RESTRICTED

NUMBER 69 DECEMBER 1946

CATM

I SAID to the man who stood at the gate of the year, "Give me a light that I may tread safely into the unknown," and he replied, "Go out into the darkness and put your hand into the hand of God. That shall be to you better than light and safer than the known way."

—M. L. Haskins

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Canadian Army Training Memorandum

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Contents

SECURITY GRADINGS

> *Correct Security classifications for military documents is a matter of vital importance; over-classification of material "just to be sure" is as harmful as a grading which is too low. The accompanying article was prepared for CATM by the Directorate of Military Intelligence, Army Headquarters.—Editor.*

It is doubtful whether Shakespeare had Security of Information in mind when he wrote the immortal words "To be or not to be: that is the question: . . ." and it is probable at that time his mind was far from the thought of "Regulations of the Realme which Concerneth Securitye". However, the problem "to be classified or NOT to be classified" concerns all of us who originate military documents or take extracts therefrom.

The question then becomes "To be classified or NOT to be classified—that is the question!" To place a SECRET or RESTRICTED classification upon every document we originate, with a "just-to-be-sure" idea in mind, does not in the least help the cause of Security; rather, the over-classification of documents tends to destroy the effect of the various gradings, in that it lowers the force and meaning of the grading in the mind of the recipient.

After due consideration and having decided that our document is to be classified, then it is important to see that the correct grading is given to it. CARO 5861 gives various examples of subjects and how they should be classified, and it is recommended for your careful study. In general the following is a good guide:

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HISTORY OF THE UNIVERSITY CONTINGENTS CANADIAN OFFICERS TRAINING CORPS

McGILL CONTINGENT (148th Bn. C.E.F.)

This is the first of a series of articles on the history of the University Contingents, Canadian Officers Training Corps. In this issue CATM publishes material prepared at the McGill University, Montreal, and University of Manitoba, Winnipeg, in co-operation with GOsC the Quebec and Prairie Commands, respectively. The history of other COTC Contingents will appear in future issues of CATM.—Editor.

BATTLE HONOURS: ARRAS 1917-18, YPRES 1917, HINDENBURG LINE, HILL 70, AMIENS, PURSUIT TO MONS

Formation and Early Days, 1912-18: The McGill Contingent of the COTC, organized barely two years before the outbreak of war (1914-18) by Maj. C. M. McKergow, was the first Canadian Officers Training Corps organized in North America. Its first Commanding Officer was Maj. V. I. Smart. The Corps was the centre of the University's military activities, and other supplementary war service groups. It trained over 3,000 men of all ranks, the majority of whom saw active service. It organized the 148th Overseas Battalion, C.E.F., (Commanded by Col. A. A. Magee, C.B.E., D.S.O., E.D.) and trained the men who were to become its officers.

It trained five University Companies as reinforcements to the Princess Patricia's Canadian Light Infantry. From the University were supplied all ranks of the No. 3 McGill General Hospital; it organized two Siege Batteries and furnished a large proportion of the University Tank Battalion.

Immediate Training

Due to extreme pressure on the Western Front, members of the McGill COTC were immediately put into training for active service with the Overseas Forces. This training began in August 1914, two full months before the commencement of the University session.

It was decided, in addition to the training of officers, to raise a McGill Regiment. The members of this Regiment were organized into two classes: the first, forming ninety percent, consisted of University men, the remainder being their relatives and friends. From the McGill Regiment, thirty officers took commissions with the PPCLI, seventy-five other ranks were commissioned in the field with that unit, and one hundred others received commissions with various other Canadian and British units.

Between Wars: The McGill COTC, in common with other NPAM units, suffered from the general apathy towards anything military from 1919

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SECURITY

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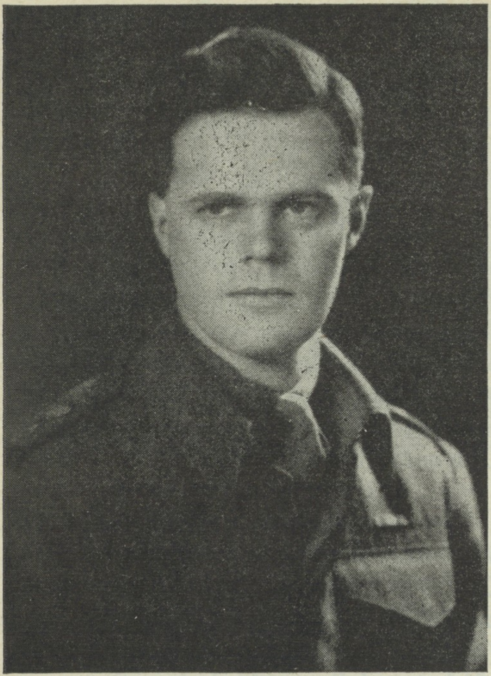


Lt. Col. R. H. E. Walker, D.S.O., E.D., Officer Commanding the McGill University Contingent, COTC.

to 1939. In spite of efforts to lure undergraduates into the Corps by various means, inclusive of providing accommodation in the Laurentians and concentrating on skiing week-ends, only 13 undergraduates submitted themselves for re-enlistment in the autumn of 1936.

The Corps at that time was made up chiefly of non-McGill men. When Lt. Col. T. S. Morrisey, D.S.O., E.D., took command in 1936 he was told by District HQ that he could have two years in which to see what could be done to reorganise the unit in accordance with the COTC regulations, and that if this could not be done it would have to be disbanded. Col. Morrisey personally lead a recruiting campaign and succeeded in bringing in 56 students in 1936, which added to the 13 who re-enlisted, gave a majority of students on strength for the first time in many years.

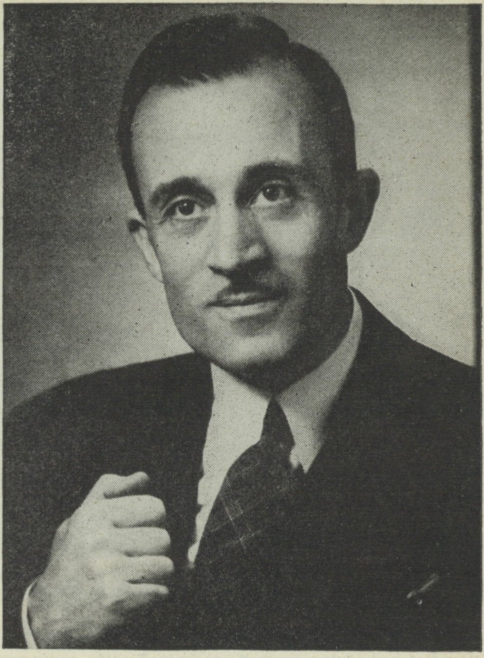
At the end of the training season 1936-37 it was thought that there was a sufficient nucleus of genuine undergraduates in the Corps to hold it together, and all non-McGill men, with the exception of a few senior NCOs required to serve until students had qualified to succeed them, were told that they could not be re-enlisted in 1937. Through the continued efforts of the Commanding Officer, by the end of Summer Term in 1939 there were some 125 cadets enrolled in the Corps.

1939-46: Just previous to the outbreak of the Second Great War, due to the illness of the CO, the command was taken over by Honorary Col. Magee, with Maj. J. M. Morris, M.C., V.D., as his second-in-command. On the declaration of war these two officers called in a selected list of some 20 ex-officers and RMC graduates to assist in rapidly recruiting ex-officers, NCOs and other ranks with war experience to re-train as instructors. The potential instructors, a total of 115 including 40 RMC graduates, were given concentrated refresher courses, which were in continuous progress, every afternoon and evening every day of the week except Sunday, for a period of two months.

Recruits flocked to join the Corps, comprising graduates not only of McGill but representatives from practically every University in Canada and a large percentage of the undergraduate body, until within two months the Corps had a strength of approximately 1,400. Lectures and instruction were given to prepare all Cadets for "B" (Common to All Arms) and "C" (Special to Arms) Syllabi. Instruction for "C" Syllabus was given in all branches, i.e., Cavalry (Horse, Armoured Car), Artillery, Artillery Survey, Engineers, Infantry (Rifle, Machine Gun), and, for a brief period, Air Force training. At the first examinations held in March 1940, 922 candidates wrote both papers and 540 passed.

First Camp, 1940

In the Winter of 1939-40 and throughout the war training trips were organized to Sherbrooke and other places, and in the summer of 1940 the first camp was held at Mount Bruno. It was during this first Mount Bruno Camp that the "R & S" Companies were formed, comprising some 525 picked men, some with partial, but many with no actual university training, but all keen, intelligent young men who had obligated themselves for Active Service. In their final examinations in August and December of that year 90% passed the Common to All Arms, and 70% the Special to Arms. All those successful in these examinations passed their Practical, and, almost without exception, proceeded overseas, a very large number to artillery units which at that time were rapidly building up and required officers and NCOs.



Dr. F. Cyril James, principal and vice-chancellor of McGill University.

In February 1940, the floor of the Gymnasium Armoury was ready, and Headquarters was transferred to the new building. Following this move the Command of the Corps was assumed by Lt. Col. J. M. Morris. In the autumn of 1940, due to the new mobilization law, basic training was made compulsory at Universities, and the Corps was reorganized into two units. All without basic training were enlisted in the McGill Reserve Training Battalion

Assault boat training at Petawawa Camp, 1944.

Pontoon bridging at Petawawa Camp, 1945.

(MRTB). Those who had already qualified in basic training, and who were prepared to obligate themselves for active service, were embodied in the COTC proper and wore the distinguishing white cadet badge. Full-time officers and NCOs (A & T Staff) were assigned to the Corps for training and administration of the MRTB, but the training of the COTC proper continued to be carried out by the Reserve Officers of the Contingent. From 1942 onwards, graduates from McGill COTC courses went to the OTCs at Gordon Head, B.C., and Brockville, Ont.

Exchange Visits

In the summer of 1943 the main training camp was held at Niagara-on-the-Lake, and during that camp there was an exchange of visits and courtesies with the United States Army Post at Fort Niagara, where on May 24

A Bailey bridge built by the McGill University Contingent, COTC, at Petawawa Camp in 1945.

Officers' and Cadets' mess for the McGill University Contingent, COTC.

a detachment of Cadets and the pipe band took part in the ceremony of Retreat on the United States Army parade ground.

In addition to cadet training, the Corps was privileged, with the co-operation of the Reserve Units, to train the Provisional Officers Training School Classes of The Royal Montreal Regiment, The Black Watch (RHR) of Canada, 17th Duke of York Royal Canadian Hussars, Royal Canadian Artillery, Canadian Grenadier Guards, Victoria Rifles of Canada, Fusiliers Mont Royal, etc. During the seasons 1943-44, Petawawa Camp was made available for the training of the engineering group, and as the war progressed, cadets carried out their two-week Camp training at various other Training Centres, such as Farnham, Three Rivers, Sherbrooke, Barriefield, St. Johns, P.Q.

More than 5,000 Cadets received their training in the COTC, of whom approximately 2,000 served, exclusive of the University Naval Training Division and the University Air Squadron. The present records show that approximately 300 McGill men made the supreme sacrifice, of whom a large percentage had served in the COTC.

The turnover in the headquarters establishment and instructional staff was heavy and constant. In the first place, the entire Reserve establishment offered themselves for active service, but age and disabilities in many cases were obstacles. Nevertheless, in all approximately 150 officers and instructors of various ranks were absorbed into the services.

Driving a carrier at Niagara-on-the-Lake where the McGill University Contingent, COTC, did some of its training.

ATOMIC TORPEDOES

Atomic torpedoes capable of diving to great depths before exploding are expected to develop from the underwater explosion of an atomic bomb at Bikini.—(*U.S. Infantry Journal*).

UNIVERSITY OF MANITOBA CONTINGENT, COTC

The first meeting held in the University of Manitoba to discuss provision for military instruction for students took place on September 19, 1914. The chairman was Sir James Aikens, then Lieutenant-Governor.

Pending outcome of discussion with militia authorities, an organization parade was held on the University Campus on Jan. 18, 1915, and a beginning was made in drilling and lectures for those desiring officer qualification. On the same date, application was made for the formation of a Contingent of the Canadian Officers Training Corps, and on Mar. 1, 1915, authorization appeared in the Gazette.

The Contingent originally consisted of eight companies, each of 60 all ranks, with a HQ staff of five, a total of 485. Graduates, the faculties of Arts and Science and of Engineering and the Medical College, were each represented by separate companies and Wesley College by two companies.

During the first year 474 men were enlisted. A series of about 10 lectures was given during February and March, and 90 wrote examinations and took the practical test for Certificate "A".

Training during the first winter was carried on almost entirely out of doors in a rigorous winter, without uniforms, and with only 100 rifles for the whole Contingent. Much of the instruction was given by an officer and three sergeant instructors from the Active Militia.

On Oct. 16, 1915, Capt. R. F. McWilliams (now Lieutenant-Governor of Manitoba) was recommended as Officer Commanding with the rank of Major.

Enlisted In Ranks

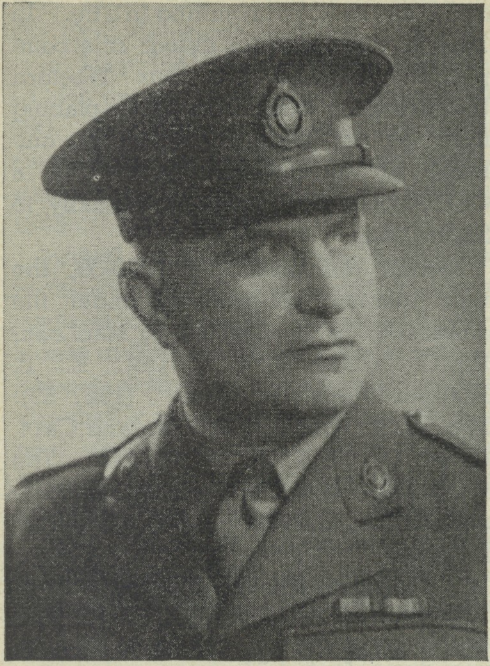
In the spring and summer of 1915 a great many members of the Contingent enlisted in the ranks of overseas units. The idea then originated that if members qualified for commissioners were to go overseas in the ranks, it would be preferable for them to go as members of a Battalion wholly composed of University men. After some delay the necessary authority was obtained to raise such a battalion composed of a company from each of the four western Universities.

Enlistment began at the end of 1915. Soon the companies were complete—"A" Company and one platoon of "B" Company from Manitoba, the remainder of "B" from Saskatchewan, "C" from Alberta and "D" from British Columbia. Until May 1916 each company trained separately. Then the Western Universities Battalion (the 196th), C.E.F., was assembled at Camp Hughes under the command of Lt. Col. D. S. Mackay. On Oct. 26, 1916, the battalion proceeded overseas. Soon after its arrival at Seaford, its potentiality as a source of officer material was recognized. Its strength dwindled rapidly as group after group was sent to Officers' Training Centres.

Finally and reluctantly those who remained came to realize that they could not proceed overseas as a unit. In the spring of 1917 they were sent to Bramshott Camp to become part of the 19th Reserve, and formed a large part of its training cadre. Its members continued to receive commissions in many Canadian battalions in France and also in battalions of the Imperial Army.

Contingent Re-Organized

At the end of the first Great War the University of Manitoba had a great influx of Returned Servicemen. In 1919-20, however, no attempt was made to reconstitute the COTC which had played such a fine part in the Great War just concluded, but with the opening of the University Year in the fall of 1920, HQ of MD 10 decided to proceed



Lt. Col. G. P. R. Tallin, Officer Commanding the University of Manitoba Contingent, COTC.

with the re-organization of the Contingent. The Military Committee of the University was reconstituted under the chairmanship of Sir James Aikins, who was then Lieutenant-Governor of the province. The Commanding Officer was Lt. Col. N. B. MacLean, D.S.O., who had gone overseas as a Company Commander in the 61st Battalion and who had later transferred into the British Army in the Royal Artillery and had a distinguished career in that service.

A slate of officers was selected from the Returned Service personnel at the University. Included were both staff and students. The Contingent was re-organized on a four-company basis and training was started in January 1921. The unit comprised four companies: "A" Company—Arts and Science; "B" Company—Engineering; "C" Company—Wesley; "D" Company—St. Johns.

Spurred on by the participation of the men returned from active service, recruiting was carried on enthusiastically and the unit was recruited up to almost full strength. Great support was given by the District Officer Commanding MD 10, who assigned an officer of the PPCLI and a staff of NCO instructors to assist in training. The first training officer was Lieut. E. E. Norman, PPCLI. He was followed by Capt. A. W. Hunt, M.M., who during the Second Great War was GSO 1, MD 10.

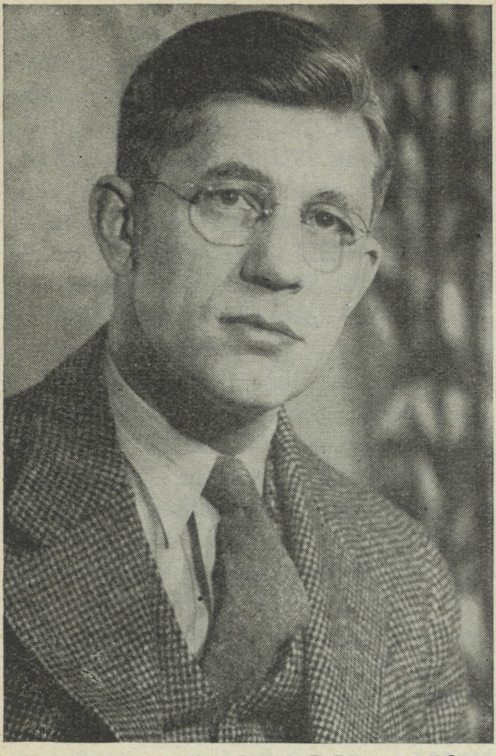
The annual inspection in March 1921 at Minto Armouries was very successful and the District Officer Commanding MD 10 congratulated the unit on the fine turn-out and excellent display of drill.

High Honours Won

In the succeeding years the unit carried on with varying success but always turning out a fair number of Certificate "A" and "B" graduates, many of whom graduated into the NPAM units in the city as officers. The unit was also instrumental in recommending, for the Permanent Force in Canada, graduates in Electrical Engineering for commissions in the RCCS and also for commissions in the RCAF. Several of these graduates won high honours during the Second Great War. One who comes to mind is Maj. Gen. Hugh Young, who served as Quarter-Master-General during the Second Great War.

The following two items appeared in the University Year Book of 1922 and 1923, respectively:

"These companies have a total strength of 486, comprising all ranks, making it the largest University Contingent in Canada. In addition, a Signal Section has been established recently. Forty-seven members are sitting this year for their Certificate 'A', or Lieutenants' examination, and two for their 'B', or Captaincy, while altogether more than 200 members of this unit will have been marked efficiently by the end of the year."



Dr. A. W. Trueman, M.A., D.Lit., president of the University of Manitoba.

"The Contingent, during the past year, has won two achievements of note. It won the Dominion of Canada Inter-Collegiate Rifle Association Cup given for competition between rifle teams representing the Universities of Canada. This year was the first time that the cup has ever been won by a Western University. The University of Manitoba had more successful candidates in the Certificate 'A' and 'B' examinations than any other University in Canada."

According to records for the years 1923-33, total strength continued to be about 250. A Medical Company was formed in the winter of 1928-29. The annual inspection programme for 1928 included a march past, a company drilling competition, a demonstration of physical drill and drill by a demonstration platoon. In the winter of 1926-27 there was a rifle competition with the University of North Dakota ROTC, home-and-home matches resulting in a tie. In 1932-33 there was an indoor rifle competition between the four Western Universities, with Manitoba placing first. In the years preceding the outbreak of the Second Great War, a COTC platoon proceeded annually to Shilo Camp.

During the period of 1920-39, the unit operated successively under the commands of Lt. Col. N. B. MacLean, D.S.O. (1920–27); Lt. Col. E. P. Featherstonehaugh, M.C. (1927–32): Maj. H. P. Armes (1932–38); and Capt. (later Lt. Col.) W. F. Riddell. The work was carried on with enthusiasm, and 477 candidates qualified for commissions.

Strength Up To 700

At the outbreak of war in 1939 there was a deluge of applications for enrolment in the COTC, and the strength increased to 700, including 200 graduates. Training was offered in four corps—Artillery, Engineers, Infantry and Medical—with two evenings of lectures and three hours of practical work each week. At this time about 50 per cent. of the officers receiving their commissions in the Active Force, and a large proportion of officers in the Reserve Army, had received their qualification through the COTC.

Compulsory military training and compulsory service was instituted in Canada in the summer of 1940. In order to maintain a supply of technically-trained men from Universities, special arrangements were made for the training of students. A University military training unit was established, with six hours' training per week required.

Some changes in staff took place. Lt. Col. Riddell retired, and Lt. Col. C. R. Hopper, M.C., was appointed Officer commanding, with Maj. G. P. R. Tallin as second-in-command and chief instructor, and the A & T staff greatly enlarged. Both Lt. Col. Hopper and

Maj. Tallin had originally enlisted in the 196th Overseas Battalion.

In May 1941 Shilo Camp saw two COTC groups, numbering upwards of 600. This figure, though not fully maintained during all the war years, was exceeded at the Annual Camp in 1945.

Mutual instruction was made the keynote of training and every effort was made to increase the scope and efficiency of the instruction. At the annual inspection in 1943 the general verdict was that a new high in efficiency had been reached, and the standard was raised year by year until the end of the war.

The authorized establishment was increased from 700 to 1,020, but for most of the war years the total number undergoing training, as well as category men whose non-combatant work was administered by the A & T staff, numbered between 1,200 and 1,400.

In addition to the exacting task of general administration, and with training carried out at three separate places, the unit administered, for the Divisional Registrar, the students' deferred call-up for military service.

Officer Material

There was a constant demand for officer material, and for the most part during the war students went forward every month as officer candidates in the CIC, RCA, RCCS, RCE and RCASC. The quota originally set for the unit by NDHQ was exceeded many times over. Incomplete returns show that at least 700 members of the unit received commissions, and about 3,000 who received training with the Contingent and with the Military Training Unit served in the forces. Many received promotion to high rank and won signal distinction.

In August 1945 Lt. Col. Hopper proceeded overseas for instruction at Khaki University, and Lt. Col. Tallin, who had returned from overseas, was appointed Officer Commanding.

The record of the University of Manitoba Contingent, COTC, gives all former members cause for pride in its achievement in two Great Wars and in the hard slugging years between, when training was carried on so successfully.

HIGH-SPEED WIRE LAYING

New equipment by which combat wire in coil form may be laid by airplanes or vehicles or paid out by bazookas and rifle grenades without the use of reels has been developed by the (U.S.) Signal Corps and is now in production.

A special coil and dispenser have been designed and successfully tested with rifle grenades, bazookas, man pack, certain types of vehicles including the amphibious DUKW, and from a liaison-type plane which paid out wire at speeds as high as 110 miles an hour.

The dispenser is about one foot in diameter, half a foot long, and weighs approximately 25 pounds. It contains about 3,300 feet of assault wire. It can be mounted on an infantry packboard or carried by the use of a shoulder strap or by hand. Communication may be maintained during the pay-out process, regardless of the method used for transportation. Two or more wire dispensers may be connected in tandem when it is desired to lay more than one coil of wire without stopping to make a splice.

A container has been designed for use by the Army Air Forces which has a capacity of eight wire dispensers, making it possible for planes to lay a continuous five-mile circuit.—*U.S. Army Ordnance.*

GERMAN TRAINING METHODS

The accompanying article is an extract from the publication "German Training Methods" produced by a combined British, Canadian and United States staff. The study was prepared from original German documents and from information obtained from prisoners of war, and CATM presents this extract in the belief that it will be of historical military interest to Canadian Army officers, both Active and Reserve.—Editor.

INTRODUCTION

In the Imperial German Army, the Infantry was regarded as all-important. This was expressly recognized by the directive of 29 May, 1906, which declared: "The Infantry is the chief arm." All other arms, even the Artillery, were ancillary to the Infantry. The Infantry stood at the right (honour position) of the line while on parade; many imperial and royal princes joined the Infantry as a matter of tradition. Nearly all corps commanders came from the Infantry.

In the peace years between 1871 and 1914, no actual war experience influenced the basic concept of Infantry training. During these years, the principles of attack were cultivated, drilled and driven home by every conceivable method of training. This has often been referred to as the "mania for attack" (Angriffshetze) of the German Infantry. The Artillery was expected to keep up with the quick tempo of the Infantry attack, but, as this was not always possible, the Infantry often made the attack without waiting for the Artillery, and consequently suffered heavily. The victories of 1864, 1870, 1871 and also 1914 and 1915, were mainly won by the Infantry in the attack. Losses were severe, but the reputation of the Infantry stood high.

Little Defence Training

Training in the principles of defence was not popular, and practice in defensive combat was not given to any great extent. Battle Drill, including long marches and rifle training, was cultivated to a very high degree. The keystone of rifle training was the careful coaching of the individual rifleman in applied fire, including the concentration of fire on definite targets so that when the platoon fired, almost every shot was effective. Great importance was given to both bayonet fighting and assault operations in Infantry training. Fighting in woods was to be avoided as far as possible, for it was feared that the discipline and control of the troops would suffer. Therefore, no training in forest fighting was given; exercises were normally carried out in open country. It was thought then an attack over ground with good cover was easy enough not to require practice. Attack by night was consciously neglected on the same grounds that caused fighting in the woods to be deprecated. Not until the years just preceding World War I did German views begin to change, as a result of the lessons drawn from the Russo-Japanese war. After 1912 recruits were made to go through 12 night exercises during their three months of basic training. Movement and regrouping of troops at night were assiduously practiced.

The whole training and mental attitude of the majority of the high officers of that time made them adopt an unfavorable attitude toward technical matters. The technical arms of the service were considered far less important than the Infantry, Engineers and Cavalry. Field Artillery units were badly trained, although military manuals contained extensive training instructions. For example, the Field Artillery was loath to adopt the practice of indirect fire from concealed positions. Heavy Artillery, on the other hand, had to some extent attained a high standard of proficiency in indirect fire. Training methods in new means of communication were never given great consideration. In general, technical matters were neglected; morale, self-sacrifice and honour were considered far more important.

World War I

Thus trained, the German Army, with the Infantry as its main arm, entered World War I. In 1914 and 1915, it fought mainly on the basis of its peacetime principles, although these were modified by new experiences. Little need be said of the nature of trench warfare which characterized World War I. For the Infantry, the entrenching too became a weapon; and the rifle, contrary to the wishes of the High Command, was merely a subsidiary weapon. The Infantry soldier came to rely on support from the Artillery and from automatic weapons more and more, and steadily made less use of his rifle, in spite of many orders to the contrary. Thus the technical arms and services received more consideration, and their training gained added importance.

In 1918, an excellent Infantry training manual was published. It was the basis for the last great offensive on the Western Front. This manual, based as it was on actual field experience, was considered so good that it remained current in the Hundred-Thousand Army (Reichsheer) for many years after the last war.

PEACETIME TRAINING

Hundred-Thousand Army (1919 to 1934): The Treaty of Versailles, 1919, strictly limited the size and functions of the German Army. The actual organization of this Army, called the Hundred-Thousand Army, fixed at an over-all maximum of 100,000 men, consisted of seven Infantry Divisions and three Cavalry Divisions, Armament, reserves and period of service (NCOs and men, 12 years; officers, 25 years) were regulated. This Army had no modern weapons such as tanks, aircraft, heavy artillery and anti-tank weapons. The only schools permitted were one officer candidate school for each branch of the service. The German General Staff was disbanded.

The basic principles of the Hundred-Thousand Army were that it was to remain non-political, and it was to devote all its efforts to aiding in the establishment of a unified Germany. In other words, it was almost a police force. Each individual soldier was to be conscious only of his duties and responsibilities toward the state. While in service, all members of the Hundred-Thousand Army lost the right to vote. The loyalty of the Army was shown during the Hitler-Putsch in Munich in 1923. Although the Putsch was aided by General Ludendorff, a favourite with Army personnel, it was put down by the Hundred-Thousand Army.

During the first few years, the main object of training in the new Army was almost exclusively the building up of complete units (divisions), ready for immediate service. This training goal became of paramount importance, ostensibly because the Reich felt itself endangered by internal upheaval and foreign attack. This policy was pursued with intensity and on a large scale. As a result, individual training suffered.

The first changes in training were brought about in 1923. The chief emphasis was shifted from the division to the lowest units—company and battery.

Army of Leaders

Germany, at the time, considered the disarmament negotiations of the allied powers hopeless, and resolved to remedy her own weak military position in some form. The only possible way, without violating the letter of the Treaty of Versailles, seemed to be the creation of a 100,000-man Army of leaders.

The Commander-in-Chief of the Hundred-Thousand Army, General von Seeckt, disagreed with the system in the old Imperial Army in which the rifleman was only a rifleman, and an officer or non-commissioned officer performed only his own particular job. He thought it better to train all the troops in order to produce an Army of capable leaders, so that, should a crisis arise, each individual soldier would be able to occupy a position as leader if the Army were ever expanded beyond Treaty strength. In addition to this, he wanted the troops to be ready at all times to go into combat, the lieutenant as platoon commander, the NCO as section (squad) leader, and the rifleman as an efficient soldier. Organization and training had to work hand in hand in order to comply with these two requirements. This idea was improved continuously in the years that followed.

Realizing that a body of capable leaders can be created only by highly qualified officers, special attention was directed to careful training of officers and potential officers.

The general officers represented mainly the elite of the Officers' Corps of the old Imperial Army. As these general officers received considerable experience during the war, their further training was mainly left to themselves. Constant contact with each other gave them many opportunities to express and digest military matters. Other means of instruction were through observation of foreign armies and military reports.

The training of suitable field General Staff officers*, who were destined to be senior commanders in the Army, took place in service commands in a manner similar to the former War Academy. All company grade officers of a certain age class were compelled to take the Service Command Examinations. Preparation for this examination took about six months, and facilities for study were offered mainly through correspondence courses established by each service command. This preparation consisted of instruction in tactics, weapons and general subjects. Officers who were interested in technical subjects were given opportunity to pass the Service Command Technical Examination instead of the regular Service Command Examination for tactical officers. The technical examination included, in addition to the compulsory subjects for all officers, subjects of a technical nature and mathematics.

Qualified For GSO

After having passed successfully the Service Command Examination, the tactical officers were detailed to a three-year training course in the service commands and upon termination of this training, qualified for nomination to field General Staff officer. The courses were nothing other than General Staff training. In 1935, with the re-establishment of the War Academy in Berlin, the courses were dropped by the service commands and continued, under centralized control, at the War Academy. Technical officers were assigned to a technical university to complete their engineering studies, and, after receiving their degree, were given an assignment for duty with the Army ordnance office.

Because the Service Command Examinations were compulsory, the efficiency level of the junior officer corps, with respect to military and general knowledge, was considerably raised.

The training of all line officers was intensified by frequent tactical exercises without troops, map exercises, tactical

**A name given officers who carried out General Staff officer assignments with the troops. This was permitted by allied military authorities, although a General Staff was prohibited.*

walks and instructions on the aims and methods of training, as well as lectures on subjects of general knowledge. Courses at special schools of the Army, and lectures within the Officers' Corps, together with newly compiled service regulations based on the war experiences of the last war, offered additional training material for all officers.

Training orders, issued yearly by the Army High Command and by the service commands, were transformed into training plans for the units by the units themselves. These training orders were worked out into minute details, and their proper execution was supervised by officers of the unit.

Instruction of potential officers started as early as 1921, and was carried out in accordance with the high aims of training which the Army had set itself. Covering a period of four years, the training qualified the potential officer to become a full assistant to the battalion commander. After six months of basic training in the training units of his own regiment, the officer candidate participated in the normal training exercises of a battalion for one year. Thus he underwent practically a complete training cycle as an enlisted man. In this manner, the potential officer was given a thorough insight into the varied functions of a unit, and could study the reaction to all orders and disciplinary matters by the troops.

No Special Favours

During all this time, the potential officer was not granted any special favours. He had to go through all service routines, including fatigue duties. This was required of all junior officers in the officers' corps. The members were expected to understand the mentality of the enlisted man, and to be in a position to judge from their own experiences how actions by leaders affected men.

Another point of importance was that the career of an officer was open to anyone in the Army. Military ability, character and education were the only criteria in the selection of future officers. Soldiers whose formal education was considered inadequate, but who showed promise, were given special courses so that they were able to pass the required examinations. This placed them on the same level with those potential officers who had received an adequate formal education.

Upon completion of one year of service in a fully trained battalion, the officer candidate was required to take an examination given by a special commission set up for the relevant service command. Having passed this examination, the potential officer received his appointment to the officer candidate school.

Officer candidates of all arms and services of the Army then received a ten-month assignment to a course at an Infantry school. This was an essential measure based on the realization that all officers of any Army must have a complete knowledge of the principal arm—the Infantry. In wartime, all other arms and services were to be regarded merely as support for the Infantry and employed accordingly.

Training at the Infantry school consisted primarily in commanding platoons, companies and battalions, together with their supporting weapons. In this respect, all phases and types of combat were studied. In addition, important general subjects were taught to enlarge the education of the officer candidates in accordance with the military tradition. The officer candidate had to even realize that as a prospective officer he would have to assume increased responsibilities. His principal responsibility would be unselfish care for his men. Even though their military qualifications might be excellent, officer candidates who showed an obvious lack of character requirements had no chance for promotion to officer rank.

(Candidates were promoted to the officer rank, not commissioned.) If rejected, the potential candidate returned to his original unit and continued his 12 years of service as an NCO. Those candidates who enlisted originally as potential officer candidates could request a discharge.

Training at the Infantry school was completed with the officer candidate examination. After the potential candidates had passed their examination, they were promoted to officer candidates and subsequently returned to their regiments. After a short period of active duty with his regiment, in which the officer candidate had to provide his leadership qualities for the first time, he was detailed to a course at his arm or service school. This course lasted 10 months. Here he learned combat methods on a battalion and regiment level and how to command such units. In addition to his regular training, he received specialized instructions so that he could be employed as an instructor and assistant to his commander upon his return to his regiment.

This training terminated with the final officer examination. Successful completion of this resulted in promotion to advanced officer candidate. After a training period of three and one-half to four years, the candidate was promoted to officer, if his application for a commission had been approved by the officers of his regiment. These officers formed a selection board which was directed by the regimental commander. The promotion of the advanced officer candidate concerned could be refused by any officer who could produce sufficient reason for doing so.

Training of NCOs

The development and training of NCOs was given great consideration, although no rigid program existed. All enlisted personnel could become NCOs. The company commander chose from among his own personnel any soldier who showed exceptional prospect as a possible leader. A minimum service of four years was required before selection could take place. These NCO candidates were normally assigned to a NCO training company within the regiment. Here they underwent NCO training for a period of six months. The company was generally commanded by the most capable officer available. The candidate, upon completion of the course, returned to his original company. Promotion to the NCO corps now depended upon vacancies in the organization of the company, length of service and ability.

In 1926, the training of NCOs and men was reorganized. In addition to maintaining the Army's striking power, the purpose of training was to produce as many NCOs as possible. All corporals had to be qualified to lead a platoon. The sergeants were trained to take the place of company commanders. Qualified men were trained to lead a section. In an Army consisting of only 100,000 men enlisted for 12 years' service, with few prospects of promotion for the individual, and without modern weapons, the danger of each individual eventually becoming stale was a constant worry. To give the men more variety in their service routine, plans were made to classify the soldiers according to their qualifications. This plan was carried out forcefully. All companies were divided into various efficiency classes and each one was trained according to a special schedule. In general, the following classes were established:

Class for sergeants: training of company commanders.

Class for corporals: training of platoon leaders.

Class for potential NCOs: training of section leaders.

First class for enlisted personnel: training of efficient individual combat soldiers.

Second class for enlisted personnel (men with one to two years of service): training depending on the knowledge acquired in basic training of valuable individual fighters and selection of qualified potential NCOs.

Class for recruits: basic training (only in regiments without training units).

In addition, specialist classes were established when necessary for NCO technicians, supply technicians, etc. Within these classes, training was conducted on various levels and supervised at all times by officers.

Association with NCOs

In addition to this military training, the general education of NCOs was expanded. Company commanders sought every opportunity to be with their NCOs when off duty as it was considered important for officers to become thoroughly acquainted with their NCOs.

Principal training subjects, during this period, were terrain evaluation for all types of warfare, training in firing, study of ballistics, close order drill, organization of the Army, sports and specialist training.

Upon completion of class and of individual training, formation training began. During this period, training within the squad was emphasized particularly. Various types of warfare were taught by way of demonstration exercises which were generally performed beforehand at a sand table under the guidance of an instructor. The aim of this training was to acquaint the rifleman with his particular duties. An individual fighter was trained to think and act independently within his squad in all phases of combat.

Squad training was completed with an inspection by the commanding officer. It was considered successful if the squad leader was able to employ his squad and all supporting heavy weapons properly in the various phases of combat. Weapons which were forbidden for the Hundred-Thousand Army in accordance with the Treaty of Versailles were frequently represented by flags. It was important to replace instinctive actions by squad leaders and riflemen with clear estimates of the situation, exact orders, and the correct execution of orders. Units and instructors were judged according to their training standard.

Squad training was followed by platoon training. This training lasted only a short time, as it was believed that a company which had had sufficient squad training would be able to fight in platoons without additional training.

After the company was transferred to a troop training area, it was trained in firing with live ammunition; there, squad, platoon and company exercises took place. Exercises on higher levels were established for the training of NCOs, officers and staffs.

The training year was completed with the autumn manœuvres in open country. These manœuvres were particularly intended to train the higher headquarters, test new tactical principles and give a better understanding of field tactics to all concerned. The duties of umpires were particularly emphasized.

Frank Discussions

Each exercise and training period was completed with an inspection and an open discussion. Deficiences in training, as well as good performances, were discussed frankly in the presence of the men.

At the end of each training period, a critical summary based on the knowledge gained by the inspections was published by the Commander-in-Chief of the Army, and distributed among all organizations concerned. This critique showed up all deficiences of training methods, and suggested appropriate measures for their correction. These suggestions formed the basis for training policies during the following year.

After Hitler became Chancellor of the German Reich in 1933, a gradual re-arming of the Hundred-Thousand Army was undertaken.

The problem now was how rapidly and how extensively the enlargement of the Army could be carried out in spite of insufficiently trained reserves.

To solve this problem, an experiment was made whereby all recruits of the year 1933 were assigned, upon enlistment, to a company of a fully trained battalion. To complete and further this experiment, one regiment of a division assigned its recruits to a rifle company, the second regiment assigned its recruits to a machine gun company, while the third regiment assigned its recruits to the Infantry gun company. This meant that a recruit, instead of being assigned to a training company of a regiment for basic training as was the normal procedure, went directly to a company for approximately three weeks of special experimental training. Upon completion of the experimental training, the recruits were returned to the training company to begin their normal recruit training.

During this three-week period, only such subjects were taught as would enable a soldier to become sufficiently trained for combat, if that were necessary, but he would be trained only in a particular branch.

Fire and Movement

The recuits were assigned to squads containing two or three trained soldiers and commanded by a capable junior NCO. Field training and range firing comprised the main part of the syllabus. Phases of field training were first demonstrated by an instruction unit, after which they were carried out by squads of recruits. Close order drill was entirely omitted. During this training period, one or two exercises on platoon and company level were included to acquaint the recruits with fire and movement during field training. The result of this experiment proved conclusively that the Hundred-Thousand Army could be tripled in a period of one to one and one-half months. The employment of such an Army for actual combat was considered impossible as the training period was not sufficient, and the NCOs and trained men required to complete new formations were not available. This led to an increased training of potential NCOs and specialists during the remainder of 1933 and 1934.

SCRUB TYPHUS CONQUERED

Scrub typhus, one of the deadliest killers the Army encountered in the Pacific and Asia, can be treated successfully with a chemical, para-aminobenzoic acid, according to the War Department's USA Typhus Commission. In a test conducted during the building of the Ledo Road eighteen patients were given the chemical while sixteen were not. Three of the patients to whom the drug was not given died, while none of the cases treated were fatal. Patients receiving the chemical had fewer days of fever, less severe symptoms and a shorter convalescent period.—(*U.S. Infantry Journal*).

DARK LIGHT

Visual communication in total darkness is possible with infrared blinkers for sending and infrared binoculars for receiving. The equipment was developed by the Navy during the war, using the same principle as the Army's "sniperscope." — (*U.S. Infantry Journal*).

ATOMIC WARSHIP

An atomic powered warship could cruise a million miles on one fuel charge, according to Harry A. Winne, vice-president of the General Electric Company.—(*U.S. Infantry Journal*).

HYPER VELOCITY GUNS AND PROJECTILES

Considerable research has been done with the object of obtaining higher muzzle velocities for guns of the future. The accompanying narrative is a condensation of an article written by Capt. E. G. Zoellner of the Directorate of Royal Canadian Artillery, Army Headquarters, Ottawa, and published in the Directorate's "RCA Notes." It deals in non-technical terms with some methods whereby increased velocities have been obtained. While of particular interest to Artillerymen, the principles of the development of hyper velocities as explained here provide interesting information for members of all Corps.—Editor.

For certain purposes, the advantages of higher velocities over those normally obtained by conventional guns and projectiles have been recognized for a long time. (Muzzle velocities of approximately 3,500 feet per second and over are said to be "hyper velocities.")

To obtain these higher velocities and greater penetrative effects, numerous methods have been tried. A type of sabot ammunition, for instance, was used as far back as the American Civil War (1861-65) and the Franco-Prussian War (1870–71). In the Great War of 1914–18 the French used a form of sabot, employing a 37mm projectile in the 75mm gun. Most of these early attempts to obtain higher velocities were confined to the use of standard calibre projectiles in guns of larger calibre.

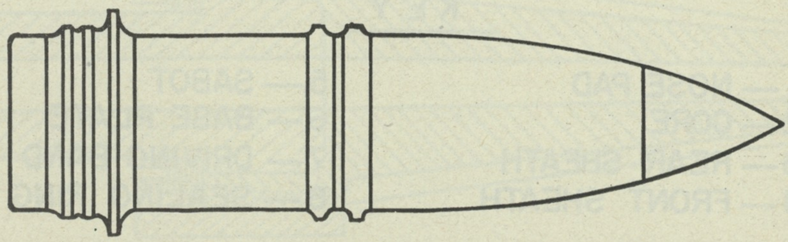
Muzzle velocities of approximately 5,000 foot seconds were achieved as long as 20 years ago. It is interesting to note that in 1937 a patent was issued in Canada to Gerlick, a German, which incorporated a special type of ammunition with a form of squeeze (or cone) bore gun.

Ideas Investigated

Serious thought with regard to the development of sabot ammunition in the United Kingdom was apparently initiated during the early part of the Second Great War by Gen. A. G. L. McNaughton, who proposed a design which provided for the removal of the sabot sheath by a small delayed-action explosive charge placed behind the core of the projectile. Since that time many ideas have been investigated in the design and development of hyper-velocity guns and ammunition. For instance, trials have been conducted in the use of plastics rather than mild steel for the sabot.

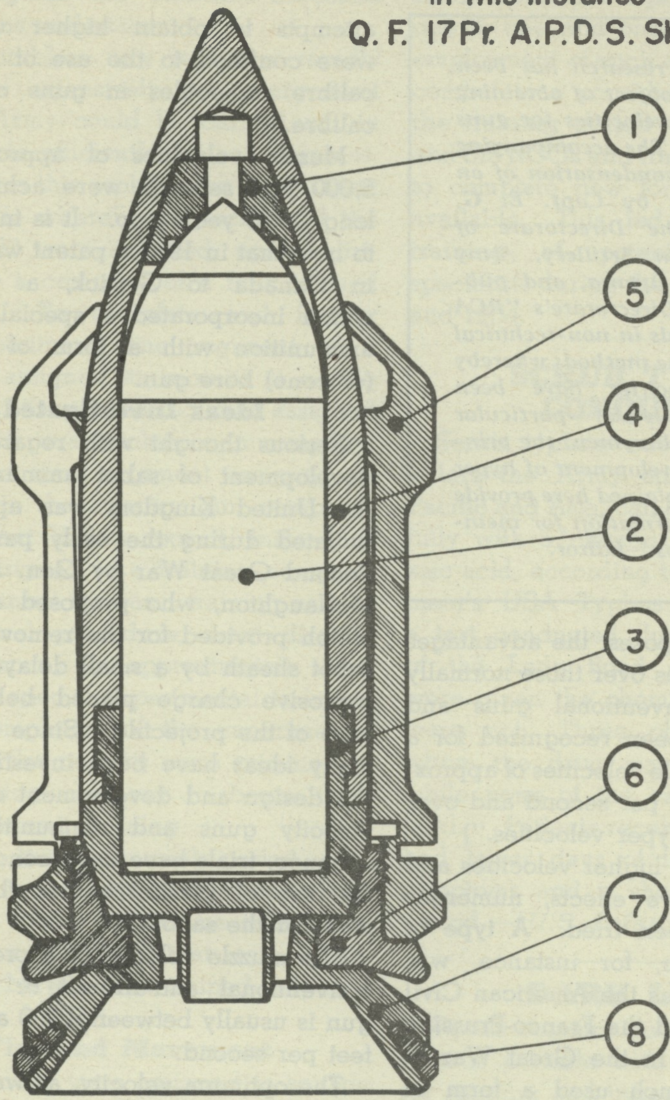
The muzzle velocity of a present-day conventional anti-aircraft or anti-tank gun is usually between 2,500 and 3,500 feet per second.

The optimum velocity, as well as the size of the projectile, depends on the purpose for which an equipment is



Typical example of shell with forward and rear driving bands.

TYPICAL SABOT PROJECTILE
in this instance
Q. F. 17Pr. A.P.D.S. SHOT



KEY

1 — NOSE PAD	5 — SABOT
2 — CORE	6 — BASE PLATE
3 — REAR SHEATH	7 — DRIVING BAND
4 — FRONT SHEATH	8 — SEALING RING

required. The use of a weapon having higher muzzle velocities than normal has important advantages for a number of purposes:

1. The height and range at which a target can be reached by a projectile can be greatly increased by increasing the velocity.

2. The time of flight of a shell is reduced by increasing its velocity. Shorter times of flight at similar ranges decrease the amount of lead necessary to apply to hit a moving target; also, the amount of error that may be caused by a target changing course during the time of flight of the shell is reduced.

3. Increased velocities result in flatter trajectories and shorter times of flight, increasing the chances of obtaining hits in direct fire at ordinary fighting ranges.

4. The weight of a projected anti-tank equipment, and its ammunition, which is required to penetrate a given thickness of armour can, in general, be reduced by increasing the muzzle velocity. In particular, the weight of an anti-tank equipment which fires hyper-velocity projectiles exclusively, might be about half that of a conventional gun which is required for a given penetration of armour. This might preclude the use of an efficient HE shell.

Decrease In Weight

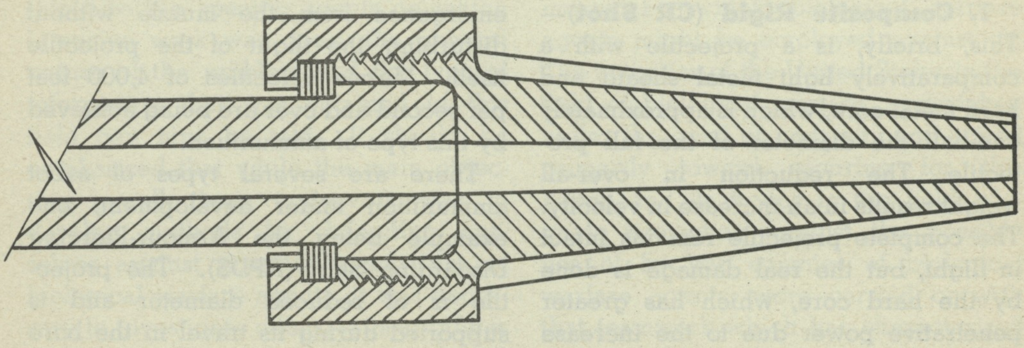
In a gun of a given calibre and using a given weight of propellant charge, an increase in muzzle velocity requires a considerable decrease in the weight of the projectile. For example, the weight of a projectile which can be fired at 4,000 feet per second is less than half that of one which can be fired at 3,000 feet per second from the same gun using the same propellant charge. Therefore, to obtain higher velocities, a corresponding decrease in the weight of a projectile for a given gun must be accepted.

In conventional guns, using a normal projectile, an increase in velocity causes a rapid increase in the rate of wear. Therefore, at hyper velocities, with conventional guns, normal projectiles are not acceptable. It is possible, however, to fire projectiles of normal weight and calibre at hyper velocities by the use of a forward driving band system which lessens the effect of erosion. When this system is employed, other alterations in design are necessary in order to maintain satisfactory ballistics and accuracy.

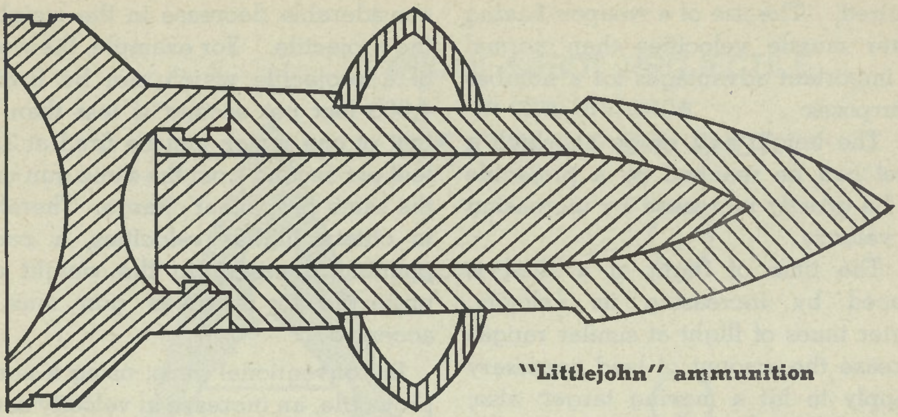
Some typical methods of obtaining hyper velocities follow:

1. The fitting of a conventional barrel of a given calibre to a gun of larger calibre. This method entails the firing of the normal projectile using a much larger weight of propellant. As this causes excessive wear it has been discarded in favour of more suitable methods.

2. Cone bore adapters fitted to the muzzle of conventional guns. This method, usually termed "Littlejohn",



"Littlejohn" cone bore adapter



"Littlejohn" ammunition

has met with considerable success. Briefly, this system consists of firing a special projectile through a standard barrel to the muzzle end of which is fitted an attachment which reduces the diameter of the projectile. This gives a considerable increase in velocity. The bore attachment is not rifled and can be fitted and removed quite easily. Muzzle velocities of more than 4,000 feet per second have been achieved by this method.

3. Squeeze bore barrels. This method employs a specially-designed tapered barrel fitted to the jacket of a gun of larger calibre. The design of the barrel and projectile, which has forward as well as rear driving bands, reduces the amount of wear to an acceptable degree.

Some Examples

Various types of ammunition are used with hyper-velocity equipments. Some examples are:

1. Composite Rigid (CR Shot)—This, briefly, is a projectile with a comparatively light metal sheath and hard metal core, which is approximately one-half the diameter of the full projectile. The reduction in over-all weight results in an increase in velocity. The complete projectile remains intact in flight, but the real damage is done by the hard core, which has greater penetrative power due to the increase in velocity and the density of the core.

2. Composite Non-Rigid (Littlejohn)—This is a projectile of smaller diameter than the normal calibre of the gun and is used in either tapered barrel guns or guns fitted with cone bore attachments. The projectile is usually three-quarters the diameter of the bore at the breech end, and is supported during its movement through the bore by collapsible flanges. The projectile itself has an extremely hard core. External ballistics are improved as the flanges are smoothed down to the profile of the projectile before it leaves the muzzle.

3. Sabot Ammunition: The object of the sabot system is to enable a sub-calibre projectile of good ballistic shape to be fired from a gun with a cylindrical bore without modification or the addition of any fittings to the barrel. In this system, the sub-calibre projectile is supported before firing and during shot travel in a casing, or sabot, which is designed so as to be thrown off after emergence from the muzzle without disturbing the flight of the projectile itself. Muzzle velocities of 4,000 feet per second and over are being achieved by this type of ammunition.

There are several types of sabot ammunition under development, one example being the Armour-Piercing Discarding Skirt (APDS). The projectile is of reduced diameter and is supported during its travel in the bore by a metal sheath of a diameter which is equal to the calibre of the gun. The sheath is weakened in manufacture by slots and nicks. On shock of discharge, the sheath splits into three longitudinal portions, but carries the projectile forward in the bore. After emerging from the muzzle the three portions are discarded by centrifugal force and only the reduced diameter projectile goes forward.

In this type of sabot the projectile itself has a smaller hard metal core, usually tungsten carbide, which has great penetrative characteristics.

BIOLOGICAL WARFARE

(From a report published in the U.S. Military Review)

A type of warfare that might have been employed in World War II—a potential avenue of attack by our enemies—was biological warfare. Biological warfare may be defined as the use of bacteria, fungi, viruses, rickettsies, and toxic agents from living organisms (as distinguished from synthetic chemicals used as gases or poisons) to produce death or disease in men, animals, or plants. This type of warfare was not known in World War I, although it was employed only on a very limited scale. There is incontrovertible evidence, for example, that in 1915 German agents inoculated horses and cattle leaving United States ports for shipment to the Allies with disease-producing bacteria.

The War Research Service was organized in the summer of 1942. It served primarily as a co-ordinating agency and drew on the facilities, personnel, and experience already existing in the government and private institutions.

While it is not possible to reveal at this time the specific agents on which intensive work was done, the general nature of the problem and the type of information that was obtained in this field can now be told. It should be emphasized that while the main objective in all these endeavors was to develop methods for defending ourselves against possible enemy use of biological warfare agents, it was necessary to investigate offensive possibilities in order to learn what measures could be used for defence.

A wide variety of agents pathogenic for men, animals, and plants was considered. Agents selected for exhaustive investigation were made as virulent as possible, produced in specially selected culture media and under optimum conditions for growth, and tested for disease-producing power on animals or plants. Intensive investigations were conducted on many aspects of this field, including studies of how well various organisms of high disease-producing power would retain their virulence and how long they would remain alive under different storage conditions; biological, physical, and chemical protective measures; the number of organisms required to produce infection; the effectiveness of antibiotics and chemi-therapeutic agents; the incubation period of various diseases; and the effectiveness of certain chemicals (or coagents) when used with pathogenic agents or toxins in influencing their disease-producing powers.

Studies were made of methods and means by which biological warfare agents might be employed against us. The activities of the United States in the field of biological warfare, undertaken under the goad of necessity and aimed primarily toward securing for this nation and its troops in the field adequate protection against the possible use of by our enemies of biological warfare agents, were carried on with that teamwork which has characterized so many of our efforts in wartime.

(Continued on Page 32)

The Editorial Board of CATM wishes to take this opportunity of extending to its readers best wishes for the holiday season

TANK ARMAMENT

CATM this month publishes the second article on tank construction, the first having appeared in CATM No. 67, October 1946, under the title "General Design of Tanks." The information was prepared by the School of Tank Technology, Military College of Science, England, and is reprinted from the British publication "The Tank", in co-operation with the Directorate of the Royal Canadian Armoured Corps, Army Headquarters, Ottawa.—Editor.

Design Procedure: In a previous article on the general design of tanks, the first step in the design of a new tank was stated to be the selection of a gun with the desired firepower. This selection depends on what types of target will have to be attacked by the proposed tank, and what are to be the maximum ranges of engagement.

These points must first be decided by the soldier in accordance with the intended tactical role of the new vehicle. When these decisions have been made, it is for the ammunition and gun designers to work out an appropriate projectile design and develop a suitable gun to fire it, bearing in mind the peculiar limitations imposed by mounting such a weapon in a tank.

Fighting Chamber

Next, the tank-mounting designer can lay out a mounting for the gun with sighting gear and laying controls, building around them a fighting chamber with sufficient space for the crew, ammunition and other storage. He must fit this fighting chamber into the limits of weight, height and space between tracks allowed him by the general designer of the whole tank in view of transportation restrictions, and enclose it with armour of a specified thickness, in which must be fitted adequate means of outside vision.

If the mounting designer cannot get all this into a turret with all-round traverse and yet keep within the limitations of the general designer, the latter may be forced to offer the soldier a limited-traverse equipment, like the German Jagdpanther and Jagdtiger. The soldier has then to decide whether a powerful gun and thick armour are worth more tactically than 360 degrees of traverse.

Selection of a Tank Gun: All battle experience goes to show that Infantry are the most important "arm" in any Army. The destruction of the enemy Infantry is the main purpose of all arms, including tanks, in our own Army. Thus, for most types of tank, the enemy Infantry, the defences they hold, and their supporting artillery, are the main targets. The best type of projectile against such targets is high explosive shell.

Unfortunately, all armoured vehicles are vulnerable, not only to ground anti-tank guns, but also to anti-tank guns mounted in enemy armoured vehicles. Thus, the tank may be prevented from carrying out its main task, unless it can first defeat the enemy "armour". This requires an armour-piercing projectile.

Against infantry and "soft" targets, H.E. (High Explosive) shell, even though small, will usually have some effect, whether these be direct hits or only near misses. On the other hand, against "hard" targets (i.e. tanks), only a direct hit with a suitably designed shell large enough to pierce the armour will be effective. In other words, the requirements for H.E. performance are not very critical, whereas those for armour penetration are extremely so. Thus although H.E. firing may be the main purpose of tanks, A.P. (Armour Piercing) firing will require more attention in design.

High Velocity Shell

For armour penetration, the best type of projectile is the high velocity shot or shell, which depends mainly on its weight and striking velocity for effect. This necessitates a gun of calibre large enough to fire a shot of adequate weight, with a long barrel in which to develop sufficient velocity, and a large chamber on which to burn the amount of propellant required to provide the velocity. This results in a large and heavy cartridge and a cumbersome gun of short life.

For high explosive effect, one requires a shell with a large capacity for explosive filling. To get this, it is generally considered that the calibre of the gun should be at least 3 inches. If this shell is to be fired from the same gun with the same velocity as the A.P. it will have to be so thick-walled to withstand the severe firing stresses, as seriously to reduce its capacity for H.E. filling. Moreover, high velocities reduce the effectiveness of H.E. shell in several ways. For H.E., then, it is much better to use a low velocity, high capacity shell, which only requires a short gun with a small charge. This gives a small round, of which a large number can be carried in the tank, and a gun which is easy to mount in a turret and has a long life. Such a gun will, of course, be unable to fire any A.P. projectile, except hollow charge, which is inferior in accuracy and penetration.

The size of H.E. shell required is unlikely to increase much in the future because Infantry can become neither more splinter resistant, nor able to make stronger fox-holes! Tank armour, however, is getting thicker and thicker, so that A.P. weapons must get bigger and bigger as time goes on.

The soldier is then faced with the following problem:

He has to ask the designer to give him an A.P. projectile and gun powerful enough to penetrate enemy armour, yet this is only for what is really a secondary or support role. For present conditions this gun will probably have a calibre of over 3 inches. Shall he also ask the designer to produce for him a separate gun for firing H.E. to carry out the main task, and relegate the A.P. weapon entirely to a support role, or shall he fire his H.E. out of the A.P. weapon (probably with a reduced charge to give lower velocity)?

If he uses the A.P. weapon for H.E., he will not be able to carry many H.E. rounds, because of their uneconomically large cartridge cases, and because some of the stowage will already be occupied with A.P. The large cartridge will give only a low rate of fire. Moreover, the rapid wear with A.P. will necessitate frequent calibration for indirect fire and semi-indirect H.E. shooting.

If separate A.P. and H.E. weapons are asked for in emergency the A.P. weapon must, of course, be able to fire H.E. and the H.E. weapon hollow charge (in lieu of A.P.).

The decision the soldier arrives at will depend on tactical considerations outside the scope of this article.

The Tank Gun Designer's Problem: The ideal tank gun should fulfill the following major requirements in order of importance:

1. A light, short cartridge, the complete round not weighing more than about 45 lbs. with an extreme upper limit of 65 lbs. when the gun is mounted with limited traverse in the hull of the vehicle.

2. An adequate life.

3. A barrel as short as possible, with centre of gravity as near the breech as possible.

Such other features as weight of projectile, calibre, and muzzle velocity must be so adjusted as best to fit the above and yet provide the specified performance. It should be noted here that the weight of the gun is of minor importance although lightness is desirable from the point of view of turret balance.

For H.E. firing only it is quite easy to comply with the foregoing specification, but modern penetration requirements, even when special tungsten-carbide-cored shot are to be used, are so difficult to meet that it may not be possible in the future to provide a gun with reasonable life without exceeding the cartridge weight limitations—particularly if an all-round traverse turret is insisted on. It is important to note that the difficulty does not arise in loading the gun, but in getting the ammunition out of the storage into a position from which it can be loaded. In this situation the fixed Q.F. (Quick Firing) cartridge ceases to be the quickest and easiest to handle inside an armoured vehicle. Instead the round may have to be split into two or more easily handled components — the Separate Q.F. cartridge.

Some of the Problems of the Mounting Designer: The first endeavour of the mounting designer is to give a sufficient arc of elevation and depression for the weapons and yet provide adequate protection and ease of control.

If the arc is large it will be difficult to design a mantlet which does not leave gaps at the top or bottom at full depression or elevation, and is also completely splash proof against heavy small arms fire. Current British practice is to provide 20 degrees elevation and 12 degrees depression, but other countries have had to use less—usually less depression.

As guns get longer and mantlets thicker, the centres of gravity of successive designs of mounting get further and further in front of the trunnions. If the designer tries to counteract this by moving the gun back in the mounting he will have to make the turret roof higher to clear the breech of the gun on recoil at full depression. Instead, he must neutralise the muzzle heaviness by a spring or hydro-pneumatic equilibrator inside the turret.

It is sometimes thought that the designer has difficulty in making the mounting strong enough to take the trunnion pull of the gun. So far is this from being a difficulty that several designers have been tempted to dispense with the recoil system and mount the gun rigidly in the cradle. They have had some measure of success, although other difficulties were introduced.

Room For Recoil

The recoil system is still then an essential of a tank gun mounting, and there is generally no difficulty in providing sufficient room behind the gun for recoil. If there were not enough room for recoil there would certainly not be enough space to load the large cartridges fired by present-day tank guns. The designer's two problems here are overheating and the use of ammunition of different muzzle velocities.

The function of the buffer is to dissipate the recoil energy of the gun by converting it to heat (due to the friction of oil passing through ports). Obviously, if a high rate of fire is maintained for some time the buffer will get very hot indeed, with the result that the gun fails to run out. Some modern guns may have a very large recoil energy to be converted to heat, so the designer has to provide rather a large capacity of oil to absorb it.

As stated earlier, when a gun fires both A.P. and H.E. it is better to fire the H.E. at a much lower muzzle velocity than is necessary for A.P. This results in a shorter recoil. It is then a problem to design a recoil system which will function equally well with both high and low velocity ammunition and allow sufficient length of recoil for the semi-automatic gear to function both types.

Another question that needs clearing up is the purpose of the muzzle brake. Its function is to reduce the backward momentum of the gun by deflecting to the side or rear some of the high pressure gases which emerge with high velocity from the muzzle after the projectile has left. The principle is the same as that of jet-propulsion, the deflected gases giving a forward thrust on the muzzle. In general, a muzzle brake is undesirable on a tank gun, as it greatly increases the out-of-balance of the mounting and causes the gun to "whip" when travelling. It also increases the risk of injury to troops by diverting the blast to the rear.

The chief reasons for fitting a brake are:

1. When the designer "up-guns" an existing vehicle to counter the introduction of heavier armour by the enemy. This enables him to use the original recoil system.

2. To reduce the amount of recoil energy which has to be converted to heat by the buffer, and so prevent over-heating.

3. To obtain improved steadiness of the vehicle when firing—especially armoured cars.

4. To improve observation by deflecting muzzle smoke out sideways. Whether it is successful in this depends a good deal on the wind and the dustiness of the ground.

Further Considerations: In an article of this length it has only been possible to discuss the selection and mounting of a tank gun. Such other topics as sighting and fire control, laying controls and the best layout of ammunition stowage would require a great deal of space to themselves.

THE MARK OF JUSTICE

Impress on all your acts the unmistakable mark of justice, applying in each case the penalty that will improve without offending, or the reward that stimulates, exalts and comforts and evokes further displays of merit. Try always to maintain regularity in treatment, equity in your acts and relationships with equals and subordinates. You will, in this way, win greater devotion, sincere affection, lasting friendships and admiration devoid of "arrières pensées" and of moral benefit. Avoid excessive friendliness today and bad humour tomorrow. In the same way that you must maintain uniformity in your military apparel, you must try to maintain uniformity in your dealings with your equals and, above all, with your subordinates.—*Lt. Col. Correia Lima in "Nacao Armada," Brazil.*

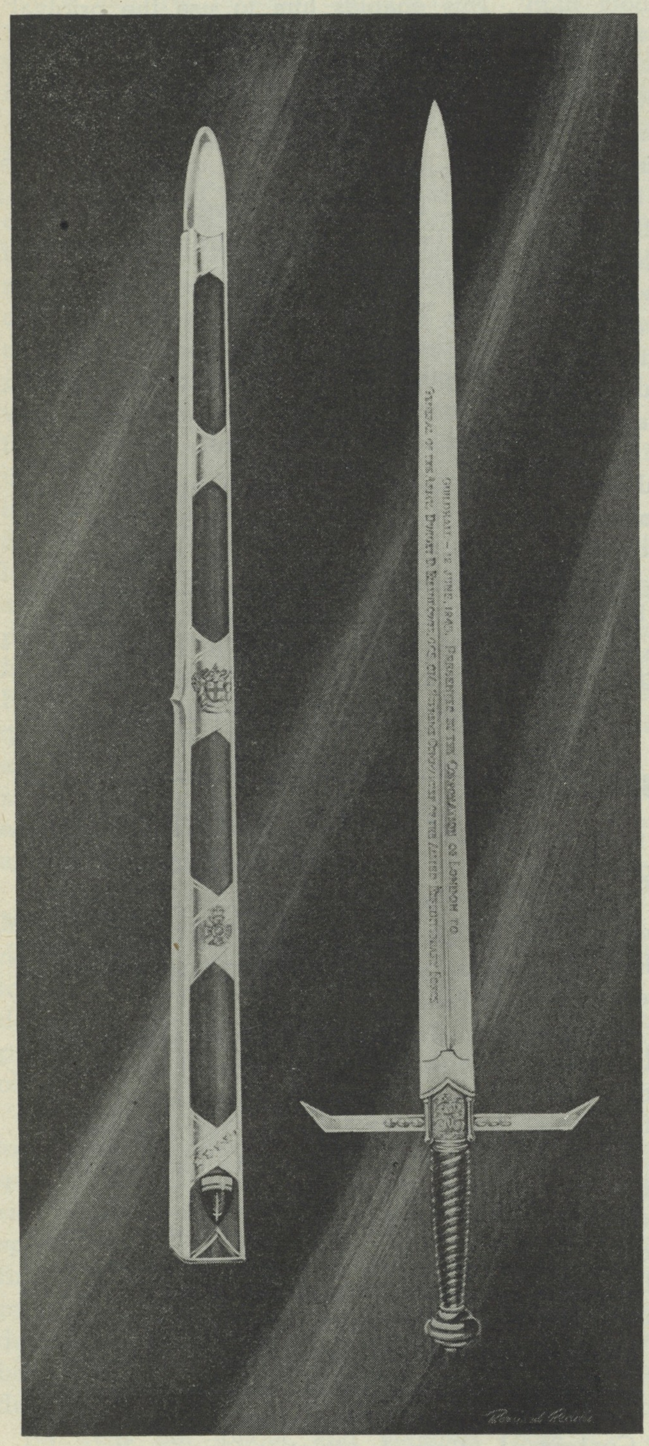
PLASTIC PROTECTION FOR SHIPS

When final plans are carried through, the (U.S.) navy will have a laid-up fleet of 2,204 ships in reserve.

To protect the outer skin of the vessels, a poisonous hot plastic paint is applied to the hull. This will kill barnacles or any other life that attempts to cling to the vessel's bottom.

In addition an unusual new technique has been developed to protect topside equipment. This is the weaving of a moisture-proof web by spray gun. Entire gun mounts are covered by means of these webs.—*U.S. Army and Navy Journal.*

SWORD OF HONOUR



The accompanying illustration, painted by CATM's artist, shows the sword and scabbard presented to General Dwight D. Eisenhower, G.C.B., O.M., by the Corporation of the City of London on 12th June, 1945.

The sword and scabbard were designed and supplied by The Goldsmiths & Silversmiths Company, Ltd., 112 Regent Street, London, W.I. The designer was R. J. Day, and the blade was produced by The Wilkinson Sword Company.

The design is inspired by the Crusaders' Sword of Liberation, adopted by General Eisenhower, to be borne on the shield of The Supreme Command shoulder flash. This flash, showing the Flaming Sword, appears on the emblazoned scabbard near the hilt in true colours on gilt. Laid on the first crossed ribbon of silver, richly gilt, are the five stars of rank.

The second crossed ribbon is adorned with the Order of Merit in true coloured enamel mounted on gilt, on which are the Crusaders' Swords, crossed.

Full Arms of the Corporation of London appear in the central position of the scabbard. They are all in true colours enamelled on gilt and resting on the crossed tie of ribbons of silver, also richly gilt. Of crimson morocco leather, the scabbard is protected on each side by a strongly gauged wire of silver. It is also protected by a fourth crossed ribbon and a silver chape guarding the point of the sword.

Hand wrought of steel, the blade is enhanced by a finely engraved inscription

Recreational Training

"FIT TO LIVE"

With another year drawing to a close, we are inclined to do a little reminiscing about things in general: whether or not the fates were kind to us; whether we made the progress we should have made; and, perhaps, whether we might not have got along better if we had felt fitter. While we are in this analytical mood, we might well ask ourselves as we stand at the gate of the New Year. "How do I look? How fit am I now?"

Having trained during the past seven years under the guidance of the timely motto "Fighting Fit and Fit To Fight," we should now turn our attention to another motto, equally timely "Fit To Live." We can enjoy health as peacetime soldiers providing we mend our ways. A New Year offers us the opportunity to give better service by keeping physically fit and mentally alert.

What is "fitness?"

1. A body free from disease.

2. Muscles, heart and lungs strong enough to supply sufficient speed, agility and endurance to do easily the maximum task in our day's work.

3. An alert mind free from worry, fear or tension, and prepared to deal with any eventuality.

4. A spirit that feels itself part of an important venture, and important to that venture in co-operation with others.

Only a totally fit man can depend on his body and mind to remain fresh through crowded days, so let's be frank about the problem. The average person today is content to use his muscles as little as possible. Consequently, modern man usually breaks down in three distinct places:

First: As he becomes older his abdomen becomes pudgy, fat and sagging. But this expanding waistline is avoidable. It is due to weak abdominal muscles and over-eating. Weak abdominal muscles allow the pelvis to sag in front. This sag tips the spine for-

(Continued on next page)

SWORD OF HONOUR

(Continued from previous page)

deeply cut into the blade, all the letters being richly gilt. The grip and pommel are embellished with gold wire, bound and entwined with crimson leather.

On the shaped boss holding the guillions or guard is placed the initial "E" in reversed cypher, in gilt, resting upon a background of azure blue enamel with the American Eagle at the back.

The guard of the sword, following exactly the sword on the flash, is ornamented with a simple suggestion of the English Oak in low relief. This is the inscription that appears on the blade:

"Guildhall—12th June, 1945. Presented by the Corporation of London to General of the Army, Dwight D. Eisenhower, G.C.B., O.M., Supreme Commander of the Allied Expeditionary Force."

ward in the lower back and overtaxes the back muscles that may cause low back pains. Walking is not exercise enough (although good brisk walking helps to stimulate many organs) to overcome this defect, as only body-building athletics or abdominal exercises will strengthen the muscles.

Second: Too many persons have weak, aching and deformed feet. It may be due to having been confined to bed for a long time, impoverished muscles, ill-fitting shoes or improper and insufficient walking. Much can be done to correct this disability. The first essential step is to walk with your toes pointing straight to the front. The toes should serve to balance the body with all five toes being pressed to the ground with each step.

Third: Many persons are weak in in the upper trunk, shoulders, arms and hands. This condition gets worse with age (but can be retarded by proper exercises) and causes drooping head, stooping shoulders, loss of flexibility in the chest wall and shallow breathing. Such people "lead with their chins". The ability to control body weight with arms and shoulders is safety insurance. Swinging and hanging by the arms, chinning, dipping, hand balancing and back arching produce quick improvement.

Sports provide an easy way to play with other people, to forget worry and work, to release tension accumulated through the day and to have fun. The experiences in co-operation, loyalty, alertness, determination and team work, provided by sport, will play a great part in building physique and morale.

First: Learn to play one or more sports well enough so that you really enjoy them. Sports that take you out of doors are particularly valuable.

Second: Know the value and limitations of your sports. Do they together provide sufficient strength, endurance and recreation?

Third: If necessary, seek other activities such as running, dancing, skiing, swimming or special conditioning exercises to round out your needs in strength and endurance.

The most indispensable condition of promoting morale within a Unit or Organization is for each one to know which way he is really going and to show a willingness to co-operate in any well-balanced sports project designed to give everyone some form of recreation.

Be so proud of the race to which you belong that you will be as jealous of its honour as you are of its safety, and keep fit so that you may fight, if called upon, for both with equal determination.

— A HEALTHY NEW YEAR —

BIOLOGICAL WARFARE

(*Continued from page 23*)

Intelligence Reports show that Japan had made definite progress in biological warfare. It is known that the Japanese Army fostered offensive developments in this field from 1936 until as late as 1945.

Intensive efforts were expended by Japanese military men toward forging biological agents into practical weapons of offensive warfare. Modifications of various weapons developed through research in their laboratories were field-tested at Army proving grounds where field experiments were also conducted in the use of bacteria for purposes of sabotage. These efforts were pursued with energy and ingenuity. While definite progress was made, the Japanese had not at the time the war ended reached a position whereby these offensive projects could have been placed in operational use.

There is no evidence that the enemy ever resorted to this means of warfare. Whether the Japanese Army could have perfected these weapons in time and would have eventually used them had the war continued is, of course, not known.

IS THE SKY THE LIMIT?

Rockets are demolishing the barriers of space, and the possibilities of rocket propulsion are explained in this article by Dr. F. J. Martin, Acting Director of the Jet Propulsion Laboratory, California Institute of Technology. The illustrations were drawn by CATM's artist and based on sketches appearing in Popular Science. Submitted for publication in CATM by the Directorate of Royal Canadian Artillery, Army Headquarters, the article is reprinted from (U.S.) Army Ordnance.—Editor.

The minds of men have long questioned the physical nature and the behavior of the boundary layer between the earth and the space through which the earth travels on its orbit. The early Greeks made the first attempts to describe the atmosphere and to understand the causes of "weather" on the basis of elementary physical measurements. However, the inadequate knowledge they possessed forced them to depend primarily on purely philosophical conceptions.

In this way Aristotle arrived at the conclusion that the atmosphere was divided into three layers. He considered the layer nearest the earth in which life exists as fixed to the earth; the top layer he believed to be attached to the fiery heavens and to move with them; the region between these two layers he hypothesized to be extremely cold.

Since the aristotelian view of nature persisted for centuries essentially unchanged, no new interpretations of the atmosphere appeared until the Renaissance, although the Arabs in the 11th Century are credited with estimating from the duration of twilight that the atmosphere extended to a height of 57 miles.

A realistic notion of the nature of the earth's envelope began when Torricelli, a student of Galileo, in 1643 constructed the barometer for measuring the pressure of the atmosphere. With this and other instruments the study of the structure of the atmosphere was undertaken up to the heights of mountains. Toward the end of the 18th Century the balloon was invented and quickly applied to extend the upper range of investigation. The sounding balloon has since been developed to a high degree of usefulness; however, the maximum altitude that can be reached under the most favorable conditions is about 20 miles.

Although men were curious for some time past to investigate the atmosphere above the limit of balloons, only during the last few years has an urgent need arisen for information at higher levels. It is well known that curiosity alone is seldom considered sufficient justification for the outlay of funds of the magnitude required. The need for this information has been brought about by modern developments in meteorology, radio communication, aviation, long-range guided missiles and nuclear physics.

The possibility of employing rocket propulsion for lifting a vehicle to great heights was realized at the beginning of this century. Serious consideration of the use of rockets for upper atmosphere research was initiated in this country by R. H. Goddard in about 1914.

At first he studied the feasibility of utilizing the solid-propellant type rocket, but later concluded that a liquid-propellant type would be superior for reaching very high altitudes. He spent many years working on the various problems connected with a sounding rocket, and a great portion of his later efforts was devoted to the development of flight-control equipment.

In the early 1930's the subject of rocket propulsion became of interest to various enthusiasts in the United States, with members of the American Rocket Society the most active in pursuing investigations with the funds available.

Sounding Rocket

In 1936 a group of research students at the California Institute of Technology became interested in the problem of the sounding rocket, and theoretical and tentative preliminary experiments were carried out until 1939 when work was undertaken for the Army Air Forces on rocket-propulsion systems suitable for the auxiliary propulsion of aircraft. The ideas for a sounding rocket were not implemented until December 1944 when the Ordnance Department requested the Jet Propulsion Laboratory to design and construct a prototype model for the use of the Signal Corps. This model was required to carry 25 pounds of instruments to an altitude of at least 100,000 feet.

A conservative estimate of the factors entering into the design of such a vehicle was made, and it was concluded that the requirements could be met. As development of the vehicle proceeded, material reductions in estimated empty weight were achieved, so that by the time firing tests were initiated at White Sands Proving Ground, New Mexico, in September 1945, the vehicle, known as the "WAC Corporal," reached an altitude of approximately 230,000 feet.

In order to carry out investigations of the upper atmosphere, it is necessary first to have a vehicle that is capable of reaching the maximum specified altitude; secondly, to develop instruments suitable for making and recording measurements of upper atmosphere phenomena; and, finally, to evolve techniques for recovering the records obtained. Each of these phases poses difficult technical problems, especially the second and third one upon which serious effort is now being concentrated, and about which little can be said in a definite way. Therefore we will limit ourselves in the present discussion primarily to the vehicle phase.

The balloon is able to lift itself and a useful pay load because the weight of air displaced by the hydrogen-filled bag is greater than the weight of the vehicle. When the best sounding balloon so far developed reaches an altitude somewhat over 100,000 feet, it comes to rest because the displaced rarefied air then equals the weight of the vehicle. Heavier-than-air craft depend on motion through the air for their sustention and at the present time the altitude limit of such craft appears to be in the neighborhood of 60,000 feet.

In order to lift a body to altitudes above the balloon limit, it is necessary to apply a propulsive force to the body which will either accelerate it rapidly to very high velocity so that the body will coast to high altitudes, or to accelerate it gradually for a relatively long period of time. Shells from guns have reached heights well over 100,000 feet; however, the acceleration imparted to the shell in the gun barrel is so great that it is practically impossible to design instruments to withstand the firing shock.

Most Reliable Scheme

Jet propulsion furnishes the most promising method for imparting the required velocity to the body with manageable accelerations. Of the various jet-propulsion schemes that have been developed to a high degree of reliability within the last few years, the rocket-propulsion scheme is the most satisfactory for the attainment of extreme altitudes.

In a rocket, the propulsion force is obtained from the reaction produced by the high-velocity jet composed of a propellant mass carried wholly within the rocket. The force is not affected by the velocity of flight of the rocket, and, since the oxygen in the atmosphere is not utilized for combustion, the rocket will operate even in empty space. As a matter of fact, the rocket is most efficient in absolute vacuum.

We might be led to believe from our experience with the familiar skyrocket that the design of a high-performance sounding rocket is not a complex engineering project and that its operation in the field is as simple as lighting a powder fuse. That this belief is erroneous will become clear from the following considerations.

Before the button is pushed which starts the rocket on its way to the desired height above the earth's surface, we must resolve these problems:

1. Choice of propellant and type of propulsion system.
2. Size of rocket to carry the desired pay load.
3. Shape of rocket to give minimum air resistance and adequate flight control.
4. Launching method.

As one might expect, the separate optimum solutions of these problems will almost certainly clash when an attempt is made to incorporate them into a unified vehicle. To minimize the contradictions that can arise, we need to know something about the relationships between the various problems.

These relationships have been well defined as the result of studies made by various investigators on the performance of a vehicle in vertical flight. They will hold as long as the propulsive force is constant during powered flight, and it does not matter if the propulsive force is obtained from the energy of the propellant by a molecular or by a nuclear process.

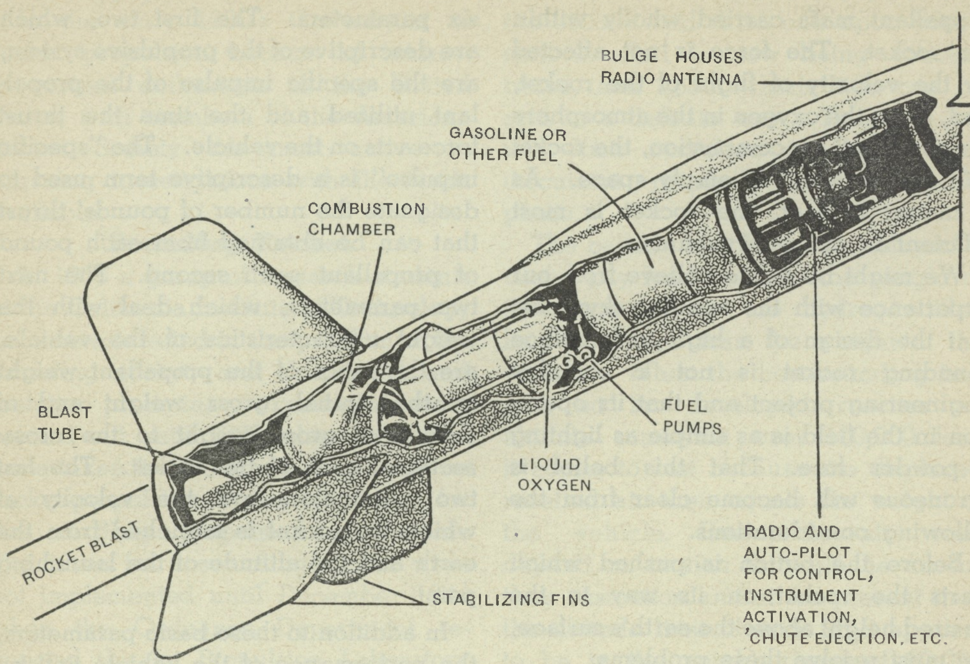
The performance of a sounding rocket is found to be determined primarily by six parameters. The first two, which are descriptive of the propulsive system, are the specific impulse of the propellant utilized and the time the thrust force acts on the vehicle. The "specific impulse" is a descriptive term used to designate the number of pounds' thrust that can be obtained from each pound of propellant each second. The next two parameters, which deal with the weight characteristics of the vehicle, are the ratios of the propellant weight to the initial gross weight and of the initial gross weight to the cross-sectional area of the rocket. The last two parameters are the velocity at which the rocket is launched from the earth and the altitude of the launching point.

In addition to these basic parameters, the performance of the vehicle will be influenced by the shape of its nose and stabilizing surfaces and the ratio of its length to its diameter. Aerodynamic shapes must be chosen that will produce the minimum of air resistance over the wide speed range traversed during accelerated flight through the atmosphere.

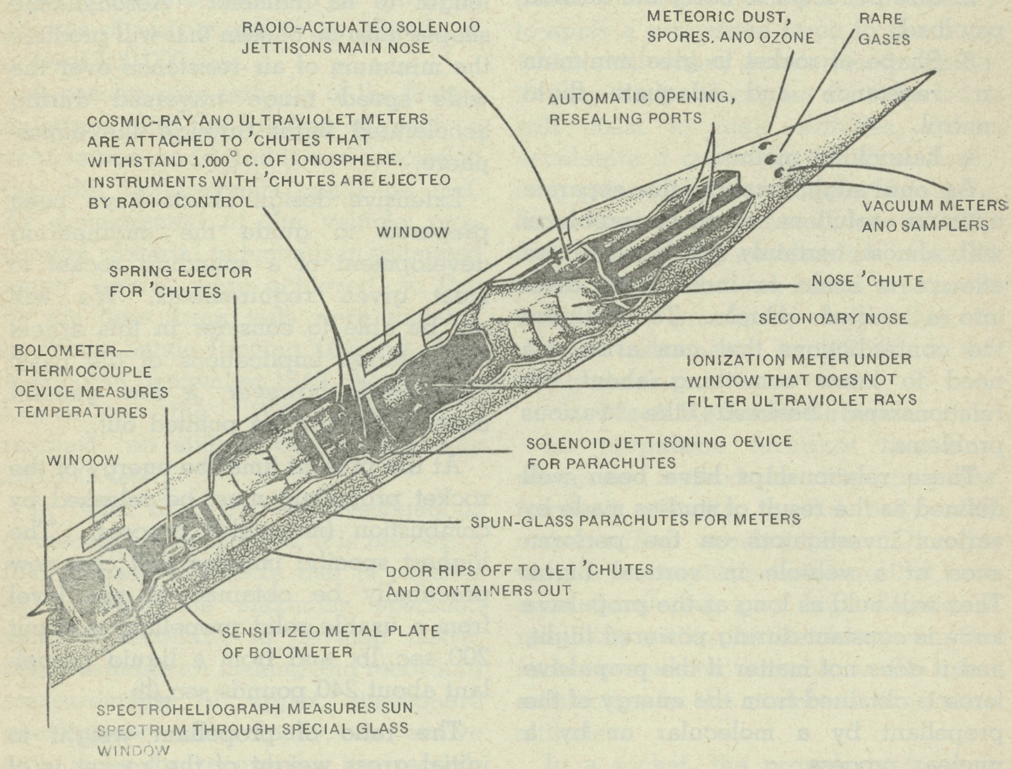
Extensive design charts have been prepared to guide the engineering development of a sounding rocket to meet given requirements. We will not be able to consider in this article the detailed implications of the basic parameters; however, a few general conclusions can be pointed out.

At the present time the energy of the rocket propellant must be released by combustion (molecular process). The highest specific impulse that can now practically be obtained at sea level from a usable solid propellant is about 200 sec./lb. and from a liquid propellant about 240 pounds sec./lb.

The ratio of propellant weight to initial gross weight of the rocket is of extreme importance. A high perform-



BULGE HOUSES
RADIO ANTENNA
GASOLINE OR
OTHER FUEL
COMBUSTION
CHAMBER
BLAST
TUBE
FUEL
PUMPS
LIQUID
OXYGEN
ROCKET BLAST
RADIO AND
AUTO-PILOT
FOR CONTROL,
INSTRUMENT
ACTIVATION,
'CHUTE EJECTION, ETC.
STABILIZING FINS



RADIO-ACTUATED SOLENOID
JETTISONS MAIN NOSE
METEORIC DUST,
SPORES, AND OZONE
RARE
GASES
AUTOMATIC OPENING,
RESEALING PORTS
COSMIC-RAY AND ULTRAVIOLET METERS
ARE ATTACHED TO 'CHUTES THAT
WITHSTAND 1,000° C. OF IONOSPHERE.
INSTRUMENTS WITH 'CHUTES ARE EJECTED
BY RADIO CONTROL
VACUUM METERS
AND SAMPLERS
WINDOW
SPRING EJECTOR
FOR 'CHUTES
NOSE 'CHUTE
SECONDARY NOSE
BOLOMETER—
THERMOCOUPLE
DEVICE MEASURES
TEMPERATURES
IONIZATION METER UNDER
WINDOW THAT DOES NOT
FILTER ULTRAVIOLET RAYS
SOLENOID JETTISONING DEVICE
FOR PARACHUTES
WINDOW
SPUN-GLASS PARACHUTES FOR METERS
DOOR RIPS OFF TO LET 'CHUTES
AND CONTAINERS OUT
SENSITIZED METAL PLATE
OF BOLOMETER
SPECTROHELIOGRAPH MEASURES SUN
SPECTRUM THROUGH SPECIAL GLASS
WINDOW

ance sounding rocket must have from 50 to 80 per cent. of its weight in the form of propellant. This requirement stresses the critical importance of achieving the minimum in weight for the vehicle structure and propulsive system. For example, if the empty weight of the WAC Corporal is reduced by 50 pounds, corresponding to a saving of 18 per cent in structural weight, an increase in altitude of about 60,000 feet can be expected.

In order to minimize air resistance, it is advantageous to have as high a value as possible for the ratio of the initial gross weight to the cross-sectional area of the rocket.

Since only 20 to 50 per cent of the initial gross weight of the rocket is available for structure, propulsive system, and pay load, we can conclude that the required size of the rocket will be primarily determined by the pay load that is to be carried to a given altitude.

Let us assume that a rocket weighing initially 1,000 pounds can be designed to carry a pay load of 100 pounds to 500,000 feet; then if we want to increase the pay load to 500 pounds, we can expect the rocket's initial weight to be about 5,000 pounds. Actually, the permissible pay load ratio improves considerably as the size of the rocket increases because, first, the structural efficiency improves and, secondly, the fraction of the thrust lost in overcoming drag decreases.

The advantage of a high launching velocity, when obtained by means auxiliary to the vehicle-propulsion system, is evident as is the advantage of launching the vehicle from a high altitude to minimize air resistance.

Let us now take a quick glance at some rocket vehicles that have been actually launched. The first serious sustained effort to construct a sounding rocket was carried out by Dr. Goddard. Although the highest altitude reached by one of his rockets was about 7,500 feet when it was launched on May 31, 1935, the rocket is of considerable historical interest. Unfortunately, very meagre information was published on the rocket by Goddard before his death in 1945.

The Goddard rocket was somewhat over 10 feet and the diameter about eight inches. A liquid propellant combination consisting of liquid oxygen and gasoline was used with a motor that delivered about 300 pounds' thrust for a period of approximately 20 seconds. The rocket was launched from a 60-foot tower with an initial velocity of zero. To maintain a vertical flight path, control equipment was provided to operate movable surfaces in the rocket jet. Photographs of the flight show the rocket travelling with an oscillatory yawing motion in the manner of a fish swimming in a vertical direction.

V-2 Rocket

High altitudes were first reached by the German V-2 rocket. This vehicle was designed primarily for carrying an explosive charge for the destruction of ground targets. Many of the rockets were launched against England during World War II at a range of about 200 miles, and during the trajectory of the rocket a maximum altitude of approximately 300,000 feet was reached.

At the peak of the trajectory the flight speed was about 3,500 feet a second. The German technicians who designed the V-2 state that two of the missiles were maintained in vertical flight after launching and reached an altitude of 560,000 feet.

The length of the V-2 rocket is 45 feet, 10 inches; its diameter is 5 feet, 7 inches; and at launching it weighs 28,200 pounds. The initial gross weight is made up of a propellant load of 19,000 pounds, a pay load of 2,200 pounds, and an empty weight (structure, propulsion system and control equipment) of 6,900 pounds.

The rocket uses a liquid oxygen-alcohol propellant combination from which an average specific impulse of about 223 pounds sec./lb. is obtained during powered flight. The propulsion system delivers a sea-level thrust of about 55,000 pounds for 65 seconds. A predetermined trajectory is maintained by means of an autopilot system which operates vanes both in the air stream and in the rocket jet. The missile is launched from a vertical position with zero initial velocity.

We have sufficient information on the V-2 to evaluate the primary design parameters we considered earlier. We obtain the following values:

Average propellant specific impulse............223 lbs. sec./lb.
Thrust (sea level).........55,000 lbs.
Thrust duration..............65 sec.
Ratio of propellant weight to initial gross weight..........0.675
Ratio of initial gross weight to cross-sectional area..........1,155
Launching velocity.........0 ft./sec.
Launching altitude.........Sea level

Economic Limitation

In the case of the V-2, the pay load amounts to 7.8 per cent. of the initial gross weight. From the point of view of utilizing this rocket for investigations of the upper atmosphere, the amount of pay load that can be carried is more than adequate. The chief limitation of this vehicle is an economic one, for to fire a single round about $75,000 must be expended.

Also, in spite of the fact that the V-2 had reached a high stage of development, the Germans found that about 30 per cent. of the missiles launched failed to perform satisfactorily. We can well imagine the discomfort of the Government budgeteers if they were asked to approve the expressed desire of one scientist to launch 200 sounding rockets simultaneously at various points of the globe, not as a single experiment but to be repeated several times.

Fortunately, most measurements of upper-atmosphere phenomena do not require instruments of very great weight, and, furthermore, many scientists feel that during the next decade most studies will be concentrated within the layer up to about 300,000 feet. To meet these requirements, a vehicle of much smaller initial gross weight, and therefore cost, can be employed.

The first version of the WAC Corporal reached an altitude of about 230,000 feet. It has an over-all length of 16 feet, a diameter of 1 foot and an initial gross weight of 696 pounds. A break-down of this weight is as follows: propellant, 374 pounds; pay load, 25 pounds; structure, propulsive system and compressed air, 297 pounds.

Booster Rocket Used

No flight-control equipment is used; instead, the vehicle is launched from a 100-foot tower by means of a booster rocket which gives the vehicle a high initial velocity by the time the booster thrust is ended at a height of about 150 feet above the launcher. In this manner the effect of wind is minimized, and the fixed fins of the WAC are able to maintain essentially vertical flight. In the experiments made in New Mexico, one WAC round landed a maximum distance of seven miles from the launcher when no parachute was used during descent.

The WAC is an interesting example of the use of the step-rocket principle which, when utilized to the maximum of its effectiveness, is capable of transporting the final step of a combination to very great heights.

For example, if the WAC Corporal were launched as the second step with a V-2 as the mother vehicle, then calculations show that an altitude of approximately 2,000,000 feet would be reached by the WAC Corporal, and at the end of its powered flight it would have a velocity of 9,500 feet a second.

CHIVALRY IN THE ARMY

Those readers interested in Army customs and traditions will find some valuable historical information in this article by Maj. W. L. Sparkes, The Devonshire Regiment, and reprinted from the "Army Quarterly," a British publication. It is suggested that it be read in conjunction with a former series of articles entitled "Military Customs and Survivals" published in CATM Nos. 60 to 63, March to June, 1946, inclusive. They all contain a variety of information suitable for lecture purposes.—Editor.

How many officers and other ranks realize the traditional significance of what they enact when presenting arms, and, in the case of officer's sword drill, what the salute implies: do they realize what these movements mean and the message they give? And when a guard of honour is furnished, what does that name signify and why is a guard as such furnished? Similarly, when an officer or man marries, why does his bride come out of church under an archway of swords or bayonets: and she "on his left arm"—why is she thus honoured?

All of these have their origin in traditional chivalry and, in the case of the officer's sword drill, also in religion. One dictionary describes chivalry as "A system of knighthood with its usages and privileges, being originally a military organization for the defence of Christendom against the Pagan and the Turk: the qualifications of a knight such as dignity, courtesy, bravery, respect of the rights of others and respect for womanly dignity and purity."

Privileged to Honour

It is not generally known that we in "His Majesty's Fighting Services" have the privilege not only of striking down the King's enemies, but with our weapons—arms—we also have the privilege of honouring those whom we wish to honour.

A case in point occurred in Exeter in 1926 when a guard of honour was furnished by the Depot, The Devonshire Regiment, on the occasion of the Mayor of Exeter being present at the city war memorial: the guard marched through the streets, officer with drawn sword and men with bayonets fixed. A civilian, uninitiated in the old customs of the Service, wrote an indignant letter to the local paper to the effect that this was "a disgusting military display." In his ignorance, he did not realize that the County Regiment was paying the greatest compliment which men at arms could render, a dual compliment to both His Majesty's representative, the Mayor of Exeter, and to the memory of their fallen comrades; in that, with our arms we were honouring those whom we wished to honour, and that no civilian could render so fitting a token of respect in so chivalrous a manner: further, that these customs have their origin in antiquity.

But how, by furnishing a guard of honour and the fact that the guard and officer commanding were fully armed and that they presented arms—how did they pay a compliment to the mayor and how were their fallen comrades honoured? What is the tradition behind these actions and what is their historical significance and message?

"Bold Bad Barons"

In England in the days of the "bold bad barons," before the advent of firearms, the feudal system was in vogue. Each Lord of the manor or castle had his own armed retainers—his private army. It will be noticed that in every ruined castle there is a room just inside the entrance gateway: this is the guardroom. The entrance is approached usually over a draw-bridge and under a portcullis, and there is generally a tower—a watch-tower—over the entrance.

There was always an armed guard—and to this day all military establishments have their guard-room. On the approach of an armed party (and who knew if they were friend or foe?), the watchman in the tower warned the guard who "turned out," lowered the portcullis, raised the drawbridge and then "stood to arms." If friendly, they were allowed inside, and to prove their good faith literally presented arms to the castle guard (in this case their arms were pikes and halberds), who took them and placed them in the guard-room. Who knows, there may well have been some simple ceremonial such as the two armed parties facing each other with pikes or halberds held upright between their feet, or pikes held at arms length, toe at right foot—i.e., "exposing their guard."

Presenting Arms

In either case, "presenting arms" or "exposing their guard," the gesture was an expression of mutual trust, confidence and respect, in that armed men gave up their arms or uncovered their guard. Thus even now, when armed, if we wish to pay homage or compliment, i.e., to honour any one, we present arms as a token of our complete faith in their integrity as being a chivalrous friend who would take no advantage of our gesture of trust. Be it noted that every army in the world has some such motion as our present one for paying compliments.

Collectively we furnish a guard of honour—not merely a guard but one of honour, fully armed with which to pay respects. What can be more symbolical of ancient chivalry than men at arms furnishing a guard of honour, and in unison proffering their weapons as a token of trust and homage? No civilian organization can pay so charming a compliment; only the armed forces of The Crown have that traditional privilege—with our weapons we indicate our respect.

Mention was made of officer's sword drill. In the days of the Crusades swords had no hilt as have the present-day ones: there was merely a bar above the grip. This formed a cross. No knight, esquire or gentleman ever drew his sword without first kissing the cross—to ask God's blessing and protection. To this day, before any new motion is made in sword drill, the sword is brought first to the recover, i.e., in line with the mouth, epitomizing the act of kissing the cross. It will be noted that this is the very first movement on drawing the sword. When saluting with the sword the motion is that of uncovering one's guard—a similar token of chivalrous trust as that of the man presenting arms—a gentleman-at-arms proving his own sincerity of friendship and faith in the integrity of whom he is honouring.

It is the custom of the service that when an officer marries, a guard is furnished by his brother officers the groom and bride passing under an archway of swords when leaving the church as man and wife.

Protection of Arms

The bride should be on her groom's left arm—leaving his right free to use his sword with which to defend himself and her against possible disgruntled suitors! The archway of swords signifies that the lady and her husband are coming under the protection of her man's brother officers who are prepared to defend them—and that she can rely on them to do so: in other words, she is welcomed within the regiment.

Politeness and good manners cost the donor absolutely nothing, and we in the Fighting Services have many reminders of both in the ancient customs handed down to us and which we have the peculiar advantage of being permitted still to exercise when we wish to honour our friends—or even an inspecting general.

A METHOD FOR MEASURING KNOWLEDGE

It is realized that this system of measuring knowledge gained is not wholly applicable to Canadian Army Schools, due to their limited size. However, for comparing standards of improvement on similar courses from year to year, this method is recommended to commanders of all Army Schools. The article was written by A. J. P. Wilson of the (U.S.) Chemical Warfare School and is reprinted from the Military Review, a U.S. Army publication.—Editor.

One of the fields in which the military technique has been an outstanding success is in pedagogy. The largest mass education ever attempted had to be undertaken to train men from civilian occupations in the thousands of specialized classifications necessary to cover the many requirements of an armed force.

Speed was an additional requirement, and it was necessary that all courses in military schools be shortened and concentrated to the "nth" degree. All possible means were developed to give the vital knowledge in the minimum time. If the teaching is on an honest basis, the aim is to give the students a thorough understanding of the subject and not just to pass the examination. Therefore, it becomes highly important to have a means of measuring how much the student actually assimilated.

The author has been in charge of instructions in supply and logistics in the Officers Division of the Chemical Warfare School. As is customary, at the end of the series of lectures and exercises on this subject, an examination was given consisting of about 12 questions and covering a period of an hour. Analysis of the papers of several classes indicated that some vitally fundamental points were being missed by large numbers of students, and some points were being answered correctly by practically everyone. The question then arose as to whether insufficient emphasis was being put on those points being missed and too much on the others. It was also necessary to ascertain how many of these latter points were known to the student before the instruction started.

It was decided to select 20 or 30 of the most important principles and points, the knowledge of which was believed essential if one were to be considered proficient in supply. These points were then built into a rather short and condensed written test. Most of the questions were of the multiple choice variety i.e., in which the student has only to check the correct answers or the correct principles among the several given.

By this method the students were able to complete the test in a very short period of time, because, in a vast majority of the cases, they had only to check the correct answer or answers. Thus it was possible to obtain a quantitative measure of what the class knew on these main principles and the points on which they were weak. This was the purpose of the test.

The test was designed to:

1. Give a good coverage of the field of supply (30 important points were covered).

2. Be difficult, so as to give as accurate a gauge as possible of how much the student knew.

3. Reduce to a minimum the chances of guess work.

4. Be short (15 minutes was the allotted time), so as not to prejudice the student against the course.

It was designated as "Supply and Field Service Information Test," and was given to the students one or two days after the start of each class. The students were told at that time that it was given for the purpose of finding out how much knowledge of the subject of supply they possessed, that it was not a "pay" examination and would not count against their record; and that they were not to guess at the answers if they did not know.

When instruction on supply was begun, which generally occurred in the second or third week, the approved solutions to the test were posted on the bulletin board for three days. During the course of instruction each point was given from the platform in addition to being covered by assignments in manuals, circulars and school mimeographs.

At the end of the supply course, the identical test was given again to the class. The students were told then, that it was a "pay" examination and that they were to try to answer all questions. The results of this FINAL test were compared with the scores made on the INITIAL test.

By the use of this test, it is possible to determine the following:

1. The gain in knowledge made by the class and by individual students.

2. A comparison of this gain between other classes and the average of all classes as well as a comparison of individual students.

3. An analysis of the points on which the class was low.

4. The relative teaching abilities of nstructors.

This test was given to over 1,000 students in various classes covering a period of over a year, and the results are tabulated as follows:

	Initial	Final
Average (Arithmetic)	41.4%	73.8%
Median (midway between highest and lowest)......	41.2	70.5
Mode (the block that occurs oftenest)..	31–35	71–75

No significance should be attached to the values as they can be arbitrarily varied by changing the questions. Only the increase or gain should be considered.

Classes varied, of course, and students in some cases made gains as high as 80 points. Some students (very small number) showed a loss—as much as 15 points.

A separate score was kept of officers who had previous experience on the subject either actual (field) or theoretical (other supply courses). The results showed an initial score of 64, much higher than inexperienced men, but their gain was only 12.4, which gave them a final score of 76.4, only slightly above the average of all final scores.

One of the most interesting cases occurred when 12 Chinese Army officers were assigned to one of the courses as observers. They took this test and their average initially was 8.2% and on the final test was 44.3% or a gain of 32.1%, which was very close to the gain in points registered by American officers. However, it represents a much greater gain on a percentage basis because of the lower base.

Any ordinary examination that is well constructed will indicate:

1. The rating of the students within their class.

2. The rating of the class against the over-all average.

3. That the students have or have not sufficient knowledge to be passed.

This test has these qualifications and, in addition, has the following advantages over that of the ordinary examination in that:

1. It indicates at the beginning of the course the relative amount of knowledge on the subject possessed by each student and by the class; therefore, it shows the instructor what points need special emphasis during the course of instruction and the relative amount of

(*Continued on Page 45*)

ATOMS AND AIR FORCES

The atomic bomb has increased the scale and range of bombing, and it is not unreasonable to suppose that this weapon might be carried a distance of 7,000 miles non-stop by a suitable aircraft. But with all its destructive power, the atomic bomb will not "win" a war by itself: the territory that it blasts must be occupied "by the ordinary man standing on his ordinary feet," and so it cannot be argued that the bomb has put the army and navy out of date. These are some of the views expressed by Maj. Olivier Stewart, M.C., A.F.C., British Army officer, in the accompanying article, which was originally published in "The Navy" (Great Britain) and submitted for publication in CATM by the Directorate of the Canadian Infantry Corps, Army Headquarters, Ottawa.—Editor.

All weapon development is concerned with carrying. The object is to do always the same thing, namely, to produce the effect of hitting someone on the head with an iron bar. But in order to do this from a distance, almost inconceivable complications have been introduced until we finally reach the atomic bomb.

The atomic bomb, like the 15-inch gun, does no more to those it reaches than is done when someone hits them over the head with an iron bar. There are no degrees of deadness so that the "vaporization", of which so much has been heard when the atomic bomb is used, is beside the point. A person who has been "vaporized" is no more dead than a person who has been hit hard enough on the head with an iron bar.

But there is the difference in range. The gun and the bomb give increased range. They do not do any more to enemy personnel—they may do more to his buildings—than direct assault, but they do it at a greater distance and they do it on a larger scale.

The atomic bomb puts up the scale and the range at once. In order to create the effect of a single atomic bomb with ordinary explosive bombs, 2,000 aircraft of the Lancaster type would be needed. But as each of those aircraft would be carrying ten tons of bombs, their range would be less than an aircraft carrying the 500-odd pounds of atomic bomb. It would be less to the tune of 21,900 pounds of petrol which is 3,130 gallons, which is, or might be if one takes very generalized figures, ten hours' flying on the basis of about half a pound per horsepower per hour for a four-engined aircraft.

Bigger Scale

The atom bomb, therefore, has done on a bigger scale, what the rifle did on a bigger scale. It differs in scale and range and in nothing else. And if, as has been suggested, it becomes possible to attach an atomic bomb to a rocket like V-2 as the warhead, then it will again step up range.

For when an atomic bomb is launched according to the technique used against Japan, the range is only six miles or so. The crew which sends the missile cannot be much farther away than that. But the V-2 has a range of 240 miles. The launching crew are so far from the target that they cannot see it.

It has become customary to regard as the "range" of a bombing force the distance from the airdromes of departure to the target. But it is equally permissable to regard the distance from the bomb aimer to the target as the range.

In the central fact that the atomic bomb when launched from an aircraft puts up the scale of the destruction enormously and the range considerably, there is some sound starting point for examining its effects on the future of air forces, and especially of the Fleet Air Arm.

In the war against Japan, the atomic bomb would not have come with such devastating effect had it not been for the long, patient work of the naval air forces in the Pacific. They had done much to prepare the way for the use of this new bomb. They had acquired the succession of bases which made it possible to assemble the equipment and prepare the attack.

Would it be possible in the future for this kind of war to be waged without this patient, difficult and costly preparatory period? Would it be possible, by using atomic bombs and long-range aircraft, to short circuit the island hopping?

It does seem to be a possibility. It is not unreasonable to suppose that a thing so light in weight as the atomic bomb, as used against Japan, might be carried a total distance of 7,000 miles non-stop by a suitably prepared aircraft —or in other words it could be used for an attack at a radius of action of 3,500 miles.

So the destructive power furnished by this new invention could be employed by land-based aircraft working far from the target region and without any of the sea-air actions, such as were fought in the Pacific, intervening between the declaration of war and the most tremendous acts of war.

I say, however, the "destructive power" could be wielded in this way—without the use of navies or armies. But what then? A war is not won by an act of destruction. If an enemy country were destroyed, no gain would be recorded unless and until it were occupied.

In brief, we come back—as we always do in the analysis of warlike processes —to the ordinary man standing on his ordinary feet. He must be deposited on the ground won and he must be maintained there. Until he is placed there and until he establishes himself there with appropriate regular supplies of all the things he may want, it is a mockery to talk of "winning" a war.

So here there enters into the picture again the army and the navy—the army to supply the men who are to occupy, the navy to carry them and to supply them. How much fighting of the ship-to-ship and hand-to-hand kind would be necessary cannot be foretold; but that some would be necessary is inevitable.

It would, therefore, be premature to argue that the atomic bomb has caused armies and navies to be out of date. Nor will it cause air forces to be out of date even if—as seems probable—the means of launching atomic bombs without the use of aircraft be found. The aircraft will be wanted still for carrying and for supplying and for such air-to-air fighting as that entails.

Those who see dramatic changes in the defence arrangements of the country as each new weapon appears, perform a useful service, for they do emphasize the fact that each new weapon entails a fresh consideration of the equipment and organization of the three fighting forces.

But while the final stage of war is occupation and the supply of occupying troops, the suggestion that a war can be won by a new weapon, however destructive, must remain fundamentally unsound.

Where I do see drastic changes in the air arm, at least as a result of the introduction of the atomic bomb, is in its carrying side. It must tend in the future to place much more emphasis upon carrying than in the past. Not only must the Royal Air Force expand it's Transport Command, but it must supplement it with other specialized carrying organizations. Similarly the

Fleet Air Arm will have to develop carrying as a part of the work of ship-borne aircraft.

Carrying, holding and supplying—these are the three things that must not be forgotten. There are more important things in war than destroying. Destroying, indeed, is only the means to the end of occupying and holding.

After the Normandy landing, an air force officer humourously complained that army officers wanted a new kind of bomb to be used by the Royal Air Force. They wanted them to use a bomb which blew everything up in a town they were to take and then, as they entered it, put everything back in place again. The fact was that their progress was seriously impeded by our own earlier bombing, which blocked the way to them.

The point of the story is that destructiveness has two sides to it. It is bad for the enemy, but it is also bad for the forces that must later take over and occupy. Destruction must be done because it is the only way that has been discovered for driving men back from territory they hold. But to assume that it is the be-all and end-all of war is a mistake.

The ideal military weapon would be one which did no destruction, but which eliminated human resistance. So far the only known way of eliminating human resistance is by destruction and destruction on an ever-increasing scale. But so long as there are the subsequent stages to be considered, so long will there be a need for navies and armies and air forces.

Limitations of Bomb

The only thing that would alter the position would be an invention which would penalize the destructive power more sharply. Thus, if it were possible to use the power of atomic energy and yet by some means to focus it more finely, destruction might then be confined to military targets in the strictest sense. Most of the argument about the bombing of non-military targets really revolves around the limitations of the bomb. Its destructiveness is spread and cannot, like the destructiveness of armour-piercing shell, be focused at a single point.

Supposing the possibility were to occur for focusing atomic power, there would be a gain in military effectiveness. But so far no sign has been given by weapons of this kind of progress. On the contrary, as the power of the weapon goes up, so the margin of destruction which it does is augmented.

This consideration is not concerned with the old dispute about which people in a country at war are truly engaged upon war work and are therefore legitimate targets, and which are civilians in the strictest sense. Much of the opposition to the use of bombing from the air has been based upon the view that civilians, or, that is to say, all who are not wearing uniform, are not playing a part in the waging of war. Yet at the same time it is admitted that industrial strength is war strength. The two arguments do not go well together. Total war demands total national effort and total national effort may legitimately be answered by total forms of destruction.

KNOWLEDGE

(Continued from page 42)

instruction called for.

2. It indicates at the completion of the course each point on which their knowledge was lowest and greatest and, therefore, shows the instructor where he failed and where he succeeded.

3. It gives a quantitative measure of the actual gains in knowledge of the students and, therefore, shows the relative effectiveness of instructors or methods of instruction and the relative ability of the students to learn.

INFRA-RED WEAPONS

Here is more information about the use of the "Sniperscope," one of the family of infra-red weapons successfully used in the closing years of the Second Great War. The "Sniperscope" was introduced to readers of CATM in the August 1946 issue, with illustrations. The accompanying article originally appeared in the (U.S.) Marine Corps Gazette.—Editor.

One of the most amazing pieces of equipment to come from the war is the "Sniperscope." Primarily a night-fighter, the Sniperscope is one of the family of infra-red weapons which are as unusual as their name implies.

The Sniperscope was developed late in 1943 and was used in the Pacific during the 1944-45 campaigns particularly to prevent Japanese troops from infiltrating behind our lines.

The Sniperscope, as do the rest of the infra-red units which were developed, uses the principle of sight without light. Infra-red has been known for many years to have the power of penetrating mist and the darkness of night.

It has been used extensively for photographic work under adverse weather conditions. One of its many uses is the "infra-red sextant," a sextant capable of piercing fog or haze, enabling the ship to "shoot the sun" and check its longitude and latitude.

Black Spotlight

The infra-red units developed for ground troops are a step further along this line. Very simply, they work like this. The infra-red unit, consisting of a light source and a telescopic viewer, is mounted on a weapon. The light source, which looks like a black spotlight, emits an infra-red light which shines on enemy personnel and the reflected image of the foe is picked up by the viewer. The infra-red armed man need only sight in on the image in the viewer and squeeze the trigger. The image, of a greenish hue, is remarkably clear as to details.

The use of infra-red weapons was started simultaneously in Germany, Japan and the United States. The Germans made unusually large light sources and telescopic viewers, mounting them mostly on half-tracks and tanks.

Infra-red units may be mounted on shoulder weapons, field pieces, helmets for jeep, truck or tank drivers—in short, on almost anything. The placement of the units enjoys complete freedom in that enemy troops are incapable of detecting the infra-red light with the naked eye.

When jeep mounted, the infra-red light sources are placed between the two headlights. The regular headlights of the jeep are not used when the infra-red unit is being employed. The driver of the jeep wears an over-sized helmet which has a telescopic viewer before each eye. Thus, when looked through, the images blend together, forming one complete image.

Huge Light Source

When mounted on a half-track, a huge light source approximately thirty inches in diameter is employed. The telescopic viewer is about the size of a normal telescope. This light may be used to direct anti-aircraft fire, search surrounding terrain, or locate enemy activity. The large infra-red unit on the half-track is not used to assist the driver of the vehicle, since he is equipped with his own infra-red unit consisting of headlights and the helmet.

The infra-red unit may be mounted on a variety of weapons, including the carbine, the M1 rifle, the Browning automatic rifle or .50 calibre machine gun. When mounted on the M1 rifle, a special leather cheek rest is required.

LETTERS TO THE EDITOR

KING'S CORPORAL

(The following letter has reference to an article with the same title published in the September 1946 issue of CATM.—Editor).

Editor, CATM: Tradition being part fact and part myth makes it a friend difficult to part with, even under the cold analytical eyes of science. Therefore may I be permitted to enter the lists on behalf of our old and much revered saint of the Old Soldiers' hierarchy "The King's Corporal", or as he was in my day, "The King's Sergeant" (who did the demoting is one of the things I would like to find out!)

An explanation that I heard as a young soldier in India whilst serving with The Royal Welch Fusiliers and which has the flavour of authenticity was not touched upon in the article in CATM No. 66, and I feel that it may aid in tracking down, and, I trust, establishing beyond a shadow of doubt the fact that our "hero" did actually exist, even if it was a long time ago.

During the days of the East India Company there existed a difference between the NCOs made by the Company and NCOs loaned by the War Office for instructional purposes, etc. The latter could be reprimanded by the Officers of the Company (these being for the main part officials of the Company and not professional soldiers) but could not be stripped of their rank by such officials. However, the defaulting NCOs could be sent back to England or to the nearest Military Governor for disciplinary action.

This practise may have been kept alive in part to fairly recent times through the loaning of NCOs as instructors to the private armies of the Princes in India. They, not having authority to "strip" such a one loaned, would return him to his unit for disciplining.

I daresay it is realized that a difference does exist between natives holding the King's Commission and natives who are officers, but have not the King's Commission. The difference in my day effected the dress worn and the variation of courtesy to which the holder was entitled, and in a number of instances led to misunderstanding.—*CSM F. E. J. Hancock, Educational Warrant Officer, MD 13, Calgary.*

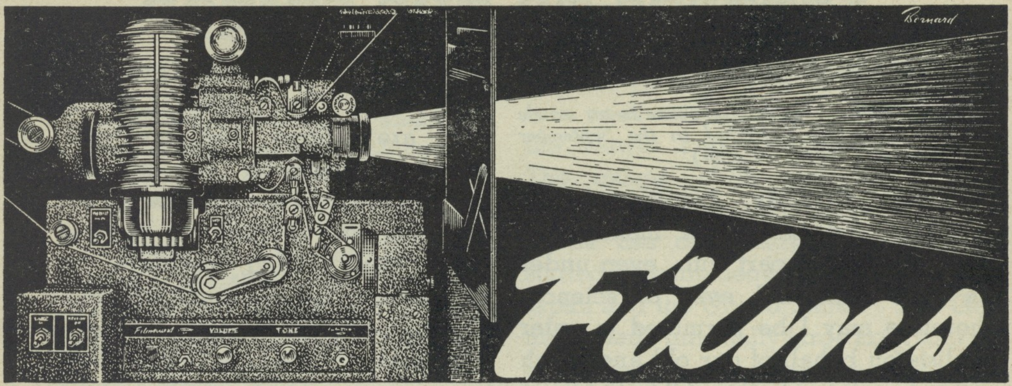
ANOTHER IDEA

Editor, CATM: I have read with interest the article entitled "King's Corporal?" in the September issue of CATM. I understand there was an instance in which a man claimed this rank in the early days of the World War, in the 1st Battalion, The Canadian Scottish Regiment, but his claim did not get past the Battalion Orderly Room.

Since reading the article, I have wondered if there is any connection between this claimed rank and the position, or appointment, of King's Messenger. I understand that in the diplomatic service there are certain trustworthy individuals, often Regular Army NCOs, who act as King's Messengers in carrying important and secret despatches, and it may be possible that some of these messengers, holding NCO rank, might have referred to themselves, or might have been referred to, as King's Corporals, etc.—*R. D. Harvey, Victoria, B.C.*

RADAR PULSES HARMLESS

Rumors that continued exposure to the extremely short radio waves used in radar might cause baldness or even sterility have been scotched by Army medical officers. Intensive research with guinea pigs at the Aero Medical Laboratory at Weight Field indicated no harmful effects whatsoever.—(*U.S. Infantry Journal*).



(For your information the following films have recently been distributed or are being distributed during the current month).

Airborne Forces

1. TF1-805 Loading of Cargo Aircraft (18 minutes)
   (a) Demonstrates methods of safe and economical loading of cargo aircraft.
2. TF1-3438 Tactical Use of the Glider Pick-up (10 minutes)
   (a) Shows practical operation and describes adaptability and value.
3. TF1-3711 DZ Normandy (80 minutes)
   (a) Depicts the various phases in the training, planning and landing of troops by the US 9th Troop Carrier Command during the invasion of Europe.
   (b) Distribution: Joint Air School (Army Component).

Signals

1. TF1-472 Radio Receivers (17 minutes)
   (a) Describes the principles and typical circuits of radio receivers.
2. TF11-622 Electricity and Magnetism—Elements of Electricity (14 minutes)
   (a) Discusses the source, transmission and use of electrical energy.
3. TF11-1200 Electricity and Magnetism—Ohm's Law (19 minutes)
   (a) Describes Ohm's Law as one of the basic principles of electricity and explains the formula and the symbols used.
4. TF11-2044 Radio Transmission Security (30 minutes)
   (a) Presents the story of the embarkation, sailing and landing operations of two task forces and shows how violations of radio transmission security may result in anything from the loss of a life to the loss of a unit.
5. TF11-2068 Defence Against Radio Jamming (18 minutes)
   (a) Designed to help minimize the effect of enemy attempts at radio jamming.
6. ERPI Receiving Radio Messages (10 minutes)
   (a) Describes the essential elements of a simple crystal radio receiving set and uses this to define the basic principles of radio reception.
   (b) Distribution: All Command Headquarters Film Libraries, Royal Canadian School of Signals, Royal Canadian Armoured Corps School, Royal Canadian School of Artillery, Royal Canadian School of Military Engineering and Royal Canadian School of Infantry.

THIS MONTH'S COVER

The text printed on the cover of this month's issue is an excerpt from a book of verses by Minnie L. Haskins, an English writer, entitled "The Desert." Readers may recall that His Majesty used the same verse in his Christmas message broadcast in December 1939.

For the information of those interested, the remainder of the verse reads:

So I went forth and finding the hand of
God trod gladly into the night.
And He led me towards the hills and the
breaking of the day in the lone East.
So heart be still.
What need our little life,
Our human life to know,
If God hath comprehensions.

The illumination for the text was painted by CATM's artist.

IT HASN'T CHANGED A BIT!

Now listen, you men, here cometh the CO, so you all believe in Santa Claus—see?