Tactical and Technical

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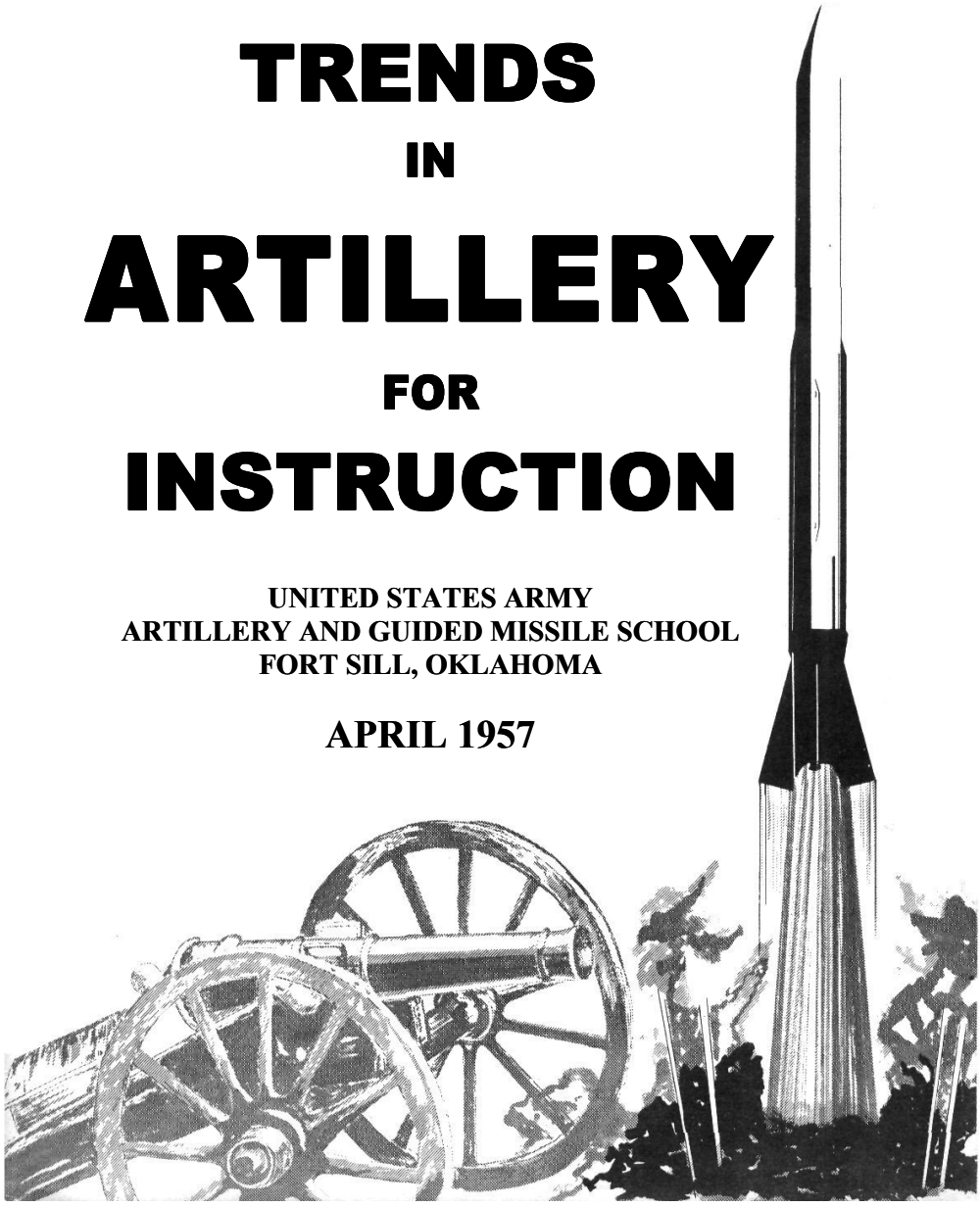
TRENDS IN ARTILLERY FOR INSTRUCTION

UNITED STATES ARMY
ARTILLERY AND GUIDED MISSILE SCHOOL
FORT SILL, OKLAHOMA

APRIL 1957



UNITED STATES ARMY
ARTILLERY AND GUIDED MISSILE SCHOOL
FORT SILL, OKLAHOMA

1 April 1957

The Tactical and Technical Trends in Artillery for Instruction is a Nonresident Training Aid. It is designed to provide Artillery personnel with tactical and technical data peculiar to field artillery. It will serve to keep Artillery personnel abreast of the most recent developments in field artillery. Suggestions for additional material are especially invited from the field. Correspondence concerning the publication should be addressed to the Assistant Commandant, U.S. Army Artillery and Guided Missile School, Fort Sill, Oklahoma, ATTN: Director, Department of Publications and Nonresident Training.

T. E. de SHAZO
Major General, USA
Commandant

April .....
May .....
June ....

1 9 5 7

This training aid is for use by the Department of Publications and Nonresident Training, U.S. Army Artillery and Guided Missile School, for Extension Courses, USAR Schools, Staff Training Programs of the Reserve and National Guard units, nonresident conferences, orientation, and other instructional purposes.

Edited and published by Department of Publications and Nonresident Training, U. S. Army Artillery and Guided Missile School, Fort Sill, Oklahoma.

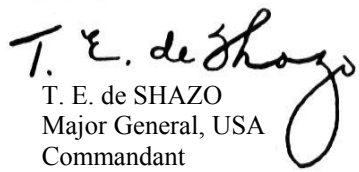
CONTENTS

OFFICE OF THE COMMANDANT

Throughout the Army we are getting more and more missile and rocket type Artillery Units. This creates a demand for wider knowledge of the CORPORAL, the HONEST JOHN, and other units.

Here at the School we are increasing our student load, organizing new courses, and changing the curricula in the old courses to meet this demand. However, it will be several years before all officers have a chance to attend one of our courses. It is also desirable that officers reporting to Fort Sill to attend a course in one of the new Artillery weapons be somewhat conversant with the weapons before they arrive.

I urge that commanders in the field, particularly those in overseas theaters, assist in introducing Artillery Officers to these new units by rotating assignments into rocket and missile units. This introduction can serve as a pre-training exercise for those officers on orders to attend a course here at Fort Sill, or a general orientation in the missile field for the remainder of the officers. Not only will the prospective student benefit and make his transition to the resident course easier, but the Artillery Officer Corps as a whole will benefit from the dissemination of first-hand knowledge of and experience with our new weapons.



T. E. de SHAZO
Major General, USA
Commandant

OFFICE OF THE ASSISTANT COMMANDANT

We hope, through the medium of this training aid publication, to keep you, the Artilleryman, informed of significant developments in the field artillery.

If maximum benefit is to be derived from this publication, individual copies must be given maximum circulation. Permission is granted to reproduce in whole or in part any of the content.

To increase the training value of this publication, I invite recipients to send us questions or comments on the contents or suggestions on any artillery matter which you feel will be of broad general interest. We would like to devote a portion of the publication to correspondence from the field.

Your letters should be addressed to me and marked ATTN: Director, Department of Publications and Nonresident Training.

PAUL A. GAVAN
Brigadier General, USA
Assistant Commandant

DEPARTMENT OF PUBLICATIONS AND NONRESIDENT TRAINING

COLONEL A. S. BRITT, ARTILLERY, DIRECTOR

PREPARATION OF ARTILLERY SUBCOURSES

We are often asked the question, "What is involved in the preparation of a subcourse?" A quick resume of the process should prove interesting to the Artilleryman.

Artillery subcourses are very carefully prepared by experienced Artillerymen. Our authors are all graduates of the regular or associate advance course or have a comparable experience background. They have all undergone a period of training before starting on their first project.

A period of from 4 to 6 weeks is required for the research and consultation which goes into the production of the outline for the subcourse. A similar period is required for the production of each lesson. The subcourse is reviewed, lesson by lesson, then as a complete subcourse by the resident department which teaches that particular subject. It is thoroughly edited for grammar, readability, and consistency by skilled editors. It is reviewed and approved by Hq, CONARC.

Before the subcourse is printed, it is subjected to what we believe to be the "acid test." We reproduce 50 copies of the subcourse manuscript and send them out to 50 of our regularly enrolled students. Those students are studying at the level for which the subcourse was written and have volunteered to test the course for us. These nonexperts are asked to work the subcourse and to keep careful note of the length of time required to read the text assignment and work the lessons and examination. They are also asked to comment on any obscure points, inconsistencies, or anything else which, to them, detracts from the value of the subcourse as a teaching vehicle. Their comments are carefully reviewed and valid comments are included in the final printed edition. We have received some very sound and eye-opening comments from these nonexperts, and there is no doubt in our minds that this test adds to the worth of the subcourse.

We try to overcome the lack of instructor-student contact, inherent in extension instruction, with the use of rather extensive attached memoranda. In this memoranda the author expands on the text assignment just as the platform instructor does. We also provide the student with a discussion of the solution to each exercise.

In all new subcourses we are avoiding the use of the so-called "academic question," such as "List the Duties of the S-3." Instead we teach principles, place the student in a situation, and give him a set of circumstances. Then he is required to apply the principle to the situation and circumstances and to arrive at a solution. In the discussion we restate the principle involved, recall the situation and circumstances, and state the school solution, pointing out how it correctly applies the principle illustrated. We also point out why the wrong answers are, in fact, wrong.

Yes--our subcourses are carefully prepared. They have resident department and CONARC approval. They are edited to insure that they are

readable and easy to study. They are tested under home study conditions by people who are nonexpert in the subject matter field. They must be studied carefully because they cannot be solved by simple parallel reading.

Subcourses like that cannot be produced cheaply or quickly. It is a long painstaking process. We are justified in spending the necessary time and money because we feel that the product justifies that expenditure.

EXTENSION COURSES PROVIDE OPPORTUNITY FOR BRANCH QUALIFIED OFFICERS

Upon graduation from the advance course of the U. S. Army Artillery and Guided Missile School, an officer is considered branch qualified. His formal artillery schooling completed, he has little opportunity for further academic training in artillery. Because of his length of service, he usually becomes a field grade officer soon after graduation. The limited peacetime troop assignment possibilities may result in branch immaterial assignments for long periods. In the event of mobilization, reassignment to a troop unit may catch such officers unprepared artillery-wise. To keep pace with a dynamic artillery, officers assigned out of branch must keep abreast of change to be prepared for troop assignment.

Extension Courses of the U. S. Army Artillery and Guided Missile School are available to both active duty and reserve officers who wish to stay prepared.

Sign Up Now!

PROCESSING APPLICATIONS FOR ENROLLMENT IN ARMY EXTENSION COURSES FROM US CITIZENS IN FOREIGN COUNTRIES

To expedite processing of applications for enrollment in Army Extension Courses submitted by United States citizens residing in foreign countries, DA Pamphlet 350-60, July 1956, should be consulted prior to indorsement and forwarding of applications. Extracts from this reference are quoted below:

"para 9. ENROLLMENT.

* * * * * * *

g. United States Citizens Residing in Foreign Countries. -- The following persons residing in foreign countries may enroll in Army Extension Courses if otherwise qualified:

* * * * * * *

(3) Military personnel of the reserve components of the Armed Forces of the United States not on active duty and qualified United States civilians resident in a

country which does not prohibit receipt, study, and mailing of Army Extension Course lessons and material.

(4) Military personnel, active or inactive, and qualified civilians who are members of United States Foreign Service, or are on the staff of Military Attaches, or are members of military mission or United States Advisory Group are acceptable for enrollment if properly vouched for by the chief of agency concerned.

(5) Applicants who are employed by a foreign government will not be enrolled in the Army Extension Course Program unless the written consent of the foreign government concerned is attached to the application.

(6) Information concerning the local law, as pertains to the mailing of extension courses to the foreign countries concerned may be obtained from the office of the military attache. Clearance will be obtained by addressing applications through the Department of the Army, Washington 25, D. C., ATTN: Assistant Chief of Staff, Intelligence.

* * * * * * * ."

DISTRIBUTION OF STAFF TRAINING CATALOGS

Many inquiries are received from USAR Artillery Units and Artillery Unit Advisors as to whether or not instructional material of the School is available. It would appear that the Staff Training Catalogs are not getting into the hands of the using units and that the purpose and intent of the Staff Training Program is not fully understood. Chiefs of Military Districts, Senior Artillery Advisors, and Artillery Battalion Unit Advisors are urged to see that distribution of the Staff Training Catalog is made to artillery battalion commanders. Additional copies will be forwarded upon request.

EXTENSION COURSE SERVICE TESTS

During this quarter, the Extension Course Division will test two new subcourses:

Arty Subcourse 6, Conduct of Observed Fire, 1 June 57 (based on new FM 6-40)

Arty Subcourse 32, Defense of Artillery, 1 May 57 Any officer desiring to assist in these service tests may write for full particulars. Correspondence should be addressed:

US Army Artillery and Guided Missile School
Extension Course Division
Fort Sill 10, Oklahoma

"For most men, the matter of learning is one of personal preference, but to Army Officers, the obligation to learn, to grow in their profession, is clearly a public duty."--General Omar N. Bradley

Fulfill this obligation through Extension Course Study.

STATUS OF FM 6-40

The latest word of FM 6-40 (Field Artillery Gunnery) is that the manual will clear the printers during April. Distribution is to be made through normal AG channels.

RECENT TRAINING FILMS

The following training films on the HONEST JOHN and CORPORAL have been released for distribution:

TF 6-2374, 762-mm Rkt, Part I, "Introduction to the System."
(Running time 16 minutes.)
TF 6-2375, 762-mm Rkt, Part II, "Mechanical Assembly."
(Running time 14 minutes.)
TF 6-2376, 762-mm Rkt, Part III, "Electrical Testing."
(Running time 16 minutes.)
TF 6-2377, 762-mm Rkt, Part IV, "Loading."
(Running time 13 minutes.)
TF 6-2378, 762-mm Rkt, Part V, "Preparation for Action."
(Running time 19 minutes.)
TF 6-2379, 762-mm Rkt, Part VI, "Firing and March Order."
(Running time not available by publication date.)
TF 6-2402, the CORPORAL Battalion, Part II, "Description of Equipment."
(Running time not available by publication date.)

USAR SCHOOLS--ACTIVE DUTY TRAINING

During the period 4-10 March 1957, instructional material for the USAR schools, active duty for training phase (1956-1957 school year), was shipped to designated camp sites.

STAFF TRAINING MATERIAL

Instructional material for the first quarter of the 1957-1958 USAR school year will be shipped on 15 May to USAR schools scheduled to conduct artillery branch courses during the 1957-1958 school year.

POI FOR USAR SCHOOLS

The Program of Instruction for field artillery courses to be presented in USAR schools during the 1957-1958 school year will be distributed on or about 1 May 1957.

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DEPARTMENT OF COMMUNICATIONS AND ELECTRONICS

COLONEL G. W. SEAWARD, ARTILLERY, DIRECTOR

NEW FAMILY OF FREQUENCY MODULATED RADIO SETS

As early as 1948, design was started on reduced bandwidth frequency modulated radios for military use. These radios were to be the replacement sets for our present standard frequency modulated series. However, as development progressed, transistors began to loom as a feature of at least equal importance to reduced bandwidth frequency modulation. When this became evident, the original development project was suspended and a series of conferences were called to incorporate all technological advances in the new sets. As a result of these conferences, military characteristics and specifications for the new family of frequency modulated sets are nearing completion. The basic set of the new series will be known as the AN/VRC-12. This set will replace the entire "3 through 8" series of sets now used by the combat arms. Also, radio set AN/PRC-35 is being developed to replace the current AN/PRC-6; and the AN/PRC-25 to replace the present PRC-8, 9, and 10 series. The PRC-35 and PRC-25 are designed to incorporate all of the technical improvements of the VRC-12 and to be compatible in all operational respects.

Production of the new sets is eagerly anticipated by the combat arms for several reasons. First, since the new sets will offer operational capability over 800-1000 channels as compared to the present 280, some relief in the crowded frequency spectrum can be expected. This gain in channels has been made possible, partially through raising the upper end of the frequency spectrum utilized (from 54.9 to 70 mcs), but for the most part by incorporating design improvements which permit 50 kc channel separation rather than the present 100 kc bandwidth.

A second highly desirable feature will be unification of equipment for all the combat arms. Although the primary goal underlying this feature is reduction in the number of equipments and parts in supply channels, an additional advantage will be the removal of the unsatisfactory overlap bands. Since sets for each combat arm will be identical, operating capability on all channels will be possible for all. Such nuisance factors, therefore, as exchange of equipment between the various arms and unbalanced assignment of available channels can be eliminated.

A third, and certainly most interesting feature of the new sets, is that they will represent the first large scale use of transistors in military radio application. Although transistorization of all components may not be completed, the far reaching effects of this development, particularly in the way of miniaturization and reduced power requirements, should prove this a welcome innovation.

The AN/VRC-12 family presents considerable departure in equipment design. These radio sets will not be compatible with existing sets, therefore issue must be accomplished on an area or complete system basis. This disadvantage is more than offset by the gain in number of channels, unification of equipment, miniaturization, and reduced power requirements.

RESIDENT INSTRUCTION CANNOT DO IT ALL

A truly effective Reserve demands a corps of officers who are current in their knowledge of the tactics and techniques of their arm. Resident instruction will reach only a small portion. For the remainder, the Extension Courses of US ARMY A&GMS provide a convenient, easy to absorb fund of current information on Gunnery, Tactics, Communications, et al.

PROGRESS OR STAGNATION

Military proficiency hinges on education, and the military mind will either show progress through study or stagnate through lack of study. Refresh and deepen your military education through extension course study!

* * * * * * *

DEPARTMENT OF GUNNERY

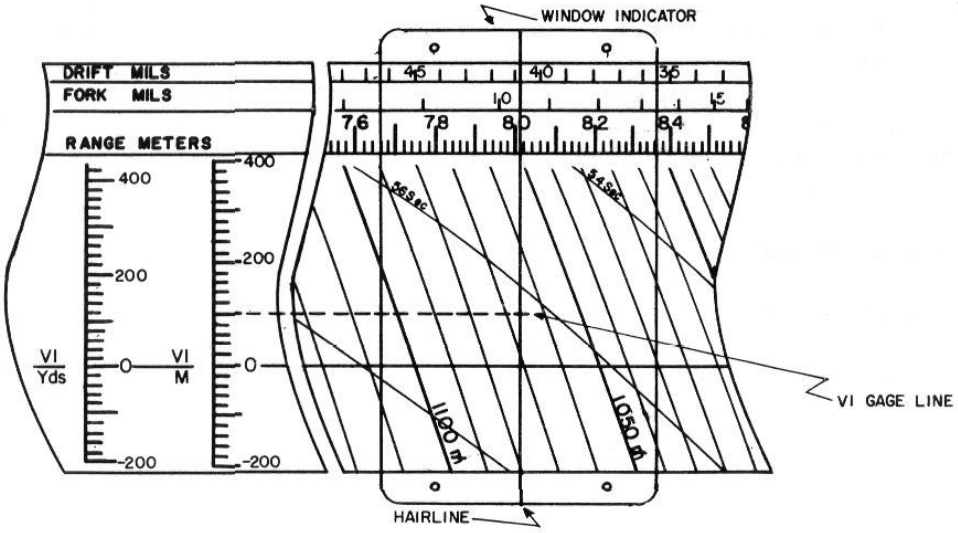
COLONEL W. E. SHOWALTER, ARTILLERY, DIRECTOR

HIGH ANGLE FIRE DIRECTION MADE EASY

Condition of the terrain in the target area or at the battery position often necessitates high angle fire to accomplish effective artillery fire support. Also, the increased lethality obtainable from high angle fire under certain conditions dictates that all artillerymen be proficient in its use. But what a headache high angle procedures have been in fire direction centers and in gunnery classes--determining and using the 10-mil site factor, multiplying, changing signs, and obtaining replot data through successive approximation. As a result of such involved procedures, many FDO's have hesitated to use high angle fire. To simplify these procedures, Capt W. C. Wilson, USMC, a gunnery instructor at the School, proposed a GFT that

would directly provide the required quadrant elevation (QE) for a given vertical interval (VI) and range. Using Capt Wilson's idea and two-dimensional firing table data (i.e., utilizes range and vertical interval as entries to obtain QE) from the Ballistic Research Laboratories, Aberdeen Proving Ground, a two-dimensional GFT rule for 105-mm howitzer high angle fire has been constructed.

The GFT consists of a set of two 12-inch slide rules with indicator similar to present GFT rules, which provide data for all seven charges. Provision is made for conversion from yards to meters to permit use of the GFT with yard measuring equipment. Elevation lines representing the terminal portion of the trajectory are provided for each 10 mils of elevation. VI scales are provided in both meters and yards. Scales or lines for drift, fork, and time of flight values are also provided. A segment of the GFT rule is shown in figure 1.



(Charge 6, 105-mm howitzer.)

Figure 1. Sections of two-dimensional high angle GFT rule.

The GFT can be used to determine QE, elevation, time of flight, and correct range for replot graphically; it may also be used in the computation of site. In using the GFT, the range, height of target above (below) gun, and the charge to be fired must be known.

Use of the new high angle GFT greatly reduces the time required to determine QE as the QE is read direct for any given range and VI combination. To use the GFT in computing data, a horizontal VI gage line corresponding to the computed VI is marked on the hairline; the hairline is moved to the announced range; and the QE is read under the intersection of the hairline and the VI gage line. In figure 1, the QE for range 8,010 meters and VI

of plus 100 meters is 1067 mils. For continuation of a mission, only range is required as the VI remains constant. The continued use of the VI gage line provides an accurate QE for each round because the site is always included and contains the correct complementary angle of site value.

Compare this simple procedure with our present procedure in which the angle of site must first be obtained and then multiplied by the 10-mil site factor to determine site. For convenience, this same 10-mil site factor is used throughout the mission although actually its value (and thus the site itself) changes with every range change. Another minor inaccuracy which has been accepted in our present procedures is in normally ignoring site when the angle of site is no greater than plus or minus 30 mils.

Determination of replot data is also greatly facilitated with the new rule as the range corresponding to the adjusted QE is obtained directly from the GFT. To obtain this range, the intersection of the VI gage line and hairline is placed over the adjusted QE and the correct range is read under the hairline. If a GFT setting is used, the correct range is read under a range gage line.

With present procedures the correct site must be determined and stripped from the adjusted QE to determine the correct adjusted elevation and its corresponding range for replot. This correct site is obtained by multiplying the angle of site (a constant value) by successive apparent adjusted elevations, until 2 successive sites are within 1 mil.

If elevation instead of QE is desired from the new high angle GFT, it can be read under the intersection of the hairline and the VI zero line. If site is desired, it can be obtained by subtracting the elevation from the QE.

The new GFT for high angle fire is a prototype model and has been distributed in only limited quantities to a few troop units and test agencies for further evaluation. However, the Book Store of the School has it for sale at $1.75 per set, complete with instructions for use. The Marine Corps is interested in this GFT and has purchased it for troop use and further evaluation. The School is considering a recommendation to Hq, CONARC, to authorize production of a pilot model and testing by the U.S. Army Artillery Board for standardization and issue to troop units.

The Department of Gunnery would welcome any comments or suggestions on this GFT which could be used in aiding development of the best designed models for troop use.

NEW REGISTRATION PROCEDURES AND TECHNIQUES

Since the target grid system was introduced to gunnery, many objections have been voiced that the system was not as adequate in some respects as the old BC methods. One of the main objections is that, in a precision registration, the system sometimes resulted in the use of an exceedingly large number of rounds in obtaining adjusted data. To improve the procedures, over 100 registrations were fired at Fort Sill, all of which were

carefully controlled. For example, each round in fire for effect was surveyed and plotted, and gunnery instructors acted as gunner and number 1 cannoneer on many missions. The results of these missions are quite enlightening in that most of the difficulties can be traced directly to human errors rather than to the system or procedures. These errors, purely "sloppy gunnery," will be covered separately. The purpose of this discussion is to highlight only those improvements of the registration procedures and techniques which resulted from this project.

Based on evaluation of this research firing, the target grid system was improved by a new 1/2 s table, a new FDC sensing table, and additional fire direction procedures which have been incorporated in the revision of FM 6-40. In addition to specific changes, the FDO has been given more opportunity to exercise judgment in order to obtain faster and more valid corrections from registrations.

The new 1/2 s table was found to be more adequate than the old table in 41 per cent of the missions fired with 105-mm howitzers. In 55 per cent of the missions fired, either of the 1/2 s tables would have given the same result, and in 4 per cent of the missions the old table gave the best results. Another benefit of the new 1/2 s table is that rounds during bracketing procedures are normally not shifted as far away from the OT line as they were with the old table. This is because the new table is based on a 40-yard rather than a 50-yard bracket. Evaluation of the new FDC sensing table results indicated that, for the 105-mm howitzer, 1 out of 7 rounds (14 per cent) in FFE would give an additional FDC deflection sensing, and that this would happen in 2 out of 3 missions (66 per cent).

Overall, it was found that in using the new 1/2 s table and FDC sensing table, a 2-mil deflection bracket was obtained in an average of 5.4 rounds with the 105-mm howitzer.

Although test results were more than satisfactory, one additional technique was added, in order to eliminate any long registration which might still occur. That is, the FDO, after receiving two successive deflection sensings of doubtful in FFE, may consider either the deflection correct or may command an arbitrary deflection shift. The procedures in both of these alternatives are based on information furnished by the observer relating location of the rounds to the location of the target. It is anticipated that this arbitrary shift will yield a positive deflection sensing. This procedure is continued until the FDO is satisfied that a proper deflection bracket has been obtained. Another change is that, although the center of a 2-mil deflection bracket is deflection correct, the artillery commander or FDO is now justified in accepting the center of a 4-mil deflection bracket as deflection correct when observed fires are to be used. It is also justified when speed, not refined accuracy, is critical either in combat or in certain phases of Army training tests.

One of the changes which was made for simplicity and ease in handling involves increasing an uneven valued fork to the next higher even number.

This is done only when it is required to split the fork during the fire for effect phase. There has been no change in using the correct value of the fork during computations for adjusted elevation.

Another change was made in recognizing the need for verification of an apparent invalid impact registration. If a registration results in a single round in one sense, i.e., 5 overs and 1 short, it may be verified before being accepted as correct. To verify a 5 and 1 preponderance, the adjusted elevation is changed 1/2 fork in the appropriate direction from the last elevation fired and 1 round is fired. If the round is in the same sense as the single round of the 5 and 1 preponderance, the adjusted elevation computed from the 6 rounds fired is considered verified (ignore verification round in computation). If the round is in the same sense as the preponderance, two more rounds are fired at the same elevation at which the first verification round was fired. If these two rounds are both in the same sense as the preponderance, the registration is invalid. In that case, the FDO notifies the observer that the registration is invalid and orders him to proceed with a new adjustment from the last round fired. The results of the previous FFE are disregarded. If any of the rounds fired at verification elevation are in the minority sense, a new adjusted elevation is computed using the last six rounds fired.

Listed below are the data contained on the reverse side of the new revised record of precision fire form (fig 2).

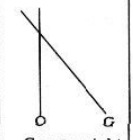
THE SECOND LIEUTENANT FORWARD OBSERVER

The classic duty of the second lieutenant in the United States Army Artillery is that of serving as a forward observer. In many instances it is his first assignment on active duty and is a job that he must be qualified to do should the need arise. The training of second lieutenants as good forward observers is therefore one of the prime objectives of the Officer's Basic Course (OBC) and the Officer Candidate Course (OCC) at the U. S. Army Artillery and Guided Missile School. In the event that his first assignment is that of a forward observer, the battalion and battery commanders of the unit to which the lieutenant reports will have a vital interest in the result of the training he has received. They will want to know just how good a forward observer he is; how much training in adjusting artillery fire he has had and of what type.

On the whole, they will find him capable in the adjustment of fire and possessing a knowledge of his job well grounded in practical experience and an understanding of its principles.

The OBC graduate will have observed about 250 fire missions. He will have actually conducted the fire of about 10 of these missions. Ten per cent of the missions that he has observed will have been precision missions, either registration or destruction, and the remainder will have been area

FDC sensing											
Observer sensing	1-99m	100 -499m	500 -799m	800 -1399m	1400 -1600m	1601 -1799m	1800 -2399m	2400 -2699m	2700 -3099m	3100 -3200m	
?R	?R	-R	-?	-?	-?	-?	-?	-?	-L	?L	
?L	?L	+L	+?	+?	+?	+?	+?	+?	+R	?R	
+LN	+R	+R	+R	+R	+R	-R	-R	-R	-R	-R	
+R	+R	+R	+R	?R	-R	-R	-?	-?	-?	-L	
+L	+L	+?	+?	+?	+R	+R	?R	-R	-R	-R	
-LN	-L	-L	-L	-L	-L	+L	+L	+L	+L	+L	
-R	-R	-?	-?	-?	-L	-L	?L	+L	+L	+L	
-L	-L	-L	-L	?L	+L	+L	+?	+?	+?	+R	

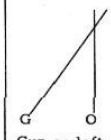


Gun on right of observer

1/2 S table					
GT range in yards	Angle T in mils				
	0-99 3100-3200	100-499 2700-3099	500-799 2400-2699	800-1399 1800-2399	1400-1600 1601-1799
2,000	2	4	8	16	16
3,000	2	4	8	8	16
4,000	2	2	4	8	8
5,000	2	2	4	8	8
6,000	2	2	4	4	8
7,000	2	2	4	4	4
8,000	2	2	2	4	4
9,000	2	2	2	4	4
10,000	2	2	2	4	4
11,000	2	2	2	4	4
12,000	2	2	2	2	4
13,000	2	2	2	2	4
14,000	2	2	2	2	2
15,000	2	2	2	2	2

Elevation Change Factor					
	Difference +'s and -'s				
Fork	1	2	3	4	5
1	.1	.2	.2	.3	.4
2	.2	.3	.5	.7	.8
3	.2	.5	.8	1.0	1.2
4	.3	.7	1.0	1.3	1.7
5	.4	.8	1.2	1.7	2.1
6	.5	1.0	1.5	2.0	2.5
7	.6	1.2	1.8	2.3	2.9
8	.7	1.3	2.0	2.7	3.3
9	.8	1.5	2.2	3.0	3.8
10	.8	1.7	2.5	3.3	4.2
11	.9	1.8	2.8	3.7	4.6
12	1.0	2.0	3.0	4.0	5.0
13	1.1	2.2	3.2	4.3	5.4
14	1.2	2.3	3.5	4.7	5.8
15	1.2	2.5	3.8	5.0	6.2
16	1.3	2.7	4.0	5.3	6.7
17	1.4	2.8	4.2	5.7	7.1
18	1.5	3.0	4.5	6.0	7.5
19	1.6	3.2	4.8	6.3	7.9
20	1.7	3.3	5.0	6.7	8.3

FDC sensing											
Observer sensing	1-99m	100 -499m	500 -799m	800 -1399m	1400 -1600m	1601 -1799m	1800 -2399m	2400 -2699m	2700 -3099m	3100 -3200m	
?R	?R	+R	+?	+?	+?	+?	+?	+?	+L	?L	
?L	?L	-L	-?	-?	-?	-?	-?	-?	-R	?R	
+LN	+L	+L	+L	+L	+L	-L	-L	-L	-L	-L	
+R	+R	+R	+?	+?	+?	+L	+L	?L	-L	-L	-L
+L	+L	+L	+L	?L	-L	-L	-?	-?	-?	-R	
-LN	-R	-R	-R	-R	-R	+R	+R	+R	+R	+R	
-R	-R	-R	-R	?R	+R	+R	+?	+?	+?	+L	
-L	-L	-?	-?	-?	-R	-R	?R	+R	+R	+R	



Gun on left of observer

Figure 2. New 1/2 s table and new FDC sensing table.

fire. Of the area missions that he has observed, 30 per cent will have been time fuze, 20 per cent delay fuze, 5 per cent VT fuze, and 45 per cent fuze quick. In addition to the regular service practices, each OBC graduate will have participated in 1 direct fire mission and 1 assault fire mission.

The OCC graduate will have observed about 185 missions and will have conducted the fire of about 9 of these missions. The types of missions conducted in the OCC classes are broken down into the same percentages as those in the OBC.

In addition to this practical experience in adjusting artillery fire, the OBC and OCC graduate will have a thorough knowledge of fire direction procedures and their principles. This knowledge furnishes him with a basic understanding of the entire operation of adjusting artillery fire that complements his practical experience and completes his training as a forward observer.

MODIFICATION IN SETTING DEFLECTION

A method of obtaining more accuracy with the panoramic sight has been included in the revision of FM 6-40. This method requires that the final motion in setting micrometer or azimuth readings be from lower to higher readings. Any play or lost motion in the head of the sight will be partially corrected for or eliminated by this means since the final motion in setting the scales is always in the same direction. This principle applies to all fire control instruments. The system has been taught at the School for several years and is not new. However, it is not included in the current service of the piece manuals. It will be included in revised editions.

MATHEMATICS FOR ARTILLERY

A resident instruction text "Mathematics for Field Artillery" is being prepared at US ARMY A&GMS. This text is expected to meet the needs of all resident departments as a review text in mathematics and will eliminate present duplication. It is planned that this instruction text will be published before July of this year.

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DEPARTMENT OF MATERIEL

COLONEL J. H. DALY, ARTILLERY, DIRECTOR

THE REASON FOR TWO TUBE LENGTHS FOR THE M44

Tubes for the 155-mm howitzer M44, self-propelled, were produced in two lengths -- 142.04 inches and 143.6 inches.

The 14.02-inch tube, model D730-7637, was designed to shoot case loaded ammunition similar to the 105-mm howitzer ammunition. In this model tube, the powder chamber length is 31.04 inches. Some of these tubes have been modified to shoot bag charges.

The 143.6-inch tube, model D730-6745, is designed to shoot bag charges. The powder chamber length in this tube is 29.8 inches.

Ballistic properties of the two tubes are identical, and the tubes are interchangeable in the mounts.

USE FIELD ARTILLERY PERSONNEL TO GRADE ASSEMBLY AND PREFIRING PROCEDURES IN BATTERY AND BATTALION TESTS

Commanders in the field who administer battery and battalion tests are urged to start utilizing Field Artillery personnel for grading assembly and prefiring procedures of units with an atomic capability. Assembly and prefiring checkout are now artillery functions and are taught in regularly scheduled specialist and career courses at U. S. Army Artillery and Guided Missile School. These parts of tests should be graded by Artillerymen just as is gunnery, survey, or any other normal artillery function.

It has been noted in the past that Ordnance personnel were employed to grade these procedures. This has been due, primarily, to the lack of sufficiently trained Artillerymen. Most of the specialist courses at the School have been turning out students for a period of 1 year and some for 18 months. Starting with Artillery Officers Advanced Course of FY 56, career courses which receive this training include Artillery Officers Advance Course, Associate Field Artillery Officers Advance Course, and Field Artillery and Field Artillery Missile Battery Officers Course. It is believed that there are now sufficient numbers of trained personnel in the field that they can be utilized for grading these procedures.

CORPORAL GUIDED MISSILE INSTRUCTION TRANSFERRED TO US ARMY A&GMS

During the months of December 1956 and January 1957, all Corporal Guided Missile Courses at Fort Bliss, Texas, were transferred to the US ARMY A&GMS at Fort Sill, Oklahoma. This transfer involved several officer general courses and a number of officer and enlisted specialist courses. The courses transferred were:

Field Artillery Missile Officer Basic Course	6-O-B	15 weeks
Associate Field Artillery Missile Battery Officer Course	6-O-2B	16 weeks
Field Artillery Missile Maintenance Officer Course	6-O-41	31 weeks
Associate Field Artillery Missile Officer Advance Course	6-O-4B	16 weeks
Field Artillery Missile Fire Control System Maintenance	6-OE-31	32 weeks
Field Artillery Missile Electronic Materiel Maintenance	6-OE-33	28 weeks
Field Artillery Missile Mechanical Materiel Maintenance	6-E-42	8 weeks

Instruction in the Corporal system ceased at US ARMY AA&GMS on 21 December 1956 and resumed at US ARMY A&GMS on 11 February 1957.

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CHANGE IN REGULATIONS PERTAINING TO EXTENSION COURSES

Change 2, 15 Feb 57, to AR 350-60 changes the distribution of completion certificates for RA and NG or Reserve officers in the active military service to include one copy to TAG, DA, Washington 25, D. C., ATTN: (appropriate career branch).

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DEPARTMENT OF MOTORS

COLONEL J. W. MILNER, ARTILLERY, DIRECTOR

THE NEW FAMILY OF WEAPONS

Among the new family of self-propelled weapons are the 40-mm gun M42, the 105-mm howitzer M52, the 155-mm howitzer M44, the 155-mm gun M53, and the 8-inch howitzer M55. These new items of equipment have many advantages over, and are superior to, the older self-propelled artillery. First of all, they give the artillery a tremendous improvement in off-road mobility. In this era of a possible two-sided atomic war, where movement and dispersion are so vitally important, both in the offense and defense, vehicle mobility is more a matter of life or death than ever before. The artilleryman is ever aware of the all-important function of "rapid occupation of position." These new self-propelled weapons greatly improve the ability of the "king of battle" to accomplish this function. For example, the M53 and M55 can go into position and be ready to fire in 3 1/2 minutes. It

is understood that if mobility is to be increased, horsepower must be increased and/or weight reduced. Horsepower has been increased in the new family of vehicles by the adoption of a family of air-cooled engines. Another important advantage is the high degree of interchangeability of parts and accessories (approximately 85 per cent). As a result, parts supply problems for the new family of artillery weapons are reduced.

Although the new family of weapons has shown a great improvement over the older type of self-propelled weapons, they still have certain inherent drawbacks. These are primarily weight, size, high fuel consumption, and lack of adequate operating space.

The new family of weapons depends on many factors to make it always available for maximum employment and completion of a mission. Ammunition, fuel, oil, maintenance, and trained personnel are but a few factors that are required to bring effective fires against an enemy. Emphasis has always been placed on the care of the weapon and the proper training of personnel. The new family of self-propelled weapons require increased concern with crew maintenance of the vehicle. In towed artillery, the weapon is the pride of the chief of section and crew. They take pride in their ability to emplace and fire the weapon with accuracy and speed. With the self-propelled weapons, the chief of section and crew must also take pride in their ability to have a vehicle that will carry the weapon to where it is needed. In essence, crew maintenance of the vehicle is most important. The new self-propelled weapons are complicated technical machines; consequently, they require attention in the form of preventive maintenance by driver and crew. This fact must be realized by commanders, chiefs of sections, and maintenance personnel. If all concerned are aware of the need for proper training, utilization of this training to its highest level, and give enthusiastic support to maintenance requirements, it is safe to conclude that self-propelled weapons will be where they are needed when they are needed.

The following question arises frequently among military men concerning self-propelled weapons. Are self-propelled weapons useless when a mechanical failure occurs in the vehicle? Artillerymen favoring towed artillery give the argument that if a prime mover has a breakdown another vehicle could be utilized to tow the weapon. It is a fact that for a short period of time a self-propelled weapon may be ineffective due to vehicle mechanical failure; however, in the new family, the high degree of interchangeability of parts and units has alleviated this problem.

INSTRUCTION ON SURFACE-TO-SURFACE MISSILE GROUND HANDLING EQUIPMENT (GHE)

On 11 March, the Department of Motors started orientation instruction on SSM Ground Handling Equipment. This instruction will be repeated

periodically in the following courses: SSM Officer Basic Course, Field Artillery and SSM Battery Officer Course, Associate SSM Battery Officer Course, Associate SSM Officer Advanced Course, SSM Maintenance Officer Course, and SSM Mechanical Materiel Maintenance Course.

The orientation currently consists of conferences and demonstrations on the propellant trucks, the launcher, the erector, the air compressor, the air servicer, the servicing platform and the wrecker as major items of equipment in the Corporal system. Basic operating principles, characteristics, limitations, and maintenance key points are covered. As new missile systems are introduced, their equipment will be phased into the orientation.

It is being proposed that a similar orientation annex be added to the following POIs for FY 58: Field Artillery Officer Basic Course, Associate Field Artillery Battery Officer Course, Artillery Officer Advanced Course, Associate Field Artillery Advanced Course, Artillery Motor Transport Course, Artillery Vehicle Maintenance Supervision Course, Field Artillery Officer Candidate Course, and Field Artillery National Guard Officer Candidate Course.

Two new courses are being requested. POIs have been completed and are now being forwarded to Hq, CONARC, for approval for an 11-week course for GHE mechanics and a 12-week course for GHE maintenance supervisors. The latter course would include both motor officers and motor sergeants from SSM units. Tentative starting schedule is July 1957 for the first class of mechanics and October 1957 for the supervisors. The courses would be repeated every other quarter in FY 58. No schedule for FY 59 has been considered to date. Additional details on the scope of these courses, personnel eligible, firm starting dates, and input quotas will be available as soon as the courses are approved.

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DEPARTMENT OF OBSERVATION

COLONEL E. G. HAHNEY, ARTILLERY, DIRECTOR

THE HELICOPTER IN ARTILLERY SURVEY

Using the helicopter as an aid to the artillery surveyor has been considered for several years. Initially it was used to transport survey personnel and equipment to points of difficult access. In 1950, experiments were made using the helicopter as an elevated point that could be located by intersection. The pilot dropped a marker, thus establishing the surveyed point on the ground. It was found that, if the hovering height of the helicopter exceeded 50 feet above the ground, excessive errors resulted. Further, this method rendered only horizontal coordinates and offered no ability to carry direction and vertical control.

In 1956, a new method of helicopter employment was investigated. This method eliminated the disadvantages in the former test by permitting the carrying of direction, vertical control, and horizontal control. Also, no rigid limits were required for the position of the helicopter either vertically or horizontally.

The principles of the new system are simple. First, a known starting base is established and the terminal positions are occupied. The length and direction of this base are determined by conventional means. Second, an unknown base some 10,000 to 20,000 meters distant and roughly parallel to the first base is occupied. Terminal stations must be inter-visible. Last, an aerial base is established by having a helicopter fly approximately midway between the occupied bases. The ends of the aerial base are established by instrument readings on the helicopter's position by the four operators located at the ends of the occupied bases. Horizontal and vertical readings are taken simultaneously under the command of the survey officer in the helicopter. From the readings recorded by the operators at the known base, the ends of the aerial base are computed. Then, by two point resection, the coordinates of the ends of the sought or unknown base are computed. In this manner horizontal control, vertical control, and direction are carried to a distant base. As tested at the U. S. Army Artillery and Guided Missile School, this procedure, including computations, required less than 2 hours.

Based on experience gained in the initial test, experimentation was extended to locating three intermediate aerial positions. With an instrument operator at a distant unknown point taking simultaneous readings, control was carried to the distant point by three point resection computations. The final data resulting from this test were more dependable than those obtained by the two point resection method. The number of distant points so located would be limited only by communication and coordination difficulties.

The excellent results of these tests have justified the belief in the helicopter's usefulness to the artillery surveyor. Experimentation in its use will continue at the U. S. Army Artillery and Guided Missile School until all possible applications have been explored.

INERTIAL GUIDANCE FOR FIELD ARTILLERY MISSILES

The idea of inertia is a scientific fundamental. It is embodied in 2 of Newton's 3 laws of motion. Essentially, inertia means that any body in the universe will tend to remain either at rest or at a constant velocity, unless a force compels it to do otherwise. In other words, if an unbalanced force acts on a body, it will change its velocity; that is, accelerate. This principle can be applied in numerous ways, from making bowling possible to furnishing a means for missile guidance.

Inertial guidance employs a device called an accelerometer. A basic accelerometer is a pendulum. A pendulum suspended in a speeding-up

vehicle would show a displacement to the rear. Inertia is the cause of this, since the bob at the end of the pendulum tends to remain at rest. The vehicle will tend to move ahead of the bob so long as the vehicle accelerates. The force causing the vehicle to accelerate is not acting on the pendulum. It would be possible to determine the amount or degree of acceleration from within the vehicle by measuring the displacement of the pendulum. Then, by keeping track of the acceleration versus time, distance traveled could be computed.

This basic accelerometer is unsatisfactory in many respects. Any simple pendulum will tend to oscillate back and forth if it is displaced. Also sideward accelerations, vibrations, and bumps will show up, making the measurement of displacement difficult. An accelerometer is needed which is restricted to movement in one direction only. This will be its "sensitive axis." Also, some means must be provided to damp out oscillations and vibrations. A more refined device, incorporating these two characteristics, would be to place a massive bob at the end of a flexible strip free to move in one direction only. Retaining springs would be attached to the bob to dampen any oscillations. This is still simplified but will suffice for discussion. An electrically conducting "pickoff," which can ride on a potentiometer, is attached to the bob (fig 3). Now, the displacement of the bob will be proportional to any accelerations along the sensitive axis. The voltage picked off will be proportional to the displacement and therefore to the accelerations. By means of this accelerometer, then, we can obtain a voltage representing acceleration. This, in turn, can be fed to a computer which will be designed to yield as an output such quantities as range-made-good, distance errors from the standard trajectory, velocity errors, etc, depending on how the sensitive axis is mounted. These outputs can then be converted to corrective commands to be applied to the missile fins and thus we have basic inertial guidance.

One other basic problem remains. It is necessary to keep the sensitive axis in a fixed direction in space. The missile, however, will obviously change its attitude continuously, and thus redirect the sensitive axis continuously. One solution is to have a "stable table" or a mounting for the accelerometer which will keep a constant direction in space. This can be accomplished by using gyroscopes, which have the property of rigidity in space. The missile then moves about this gyro-controlled platform on which the accelerometer can be mounted.

Inertial guidance is one promising solution of the missile guidance problem. It is completely internal to the missile. Hence, after the missile is launched, it cannot be jammed or interfered with by an enemy.

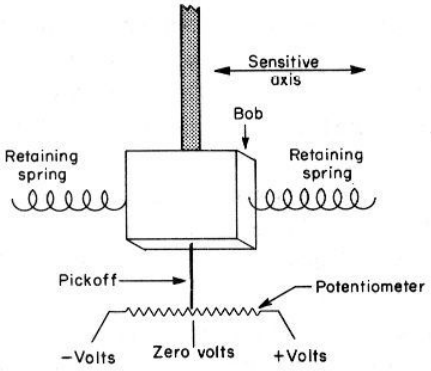

Figure 3. Simplified accelerometer.

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FM 6-40 AND EXTENSION COURSES

With the advent of a new FM 6-40 the Extension Courses of the US ARMY A&GMS will reflect the new changes. Extension courses based on the new FM 6-40 will be available for study by 1 July 1957. Study the new systems through extension courses.

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DEPARTMENT OF TACTICS AND COMBINED ARMS

COLONEL F. T. UNGER, ARTILLERY, DIRECTOR

SPECIAL WEAPONS INSTRUCTION

Commencing with the Artillery Officer Advanced Course of 1955-56 and the first Associate Field Artillery Officer Advanced Course in fiscal year 1957, all officer advanced courses at the U. S. Army Artillery and Guided Missile School have received detailed classified instruction in Special Weapons.

This instruction consists of 134 periods on special weapons effects taught by the Department of Tactics and Combined Arms, and 26 periods on atomic projectiles and warheads taught by the Department of Materiel.

The special weapons effects instruction is based on the Special Weapons Course (250-0-8) presented at the U. S. Army Command and General Staff College. It includes detailed coverage of atomic weapons effects to include selection of desired ground zero and height of burst; damage estimation, both detailed and rapid; and troop safety. The instruction culminates

in a series of technical exercises designed to give complete coverage of target analysis procedures and duties of the special weapons officer.

The materiel instruction is designed to give each student a working knowledge of field artillery prefiring procedures on 8-inch howitzer and 280-mm gun atomic projectiles and Honest John and Corporal warheads.

Successful completion of the above-mentioned special weapons instruction qualifies the student for the award of the prefix 5 to his primary military occupational specialty (MOS), and indicates that he is qualified to serve as a special weapons officer on an Army staff at any level.

The special weapons effects instruction given by the Department of Tactics and Combined Arms is presented prior to instruction in field artillery tactics so that employment of atomic weapons can be stressed during that phase of the student's training. At present, approximately 55 periods of tactics instruction include an active atomic situation. In the near future, all tactics instruction will be based on the use or threat of use of atomic weapons.

The Department of Gunnery teaches atomic field artillery gunnery. The Department of Observation provides information concerning methods and procedures used in obtaining wind data for fallout prediction, and in locating burst points for post-strike analysis computations.

Training literature used in the atomic weapons effects instruction includes FM 101-31 and FM 101-31A, both titled "Staff Officers' Field Manual - Atomic Weapons Employment," and TM 23-200, "Capabilities of Atomic Weapons." The 39-series of technical manuals is used in teaching prefiring procedures. These field manuals and technical manuals are classified SECRET, RESTRICTED DATA, and are available through Adjutant General publications channels.

ROCID-ROCAD-ROTAD

Three new types of divisions have been developed to replace the standard infantry, armored, and airborne divisions which became so well known during and following World War II. The new infantry, armored, and airborne divisions are referred to as ROCID, ROCAD, and ROTAD respectively. The major units of these divisions are shown below:

ROCID Infantry Division

Five Infantry Regiments
Tank Battalion, 90-mm Gun
Armored Cavalry Battalion
Engineer Combat Battalion
Signal Battalion
Division Artillery
Division Trains

ROCAD Armored Division
Four Armored Infantry Battalions
Four Tank Battalions, 90-mm Gun
Armored Cavalry Battalion
Armored Engineer Battalion
Armored Signal Battalion
Armored Division Artillery
Division Trains

ROTAD Airborne Division
Five Airborne Combat Groups (similar to ROCID regiments)
Airborne Engineer Battalion
Airborne Signal Battalion
Airborne Division Artillery
Command and Control Battalion
Support Group (comparable to division trains)

The following training texts, published by U. S. Continental Army Command, contain detailed information concerning these new type divisions, and are of particular interest to artillerymen. These texts received wide distribution and should be available at most active Army installations.

Training Text 7-100-2, The Infantry Division, March 1957.
Training Text 17-100-2, The Armored Division, February 1957.
Training Text 57-100-1, The Airborne Division, October 1956.
Training Text 6-21-2, Division Artillery, Infantry Division, February 1957.
Training Text 6-18-2, Mortar Battery, Infantry Regiment, February 1957.
Training Text 6-20-2, Division Artillery, Armored Division, February 1957.
Training Text 57-6-1, Division Artillery, Airborne Division, October 1956.
Training Text 57-6-140, Heavy Mortar Battery, Airborne Division, October 1956.

All service school resident instruction will be based on ROCID-ROCAD-ROTAD organizations effective with classes starting on or after 1 May 1957.

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OFFICER CANDIDATE SCHOOL

COLONEL C. A. SYMROSKI, ARTILLERY, COMMANDANT

SPECIAL OFFICER CANDIDATE CLASSES FOR NATIONAL GUARDSMEN AND RESERVISTS

The U. S. Army Artillery and Guided Missile Officer Candidate School will conduct two special, 11-week, officer candidate courses during the

summer of 1957. One course will commence 29 May 1957 and will be for Reservists. The second course will commence 12 June 1957 and will be for National Guardsmen. Quotas have been assigned to National Guard units and Reserve units by the National Guard Bureau and U. S. Continental Army Command respectively.

The regular officer candidate course is of 22-weeks duration and is also available to Guardsmen and Reservists. The special 11-week courses have been set up for the benefit of those enlisted men in the civilian components who cannot absent themselves from civilian occupation or schooling for the longer course. The special courses have been programmed for a student personnel strength of 120 in each course.

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DEPUTY ASSISTANT COMMANDANT

COLONEL C. H. WHITE, JR., ARTILLERY

AN ARTILLERY AND GUIDED MISSILE COURSE FOR SENIOR FIELD ARTILLERY OFFICERS

A proposed Senior Field Artillery Officers Course has been prepared and forwarded to Hq, CONARC, for approval. The course is designed primarily for commanders and senior key staff officers of field artillery units or headquarters above battalion level. The following subjects are included in the course--all instruction based on the new type divisions:

Field Artillery Tactics
Special Weapons Effects
Field Artillery Missiles (includes Corporal, Redstone, Honest John, Little John, LaCrosse, Dart, and Sergeant)
Field Artillery Gunnery
Atomic Projectiles and Warheads
Missile Survey and Target Acquisition
Communications
Combat Developments
Nonresident Training Support

It is proposed that the course be of 5-week duration, conducted 4 times each year, with 30 students per class.

The majority of the officers who will attend this course will have completed branch career schooling and, in some cases, even War College level of education. In many instances, that schooling occurred before the advent of atomic weapons and field artillery missiles. It is anticipated that this course will meet a requirement for training those officers who will direct the employment of missiles and cannon with atomic capabilities, but who have had no formal schooling in such fields.

The first of these proposed classes has been tentatively scheduled to report on 11 August 1957. Quotas to the courses will be allocated by Hq,

CONARC, in conjunction with the Artillery Section of Career Management Division, Department of the Army.

ALLIED OFFICER STUDENTS AND VISITORS

Of interest to field artillerymen is the number of allied officers who visit or attend courses at US ARMY A&GMS.

Currently there are 82 allied officers from 22 countries enrolled in 15 courses at the School. A total of 197 allied officers have enrolled in courses during this fiscal year.

Since 1 January 1957, 8 groups, totalling 27 allied officers, representing 6 countries, have visited the School for periods of from 1 to 3 days.

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SECRETARY

COLONEL JOHN W. DEAN, JR., ARTILLERY

AT THE BOOK STORE

There are several versions of the legend of Saint Barbara, the Patroness of Artillerymen. On the inside of the back cover of this issue is the version and miniature picture most universally accepted and is approved for the Artillery by the Commandant--it is the version used in the Order of Saint Barbara. The legend and an enlarged picture, printed separately on 8- by 10-inch gold-tinted paper, unframed, are available at the Book Store. The price is $.75 per set, postpaid. These attractive sets are suitable for display in day rooms, offices, and headquarters. They even add a fine touch when included in personal displays of framed orders, diplomas, certificates, etc., in quarters.

Research toward fire direction equipment improvement is constantly conducted by the Department of Gunnery. As a result of this research, a two-dimensional, high angle GFT for the 105-mm howitzer, complete with instructions, is now available at the Book Store. Through the use of this GFT a speedier and more accurate computation of high angle data is now possible. Price is $1.75 per set, postpaid.

Many fine technical books pertaining to electronics and guided missiles are now stocked by the Book Store. Such books include the following:

Riders "Basic Electricity," Vol I through V
Riders "Basic Electronics," Vol I through V
American Radio Relay League "Radio Amateurs Handbook"
Cooke "Orleans," Mathematics essential to electricity and radio
Philco Training Manual "Electronic Circuit Directory"
Philco Training Manual "Syncros and Servo Mechanism"

Personnel anticipating schooling or assignment in such missile units might well benefit from advanced preparation by "brushing up" on these specialized subjects from these books. Price list on request from the Book Store.

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PREPARE FOR RESIDENT COURSES

For the Reserve or National Guard officer intending to come to a resident course we urge prior extension course study in areas where the officer feels he may be weak. They are a fine preparation--use them.

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CAREER MANAGEMENT DIVISION, ARTILLERY BRANCH

BRIGADIER GENERAL M. M. MAGEE, USA, CHIEF

CROSS ASSIGNMENTS

In order to utilize Artillery officers most economically and efficiently, it is necessary to train as many officers as possible in both the surface-to-air and surface-to-surface artillery techniques. This is done by school training and by cross assignments to both type units. Normally, officers are cross assigned at one of the following times: on graduation from the Advanced Course, when sent overseas, when returned from overseas, or when selected for command duty. Those officers cross assigned on going overseas usually go to surface-to-surface artillery units, while those returning from overseas who are cross assigned usually go to surface-to-air artillery units, because of the preponderance of type of artillery in each area.

ARTILLERY OFFICER STRENGTHS

A shortage of Artillery officers continues to exist, particularly in the grade of captain and major. Measures taken to correct and compensate for this shortage include: encouraging voluntary transfers from other branches, recalls to active duty, relief of Artillery officers from BI duties and assignment to artillery duties, and retention beyond Title II retirement eligibility dates of selected Artillery officers. Commanders of all activities are requested to assist in the implementation of these measures where appropriate.

VOLUNTARY EXTENDED ACTIVE DUTY FOR COMMISSIONED OFFICERS--FY 1957

During fiscal year 1957 the Department of the Army will, as an exception to policy and on a voluntary basis, select and call to active duty a limited number of reserve components commissioned officers in the critical technical specialists fields and in other areas. Artillery still has a limited quota for recall to active duty in the grades of major, captain, and lieutenant. Officers qualified in the following MOS's may apply for recall: 0140, 0200, 1154, 1172, 1174, 1180, 1181, 1190, and 1193. The program was announced in DA Circular 135-18, 9 May 1956. No recall program for FY 58 has been announced; however, it is anticipated that one will be announced shortly.

WARRANT OFFICER PROCUREMENT

There is still a critical need in Artillery for warrant officers in the specialties of MOS 1121 (Artillery Electronic Fire Control Assistant), MOS 1184 (Guided Missile Integrated Fire Control Assistant), and MOS 1185 (Guided Missile Materiel Assistant), as announced in Department of the Army Circular 601-25, 14 June 1956. Commanders should continue to encourage qualified enlisted personnel to apply for direct appointment as Reserve warrant officer with concurrent orders to active duty.

WEATHER WARRANTS

In the Artillery warrant officer career field, there is at present a shortage of guided missile trained warrant officers and a small overage of "Weather Warrants". In order to utilize all Artillery warrant officers, a few previously trained in MOS 8219 will be retrained in a guided missile MOS.

HOW AN OFFICER MAY OBTAIN HIS OEI

An officer may obtain his current or past OEI from either The Adjutant General or his Career Management Branch by personally visiting the Department of the Army or by deputizing in writing another officer to examine his record to obtain his OEI. Officers assigned to Career Management activities or to The Adjutant General's Office may not be deputized for this purpose. Following is an enlightening discussion of the OEI--what it is and its purpose.

THE PROBLEM

Scores on single efficiency reports fluctuate widely. Each report represents the opinion of one rater, reviewed by an indorser. Fluctuation of scores is the rule, rather than the exception. Even raters observing the same performance at the same time often disagree in evaluating it. Too often the efficiency report is a reflection of the rater, rather than an evaluation of the performance of the rated officer. The difference between "easy" and "hard" raters is one of the typical causes of fluctuation in efficiency report scores.

THE OVERALL EFFICIENCY INDEX

To lessen unfair effects of this problem the Army has adopted the Overall Efficiency Index. This index, abbreviated OEI, is an average of the most recent efficiency ratings rendered on a particular officer. The averaging method was used by the Army prior to World War II and was found to be the best estimate of efficiency when raters have disagreement as to the worth of a subordinate.

Beginning with the computation of the Overall Efficiency Index for 1956, the five year base used for the computation of the OEI will be progressively increased to a seven year base according to the following schedule: 1956 OEI will be increased to 6 years, the 1957 and all future OEI's to 7 years. However, in some instances, the index is computed for lesser periods of service, being calculated on the basis of whatever scores are available. Each index considers the length of duty time upon which the single report is based.

WHAT REPORTS ARE USED

Only regular efficiency reports are used in calculating the Overall Efficiency Index. Academic, letter, or abbreviated reports, although an important part of an officer's efficiency report file, are not used.

No score issued before 1 July 1947 will be included in calculating the OEI. Each new reporting year, the scores for that year are included in the computation. The OEI is a moving score which covers only the efficiency reports for the most recent six or seven years.

Because of school and other assignments for which scored reports are not rendered, the OEI for an individual officer will seldom be based on a full six or seven years' performance. The amount of duty time upon which the OEI is based is always presented by the index itself.

HOW THE OEI IS COMPUTED

Since 1 July 1947, all efficiency scores have been reported by using the Army Standard Rating (A.S.R.) system. Scores under this system range from a low of 51 to a high of 150, with 100 representing the middle score. The OEI uses this same standard scoring system.

At the end of each reporting year (now 31 May), the numerical scores of each officer's efficiency reports for recent years are assembled. The scores are averaged, taking into account the amount of duty time on which each report is based. The average scores on all Army officers are then arranged from the lowest to the highest, and the middle scores are assigned a value of 100. Working systematically from this mid-point, the average scores are assigned values from 51 to 150. The relative positions of officers in the service are in no way altered by this procedure.

INTERPRETING THE OEI

The index allows comparison of an officer with other officers in the Army during a particular year, or over a series of years. The meaning of an OEI is always relative to the entire population of Army officers. It carries no implication about the number of officers who can be considered competent or incompetent.

The OEI's are so developed that two-thirds of the officers will have scores between 80 and 120; one-sixth will exceed 120 and one-sixth will fall below 80. The pattern of scores will hold true for every year, making it possible to have a consistent interpretation of the OEI, even though the rating forms may be changed.

The OEI, in comparison with a series of fluctuating single scores, gives a more accurate and fair appraisal of an officer's relative efficiency. When considered with other available information, the index makes possible more effective personnel action.

OEI DISCUSSION

GYROSCOPE SCHEDULE

The following schedule shows the entire gyroscope program from beginning to the latest released information which covers the 3d Infantry Division in the spring of 1958.

GYROSCOPE UNITS

Unit Gyroing to Overseas	CONUS Station	O/S Area	Port Date (Applies to CONUS & O/S Unit)	Unit Gyroing to CONUS	CONUS Station
10th Inf Div 25th FA Bn. 35th FA Bn. 40th FA Bn. 85th FA Bn. 43rd AAA Bn.	Ft Riley, Kans	USAREUR	Jul-Sep-Nov 55	1st Inf Div 5th FA Bn 7th FA Bn 32nd FA Bn 33rd FA Bn 48th AAA Bn	Ft Riley, Kans
3d Armd Cav Regt	Ft Meade, Md	USAREUR	Jul 55	2d Armd Cav Regt	Ft Meade, Md.
508th RCT (508th RCT absorbed in 101st Airborne Division)	Ft Campbell, Ky	USAFFE	Jul 55	187th RCT	Ft Bragg, N.C. (See Foot Note 1)
11th Abn Div 89th Abn FA Bn. 457th Abn FA Bn. 675th Abn FA Bn. 544th Abn FA Bn. 88th Abn AAA Bn.	Ft Campbell, Ky	USAREUR	Jan-Feb-Mar 56	5th Inf Div 19th FA Bn 21st FA Bn 46th FA Bn 50th FA Bn 47th AAA Bn	Ft Ord, Calif.
3d Armd Div	Ft Knox, Ky	USAREUR	May 56	4th Inf Div	Ft Lewis, Wash.
257th AFA Bn	Ft Sill, Okla	USAREUR	Apr 56	597th AFA Bn	Ft Sill, Okla.
97th FA Bn	Ft Carson, Colo	USAREUR	Apr 56	254th FA Bn	Ft Carson, Colo.

GYROSCOPE UNITS

Unit Gyroing to Overseas	CONUS Station	O/S Area	Port Date (Applies to CONUS & O/S Unit)	Unit Gyroing to CONUS	CONUS Station
583d FA Bn	Ft Bragg, N. C.	USAFFE	May 56	268th FA Bn	Ft Bragg, N.C.
532d FA Obsn Battalion	Ft Sill, Okla	USAREUR	Jun 56	529th FA Obsn	Ft Sill, Okla.
553d FA Bn	Ft Sill, Okla.	USAREUR	Jul 56	18th FA Bn	Ft Sill, Okla.
538th FA Bn	Ft Carson, Colo	USAREUR	Jun 56	273d FA Bn	Ft Carson, Colo.
2d Inf Div (-) (2 RCTS) 15th FA Bn. 37th FA Bn. 82d AAA Bn.	Ft Lewis, Wash	USARAL	Jul-Aug 56	71st Inf Div (-) (Inactivated)	(See foot note 2)
8th Inf Div 28th FA Bn. 43d FA Bn. 45th FA Bn. 56th FA Bn. 23d AAA Bn.	Ft Carson, Colo	USAREUR	Jul-Aug-Sep 56	9th Inf Div 26th FA Bn 34th FA Bn 60th FA Bn 84th FA Bn 42d AAA Bn	Ft Carson, Colo.
534th FA Bn	Ft Sill, Okla.	USAREUR	Feb 57	290th FA Bn	Ft Sill, Okla.
55th FA Bn	Ft Sill, Okla.	USAREUR	Feb 57	765th FA Bn	Ft Sill, Okla.
720th FA Bn	Ft Lewis, Wash.	USAREUR	Feb 57	30th FA Bn	Ft Lewis, Wash.

11th Armd Cav Regt	Ft Knox, Ky	USAREUR	Mar 57	6th Armd Cav Regt	Ft Knox, Ky.
613th FA Bn	Ft Bragg, N.C.	USAREUR	Mar 57	59th FA Bn	Ft Bragg,N.C
546th FA Bn	Ft Lewis, Wash	USAREUR	Oct 57	519th FA Bn	Ft Lewis, Wash.
4th Armd Div 22nd AFA Bn. 66th AFA Bn. 94th AFA Bn. 197th AFA Bn. 195th AAA Bn.	Ft Hood, Texas	USAREUR	Nov-Dec-Jan 57-8	2nd Armd Div 3rd AFA Bn 14th AFA Bn 16th AFA Bn 74th AFA Bn 94th AAA Bn	Ft Hood, Tex.
2nd Armd Cav Regt	Ft Meade, Md.	USAREUR	Feb 58	3d Armd Cav Regt	Ft Meade, Md.
36th FA Bn	Ft Sill, Okla.	USAREUR	Feb 58	291st FA Bn,F	Ft Sill, Okla.
269th FA Bn	Ft Carson, Colo.	USAREUR	Feb 58	775th FA Bn	Ft Carson, Colo.
3rd Inf Div 9th FA Bn. 10th FA Bn. 39th FA Bn. 41st FA Bn.	Ft Benning, Ga.	USAREUR	Mar-Apr-May 58	10th Inf Div 25th FA Bn 35th FA Bn 40th FA Bn 85th FA Bn	Ft Benning, Ga.

FOOT NOTES:

1. 187th RCT PCSed from Bragg to Campbell 15 Feb 56 to be absorbed by 101st Abn Div. 508th RCT returned from USARFE Jun 56 to Campbell to be absorbed in 101st Abn Div.

2. Only 400 persons (officer and enlisted) of the 4th Inf Div returned to Ft Lewis.

   71st Inf Div (-) returns to Lewis and inactivates. The personnel will be absorbed into the 4th Inf Div at Lewis.

SWING TO MISSILES

The Vice Chief of Staff has directed a study be made of the problem of ensuring an adequate supply of Artillery officers in the guided missile field.

While detailed research is being completed, the following interim personnel policy will be followed:

a. A program of cross assignment of certain FA and AA colonels to missile units to provide an adequate pool of senior officers with technical competence for general officer promotion consideration.

b. Assignment of certain AA and FA officer graduates of the Artillery Advanced Course to missile units and ARAACOM's staff to increase efficiency of missile units, motivate junior officers to ask for missile unit assignments, and provide a larger pool of highly qualified senior officers in the future with missile experience.

c. Assignment of a proportionate number of missile trained Artillery officers to USMA staff and faculty, 1st RCT at USMA, ROTC duty, and the Artillery Career Management Branch to emphasize to young officers entering the service the increasing role of guided missiles in our advancing technology.

Chief, CMD, in a talk to USMA Class of 1957 on 1 February 1957, stated that graduates selecting Artillery would be assigned as follows: approximately 50 percent to SAM training, 25 percent to SSM training, and 25 percent to conventional artillery with many receiving HONEST JOHN rocket training.

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Saint Barbara of the Artillerymen

According to legend, Saint Barbara was the extremely beautiful daughter of a wealthy heathen named Dioscorus, who lived near Nicomedia in Asia Minor. Because of her singular beauty and fearful that she be demanded in marriage and taken away from him, he jealously shut her up in a tower to protect her from the outside world.

Shortly before embarking on a journey, he commissioned a sumptions bathhouse to be built for her, approving the design before he departed. Barbara had heard of the teachings of Christ, and while her father was gone she spent much time in contemplation. From the windows of her tower she looked out upon the surrounding countryside and marveled at the growing things; the plants, the trees, the animals, and the people. She decided that all these must be part of a master plan, and that the idols of wood and stone worshipped by her parents must be condemned as false. Gradually she came to accept the Christian faith.

As her belief became firm, she directed that the builders redesign the bathhouse her father had planned, adding another window, so that the three windows might symbolize the Holy Trinity.

When her father returned he was enraged at the changes and infuriated when Barbara acknowledged that she was a Christian. He dragged her before the prefect of the province, who decreed that she be tortured and put to death by beheading. Dioscorus himself carried out the death sentence. On his way home he was struck by lightning and his body consumed.

Saint Barbara lived and died about the year 300 A. D. She was venerated as early as the seventh century. The legend of the lightning bolt which struck down her persecutor caused her to be regarded as the patron saint in time of danger from thunderstorms, fires, and sudden death.

When gunpowder made its appearance in the Western world, Saint Barbara was invoked for aid against accidents resulting from explosions--and since some of the earlier artillery pieces often blew up instead of firing their projectile, Saint Barbara became the patroness of the artillerymen.

Saint Barbara is usually represented standing by a tower with three windows, carrying the palm of a martyr in her hand. Often, too, she holds a chalice and sacramental wafer, and sometimes cannon are displayed near her. In present calendars, the feast of Saint Barbara falls on December 4th.