Divisions of Illinois; the 28th of Pennsylvania; the 51st of Florida and South Carolina and the 50th Armored Division of New Jersey.

AAOR Training At Bliss



AAOR set up for training by the 165th AA Operations Detachment. The circular board is a Fort Bliss modification to permit plotting of situation data on the operations board. The three concentric rings on the outer edge of the board represent range zones beyond the gridded portion of the board. Plots are made on the rings in range and azimuth.

Navy Builds Largest Nonrigid Aircraft

The U. S. Navy is beginning construction of the world's largest nonrigid lighter-than-air craft for long-range patrol over open ocean areas and the vast Polar ice fields, it was announced recently. Known as the N-1, the new craft will have a helium capacity of 825,000 cubic feet. Its gas envelope will be 324 feet long and 71 feet wide with a double-deck crew car 87 feet long underneath. Maintenance and repair in flight of the two 800-hp Wright Cyclone air-cooled engines will be possible, and living quarters will be available to the 14-man crew of the airship on the lower deck away from engines and control.



COAST ARTILLERY ORDERS

DA and AF Special Orders Covering July 1 through August 31, 1949. Promotions and Demotions not included.

COLONELS

Anderson, Granger, to Hq Fifth Army Mil Dist, Chicago, Ill.
Brown, James D., to First Army 1277th ASU, Cp Kilmer, NJ.
Ericson, Richard A., to Far East Comd, Yokohama, Japan.
Harris, Paul A., to Hq Thrd Army, Ft. McPherson, Ga.
Lins, Harry W., to ret fr active ser.
McLean, Donald, to Hq MDW, Wash, DC.
Metzger, Earl H., to ret fr active ser.
Pierce, Harry R., to 1123d ASU Office of the Sr Instr ORC for Conn, Hartford, Conn.
Samuels, Andrew, Jr., to OC of S, Wash, DC.
Sawyer, John A., to US Army Alaska, Ft. Richardson, Alaska.
Young, Ellsworth, to ret fr active ser.

LIEUTENANT COLONELS

Baron, Albert S., to 1155th ASU Office of the Sr Instr NG for Mass, 18 Irving St., Boston, Mass.
Barros, Russell D., to CIC Cen, Cp Holabird, Md.
Bradley, Francis X., to Stu Det Hq First Army, Governors Island, NY.
Cory, Ira W., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Day, Frederick E., to OCAFF, Ft. Monroe, Va.
Hutchinson, George W., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Kelley, Stanley R., to 1155th ASU Office of the Sr Instr NG for Mass, Boston, Mass.
Knapp, Frederick D., to US Army Caribbean, Quarry Heights, CZ.
Krisman, Michael J., to US Army Forces Antilles, San Juan, PR.
Lanterman, Jack V., to Office of The Military Attache, Cairo, Egypt.
Lowe, Thomas J., to 6603d ASU Oregon NG Instr Gp, Portland, Oregon.
Bushnell, James M., to Armd Forces Info Sch, Carlisle Bks, Pa.
Campbell, Russell A., to 5433d ASU ROTC Kansas State College, Manhattan, Kans.
Connor, Thomas J., to Far East Comd, Yokohama, Japan.
Dickinson, Charles W., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Doherty, Edward P., to US Army, Europe, Frankfurt, Germany.
Elliott, Donald C., to 4054th ASU Stu Det AAA and GM Sch, Ft. Bliss, Tex.
Feaster, Burnes L., to Armd Forces Sch, Ft. Knox, Ky.
Fink, Richard A., to 4053d ASU AAA and GM Cen, Ft. Bliss, Tex.
Forks, Louis J., to 4054th ASU Stu Det AAA and GM Cen, Ft. Bliss, Tex.
Fulmer, Richard P., to 4051st ASU Stu Det Arty Sch, Ft. Sill, Okla.
Gardner, Milo S., to US Army Caribbean, Quarry Heights, CZ.
Gorgol, David O., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Grazier, James A., to OC of S, of Defense Wash, DC.
Hahn, John H., to 113th CIC Det Fifth Army, Chicago, Ill.
Hollis, Patrick M., to European Comd, Bremerhaven, Germany.
Howard, Lawrence J., to 2506th ASU Ohio NG Instr, Ft. Hayes, Columbus, Ohio.
Izquierdo, Osvaldo M., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Jalbert, Donald J., to 2d FA Bn (Rocket), Ft. Sill, Okla.

Kates, Robert C., to Stu Det Hq MDW, Wash, DC.
Kelleher, James J., to Office of Scty of Defense, Wash, DC.
Landers, Herbert H., to Second Army, 2808th ASU Stu Det Armd Sch, Ft. Knox, Ky.
Leigh, Ralph G., to Hq Fifth Army, Chicago, Ill.
Mahoney, Francis M., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Maris, John G., to Ryukyus Comd, Okinawa.
Mears, James E., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Porter, Gwinn U., to OCAFF, Ft. Monroe, Va.
Ratliffe, Lamar C., to OCAFF, Ft. Monroe, Va.

MAJORS

Abbott, Argyle C., to 4054th ASU Stu Det AAA and GM Cen, Ft. Bliss, Tex.
Arnold, Charles F., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Brening, Orlando L., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Colquitt, Rawlins M., to 82d Abn Div, Ft. Bragg, NC.
Freshwater, Harold L., to Armd Forces Special Wpns Project Sandia Base, Albuquerque, N. Mex.
Furr, Carl J., to Army Lang Sch, Presidio of San Francisco, Calif.
Kuziv, Michael, to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Lacapria, Arthur, to 1272d ASU Office of the Sr NG Instr for NY, 270 Broadway, NY, NY.
Laing, James L., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Lind, Willis T., to Far East Comd, Yokohama, Japan.
Mountain, Earle, to 1204th ASU New York-New Jersey Mil Dist, Ft. Totten, NY.
Peoples, Edward T., to OC of S, Wash, DC.
Reed, McHenry, to US Army Alaska, Ft. Richardson, Alaska.
Rohan, Thomas C., to 4051st ASU Stu Det Arty Sch, Ft. Sill, Okla.
Spann, Charles W., to 6605th ASU Wash NG Instr Gp, Cp Murray, Ft. Lewis, Wash.
Twyon, Donald E., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Wade, Charles W., to ret fr active ser.
Wood, Marcus S., to CIC Cen, Cp Holabird, Md.

CAPTAINS

Bond, John B., to 4052d ASU AFF Bd No 4, Ft. Bliss, Tex.
Boyd, Edgar E., to European Comd, Bremerhaven, Germany.
Buckley, Arthur E., to US Army Caribbean, Quarry Heights, CZ.
Burger, Paul S., to 6812th ASU ROTC Univ of San Francisco, San Francisco, Calif.
Pinkham, Walter R., to CIC Cen, Cp Holabird, Md.
Rhodes, Ellsworth T., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Rodgers, Vernon L., to Army Security Agency Sch, Carlisle Bks, Pa.
Salazar, David C., to 6605th ASU Wash NG Instr Gp, Ft. Lewis, Wash.
Seals, James F., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Smith, Laurence A., to Far East Comd, Yokohama, Japan.
Tippins, Bedell A., to 9th Inf Div, Ft. Dix, NJ.

Ulanowicz, Emil M., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Walter, Ace L., to 2d Armd Div, Cp Hood, Tex.
White, Grady O., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Williams, Horace G., to Sixth Army 6103d ASU Br USDB, Cp Cook, Calif.
Wood, Maynard P., to AAA and GM Br Arty Sch, Ft. Bliss, Tex.

FIRST LIEUTENANTS

Anderson, Oscar W., to Sixth Army 6011th ASU Seacoast Arty Sch, Ft. Winfield Scott, Calif.
Brosamer, John J., to 4054th ASU Stu Det AAA and GM Sch, Ft. Bliss, Tex.
Cahill, Vincent E., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Campbell, Ross W., to 4054th ASU Stu Det AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Colhard, Fred T., to 4119th ASU 4th Army Det, White Sands Proving Ground, Las Cruces, N. Mex.
Fabrick, John, to 113th CIC Det Fifth Army, Chicago, Ill.
Gallagher, James W., to European Comd, Bremerhaven, Germany.
Hapeman, Elmer H., to 2127th ASU Hq & Hq Det, Harbor Defense of Delaware, Ft. Miles, Del.
Huggins, Cleveland P., to 4054th ASU Stu Det AAA and GM Br Arty Sch, Ft. Bliss, Tex.
Levalley, Miller W., to 115th CIC Det Sixth Army, Presidio of San Francisco, Calif.
Muhl, James P., to Army Lang Sch, Presidio of San Francisco, Calif.
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Schultz, Frank R., to US Army Caribbean, Quarry Heights, CZ.
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Troxell, Jay W., to Sixth Army Retg Sta, Eugene, Oreg.
Walker, John E., to 4053d ASU AFF Bd No 4, Ft. Bliss, Tex.
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Buchanan, Billy C., to 109th CIC Det, Ft. Geo. G. Meade, Md.
Cook, Robert E., to Stu Det The Grd Gen Sch, Ft. Riley, Kans.
Day, Arthur W., to Hq Army Security Agency, Europe, Frankfurt, Germany.
Digennaro, Michael A., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Hutson, Louis O., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Keller, George A., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.
Kolster, Jim H., to 4052d ASU AAA and GM Cen, Ft. Bliss, Tex.

STATUS OF TRAINING LITERATURE

The following list of training publications now under preparation, being printed or recently published is compiled specifically for AAA personnel.

Those projects marked with a double asterisk (**) will be submitted to the Director of Organization and Training, GSUSA, for further coordination review and approval prior to printing. A single asterisk (*) indicates that the project is to be submitted to OCAFF for review prior to printing. Unmarked projects may be submitted through the proper channels to TAG for printing by the responsible Chief of Arm or Service concerned. New literature projects are indicated by N, Revisions by R, and Changes by C and the number of the Change.

Dates in the Status column indicate the following:

a. For two asterisks (**) projects, it is the approximate date the manuscript will be submitted to Director of Organization and Training for final review.

b. For one asterisk (*) projects, it is the approximate date the manuscript will be submitted to OCAFF for review.

c. For unmarked projects, it is the approximate date the manuscript will be forwarded to TAG approved for printing.

The average length of time required to print and distribute a manual, after its receipt in final form by TAG, is four (4) months.

Manual Number		Title	Preparing Agency	Status
<i>Field Manuals</i>				
44-1**	N	Antiaircraft Artillery, Employment (Revision of 4-100)	AA&GM Br, Arty Sch	Jan. 50
44-2*	R	Antiaircraft Artillery, Automatic Weapons	AA&GM Br, Arty Sch	Oct. 49
44-4*	R	Antiaircraft Artillery, Guns	AA&GM Br, Arty Sch	Oct. 49
44-26*	N	Service of the Piece, 90mm AA Gun on M1A1 mount (4-126)	AA&GM Br, Arty Sch	Dec. 49
44-27*	N	Service of the Piece, 90mm AA Gun mount M2 (4-127)	AA&GM Br, Arty Sch	Nov. 49
44-28*	N	Service of the Piece, 4.7-Inch AA Gun (4-128)	AA&GM Br, Arty Sch	Dec. 49
44-44	N	Service of Radio Set SCR 584	AA&GM Br, Arty Sch	At Printer
44-57**	C2	Adds—Transport by Air	AA&GM Br, Arty Sch	Mar. 50
44-60**	C3	Adds—Transport by Air	AA&GM Br, Arty Sch	Mar. 50
<i>Technical Manuals</i>				
9-372*	C2	90mm Gun and AA Mount M2	Cof Ord	Dec. 49
9-649	C1	AAA Cable Systems	Cof Ord	Suspended
9-1370*	R	90mm AA Gun Matériel (1370 AB)	Cof Ord	OCO Review
9-1380*	R	120mm Gun M1 & AA Mount M1	Cof Ord	Indeterminate
9-1608*	R	Periscopes, Director Sighting Telescopes & Elbow Telescopes for Tk's, MC FA & AAA	Cof Ord	OCO Review
9-1609*	N	Computing Sight M7 & M8A1 (for 40mm AA Carriage M2)	Cof Ord	OCO Review

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Here is the inside story of how the rocket was brought from the realm of Superman into reality. Here are the promising results of experiments in achieving hypervelocity without excessive erosion. And here at last is basic information about the search for precise knowledge of the effectiveness of weapons—a subject about which little was actually known as recently as 1940.

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ABOUT OUR AUTHORS

Colonel Robert Alan, USAF, is assigned to duty with the Joint Strategic Plans Group of the Joint Staff. During World War II, he served as commanding officer of the British Guiana Base Command in 1943 and early 1944, as Air Inspector for the 3d Bomber Command in 1944, and as Deputy Commander of the 91st Reconnaissance Wing in Okinawa in 1945.

Lieutenant Colonel Floyd A. Lambert, USAF, is assigned to duty with the Operations Division, Directorate of Plans and Operations, Headquarters, United States Air Force, Washington, D. C. He is one of the "old-timers" in the radar field receiving his Reserve Commission in the Signal Corps upon graduation from Texas A&M College in 1938.

A native of Washington, D. C., Major Chester Morrill, Jr., graduated from American University in 1936 and received the MA in Public Administration at AU in 1948. He was commissioned Second Lieutenant, Infantry Reserve, in 1936. He served in the Asiatic-Pacific Theater with the 33d Infantry Division (New Guinea, Morotai, and Luzon campaigns) as an infantryman but is now S2, 260th AAA Group, D. C. National Guard.

Colonel Earl Wentworth Thomson was one of the first flak officers in the United States Army. After serving in Europe with the VIII Bomber Command and the Eighth Air Force, he went to the Pacific as Chief of the Flak Intelligence Section, Pacific Ocean Areas. He is now on the faculty of the U.S. Naval Academy.

Lieutenant Colonel Milan G. Weber graduated from the U.S.M.A. in 1931 and the Coast Artillery School in 1937. He served with the Third Army during World War II in France and from 1945 to 1948, he was assigned to GSC duty in Washington and is presently with the U.S. Military Mission to Argentina.

Lieutenant Colonel Julian S. Albergotti is a graduate of The Citadel, Charleston, S. C. and the University of North Carolina. He was commissioned in the ORC in March 1925 and entered active duty in December 1940. During World War II he served in Iceland and the ETO. Integrated in March, 1947, he is presently serving as an Army Instructor with the South Carolina National Guard.

Major Peter W. Pedrotti served with the AAA defenses in Washington, D. C. early in the war and he has specialized in AAA communications for the past twelve years. He is presently on the faculty of the AAA and GM School at Fort Bliss, Texas.

Major K. C. Coe has had long service as an enlisted man and an officer. He has specialized in S-3 duties and is currently assigned to the G-3 Section of the AAA & GM Center at Fort Bliss, Texas.

Colonel Given W. Cleek has had long service with the D. C. National Guard. He has been recently retired with the rank of Colonel. He was formerly commanding officer of the 260th AAA Gun Battalion of the D.C.N.G.

Lieutenant Colonel Pat M. Stevens, III, a graduate of Georgia Tech, has been a Coast Artillery officer since 1933. During World War II he served with AAA units in the ETO. He is now with Ordnance Signal Section, Research & Development, Department of the Army.

Lieutenant Colonel John T. Snodgrass received his degree from University of Michigan in 1928. His war service included duty with Antiaircraft units in the Pacific. Colonel Snodgrass is presently with O&T Division, Department of the Army.

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