Oct 26 '39

LECTURE

ORDNANCE DEPARTMENT WAR PLANS

given at

ARMY INDUSTRIAL COLLEGE - OCTOBER 26, 1939.

by

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SECTION I - SCOPE OF LECTURE

1. It is intended to divide this talk into five general parts. First, to discuss the mission of the Ordnance Department; Second, to discuss the general problem of the Ordnance Department in carrying out this mission; Third, to discuss the organization which has been created to solve this problem with a brief description of the functions of the various units; Fourth, to give an illustrative example to show the scheme of our procurement planning; and Fifth, to discuss some of the difficulties which are special to the Ordnance Department in carrying out this scheme.

SECTION II - MISSION

2. Definition. It is the war time mission of the Ordnance Department to furnish certain war materiel at least equal in quantity and quality to that of the enemy. This includes design, development, procurement, supply and maintenance.

3. Comparison between Peace and War. The war mission is in general like the peace mission except that it is upon a greatly

enlarged scale and is hampered by the disruption of normal conditions. There will, however, be a change in relative importance of the work. In peace time the greatest stress is placed upon design and development of new materiel. In war time the stress will be upon procurement, supply and maintenance.

4. Functions of War Planning in Time of Peace. It is the specific function of Ordnance War Planning in time of peace to make plans so that the Ordnance Department can perform its war time mission most expeditiously. I can only hope the war will progress more expeditiously than our plans do.

SECTION III - GENERAL PROBLEM OF ORDNANCE DEPARTMENT

5. No Commercial Production in Peace Time. The big factor which makes the Ordnance problem difficult is that most of the items which we supply have no counterpart produced commercially in peace time. We have to ask sewing machine manufacturers to produce fuzes, and in almost every instance new or converted facilities must be created and manufacturers educated to make something entirely foreign to their normal product.

6. Disproportionate Requirements. Another factor which makes the Ordnance problem different from the average problem of the other supply branches is that there is no real comparison between peace and war requirements and no accurate ratios between man power and initial equipment, particularly in the earlier stages of mobilization. For example, in the case of ammunition, our annual consumption is a very limited quantity prescribed for target practice. Our war consumption

is based upon rates of fire for particular weapons which have no relation whatsoever to target practice allowances and is vastly greater. A man eats approximately the same amount of food in war time as he does in peace time and requirements for clothing also bear a definite relation to man power. But the number of anti-aircraft guns depends upon the number of anti-aircraft regiments mobilized under a particular plan. Hence every item is different and has to be worked out in detail with no royal road to solution. This involves a great amount of clerical work which has to be done for every plan which the War Department promulgates. Ratios of requirements, based upon man power in 1000 man units, have been determined for some items during the latter stages of mobilization but that method of computing requirements has never been approved by the General Staff. In time of emergency when requirements have to be computed very rapidly it may have to be resorted to.

7. Wastage Factors. Another feature is the variation in wastage factors of Ordnance materiel. The wear and tear on a truck used in peace time does not vary so very much from that in war. On the other hand, a 75 mm gun with proper care in peace time lasts for years, whereas in war, due to tremendously increased firing and destruction by the enemy it is estimated that there will be a wastage of 8% per month. Similarly radically different wastage factors have to be established for all major items, and wastage in time of peace can not be used as a criterion. As a rule of thumb for commercial items such as standard hardware and things of that nature we have adopted a proportion that 7 days of intensive firing is equal to 1

month of normal warfare in the Theater of Operations, which is equal to 3 months training in the Zone of the Interior and equal to 6 months peace time consumption. This chart gives a graphic picture of the procurement and supply of a few of the major items of Ordnance material.

Procurement Chart

SECTION IV - ORGANIZATION

8. Brief Discussion of General Organization Necessary. In order to explain how War Planning organization of the Ordnance Department works it is believed necessary first to discuss briefly the organization of the Ordnance Department, as a whole.

9. General Organization and Functions. The Ordnance Department is organized into four main groups as shown on this chart, namely -

Organization Chart

General Office
Technical Staff
Manufacturing Service
Field Service.

a. The General Office, includes the personal office of the Chief of Ordnance and administers affairs which are common to all units. It is divided into six divisions as shown, namely -

Executive
Administrative
Fiscal
War Plans
Advisory
Military Personnel.

b. The Technical Staff conducts research and development work and tests. It is divided into four divisions as shown, namely

as to funds for this work.

The District Chiefs are one dollar a year men of wide experience and prominent in business activities in their Districts, as well as men who are interested in the procurement problems of the Ordnance Department. In some cases they are reserve officers and in some cases not. As indicative of the character of men engaged in this work I would like to name these chiefs with their commercial affiliations.

DISTRICTS	DISTRICT CHIEF	BUSINESS AFFILIATIONS
Baltimore	Mr. Howard Bruce	President, Bartlett Hayward Co., Baltimore, Md.
Birmingham	Col. John Stephen Sewell	President, Alabama Marble Co. Birmingham, Ala. Graduate West Point 1891. Built the War College. Fine overseas record in Engineer Corps.
Boston	Col. Charles H. Tenney	President, Chas. H. Tenney & Co. (Public Utilities) Springfield, Mass.
Bridgeport	Col. B. A. Franklin	Vice President, Strathmore Paper Co., Mittinague, Mass.
Buffalo	Col. Ledyard Cogswell, Jr.	President, New York State National Bank, Albany, N.Y.
Chicago	Mr. E. A. Russell	Retired, Formerly Vice President, Otis Elevator Co., Chicago, Ill.
Cincinnati	Col. C. I. Harrison	President, Cincinnati Terminal Warehouse Co., Cincinnati, O. and President, Board of Sinking Fund Commissioners.
Cleveland	Mr. Henry Osborn	President, American Multigraph Co., Cleveland, O.

DISTRICT	DISTRICT CHIEF	BUSINESS AFFILIATIONS
Detroit	Col. H. A. O'Dell	Sec., Belmont Land Co., Detroit Savings Bank Bldg., Detroit, Mich.
New York	Col. James L. Walsh	Vice President, McGraw-Hill Publishing Co., New York, N.Y.
Philadelphia	Mr. John C. Jones	Vice President, & General Manager, H.S.B.W. Cochrane Corps., Phila., Pa.
Pittsburgh	Mr. R. M. Dravo	President, Dravo Construction Co., Pittsburgh, Pa.
St. Louis	Mr. M. E. Singleton	President, Missouri State Life Insurance Co., St. Louis, Mo.
San Francisco	Col. Bruce Cornwall	Member firm, Coldwell, Cornwall & Banker, Real Estate, San Francisco Calif.

The district office is expected to do everything practicable to insure that when war comes, it will be able to produce the items appertioned to it in the amounts and at the rates required. After M-Day its task is to put its War Plans into execution.

d. The Field Service is charged with storing, issuing and maintaining Ordnance materiel after it is procured. It is divided into three executive and four operative divisions, namely -

Executive - Administration
Facilities
War Plans and Training.

Operative - General Supply
Ammunition Supply
Maintenance
Surveillance.

It operates fifteen depots in the field.

e. In addition to the War Plans Division in the General Office, and the War Plans and Progress Division in the Manufacturing Service and the War Plans and Training Division in Field Ser-

vice, each operating division has a War Plans Section. Contrary to the Quartermaster system our War Planning is very much decentralized. We believe that for our particular complex problems at any rate, intimate contact between current activities and War Planning is more essential than the efficient speed with which a centralized group can operate. Furthermore, with proper coordination, which we think we have provided, we believe it best to have each unit prepare the plans which it will execute in time of emergency.

Our organization is based upon being able to pass from peace to war with least confusion. In the General Office there would be no change on M-Day except expansion. The War Plans Division would become virtually a Requirements Division to take care of the many changes in troop basis which would be bound to occur. In the Manufacturing Service, again there would be expansion. The Automotive Section of the Artillery and Tank, Tractor and Trailer Division becomes a separate division. Similarly, Infantry and Aircraft Armament separate. The War Plans and Progress Division would cease to operate the Districts and become purely a Progress Division. There would be no change in the Technical Staff or the Field Service except expansion. The various War Planning Sections in all the operating divisions are so small that they would be absorbed and would be valuable in putting plans into effect.

SECTION V - ILLUSTRATIVE EXAMPLE

10. Let us now follow through an hypothetical example to see how this organization works for Procurement Planning. Assume the Field Artillery has expressed a desire for a 7-inch gun and the Secretary

of War has directed that they be armed with that weapon.

a. Design - The first step is for the Artillery Division of the Manufacturing Service to design the gun in accordance with the general specifications of the Field Artillery as to weight, range, etc.

b. Approval of Design - This design is approved by the Technical Staff after consultation with the Field Artillery representative on the Ordnance Committee.

c. Manufacture of Pilot Gun. The Artillery Division would then order Watervliet Arsenal to make one gun.

d. Proving Ground Test - When the gun is completed it is subjected to Proving Ground Tests at Aberdeen to determine if it is satisfactory from the engineering viewpoint.

e. Field Test - After it passes the proving ground test it is turned over to the Field Artillery for a field test.

f. Adopted as Standard - After all these tests are satisfactorily completed the Technical Staff, with the concurrence of the Ordnance Committee (which is composed of representatives of all branches) recommends that it be adopted as standard. Before approval by the Secretary of War, it must be approved by the Assistant Secretary of War as satisfactory from a procurement viewpoint.

g. Drawings, etc. - The Artillery Division then prepares a complete set of specifications, drawings, lists of parts, etc. from which copies may be readily made when needed. Drawings, etc.

h. Description of Manufacture. The Artillery Division then directs Watervliet Arsenal to prepare a description of manufacture for producing a unit number of these guns at a prescribed rate, based upon their experience in making the pilot gun. This will be a method which can be used as a guide by commercial firms in making their factory plans. Description of Manufacture.

i. Wastage Factors. The War Plans Division, General Office, cooperating with the Maintenance Division, Field Service determines wastage factors for this gun in the Theater of Operations and Zone of Interior and recommends them to the General Staff for approval. Wastage Factors

j. Sets of Accessories, Equipment and Extra Parts. The Maintenance Division, Field Service, now determines the number of actually essential accessories, equipment and parts which will be necessary to maintain 100 of these 7-inch guns for 6 months of normal warfare.

k. The next step is to secure from the General Staff a troop basis for the regiments armed with these guns showing rate of mobilization and rate of passing into the Theater of Operations. Troop Basis

l. Military Requirements. The War Plans Division, General Office is now ready to compute the military requirements by month. These requirements must include initial equipment, overhead for distribution and wastage. Requirements must be computed for the guns themselves and for sufficient accessories, equipment and extra component parts to maintain the guns for their expected life in the Theater of Operations. The expected life of 100 guns 1924 Requirements.

is dependent, of course, upon the wastage factor of the gun. We assume for practical computing purposes that if the wastage factor of this gun is 5% per month in the Theater of Operations, 100 guns would last 20 months. These requirements are compiled in a procurement set based upon the list of these items required to maintain 100 guns 6 months, which has been prepared by Field Service. Procurement Set Parts

m. Procurement Requirements. Comparing these military requirements with any stocks which we might have on hand, (which in this assumed case is none), the War Plans Division, General Office then determines the monthly procurement requirements and transmits them to the Artillery Division of the Manufacturing Service. Sheet

n. Tentative Apportionment. The Artillery Division then tentatively apportions the requirements to one or more districts for procurement. (We will assume that Watervliet Arsenal is already loaded with orders to its capacity) The tentative apportionment sent to a district is accompanied by complete sets of drawings, specifications, lists of parts, and the description of manufacture prepared by Watervliet Arsenal. Form

o. Gages. The Gage Division then designs inspection gages and determines tolerances, gaging points, etc. Gage Board

p. Estimates of Production. Assume that the Chicago District is one of the districts receiving an apportionment, this district then secures estimates of production from commercial plants within its jurisdiction, which it deems qualified to manufacture this 7-inch gun and makes report of same to the Artillery Division, Manufacturing Service. Form

q. Accepted Schedules of Production. The Artillery Division reports the total estimated production, by month, to the War Plans Division, General Office to be used in computing a War Reserve of this item sufficient to tide over until production can meet requirements. The War Plans Division, General Office forwards a copy of this production estimate to the Field Service for them to use in preparing their supply plans. The Artillery Division then prepares Accepted Schedules of Production for the plants which have been selected for the Chicago District and similarily to other districts to which the apportionment has been made.

Re-port

Form

r. Factory Plans. Each plant which has been selected for this manufacture then makes a factory plan to meet the schedule which it has accepted, using in so far as it sees fit (depending upon its particular equipment) the description of manufacture which has been furnished it.

Factory Plans

s. Specific Procurement Plan. The Artillery Division, Manufacturing Service, then prepares a specific procurement plan and submits it to The Assistant Secretary of War as the solution of the procurement problem of this 7-inch gun.

Specific Procure-ment Plan

11. Ideal Condition does not Exist. What I have outlined is the ideal which we strive for in accordance with our organization. I do not wish to convey the impression that in actual practice this ideal is realized. As a practical condition much of this work remains to be done in our War Planning program and considerable time will be required with the limited funds and personnel which are available.

SECTION VI - DIFFICULTIES

12. Inherent to Task. There are other difficulties besides lack of funds and personnel which are inherent to the nature of the task itself and would have to be faced even if we had plenty of funds.

13. Rearmament. For instance, the question of rearmament. A little while ago in the illustrative example I spoke of the 7-inch Gun being adopted as standard. To designate a gun as standard means that it is believed to be the best of its type available and is authorized for both procurement and issue. An item is "substitute standard" when it is not considered the very best but is suitable and is authorized to be issued and to be procured only if necessary. An item is "limited standard" when it is believed fit to be issued to meet requirements but no more will be procured. Let us take the 75 mm gun carriage for example. The recently produced MI carriage is standard, the French M1897 is substitute standard and the British and M1916 American are both limited standard. If we had ample funds we would rearm our army today with the MI carriage. Also we would fill our war reserve with them and throw the others all away. But we cannot do that so we have to consider when and how we will rearm in case of emergency. We do not believe we can produce the MI carriage in quantity under one year, whereas we believe that we can, due to past experience, produce the French carriage (which is substitute standard) sooner than that, We know our present stocks of all kinds will be exhausted in a major emergency in less than one year. So the obvious thing to do is to manufacture some French carriages

to tide over until the MI carriages can be produced. The decision was made to start the change at the end of one year which means plans must be made to taper off production of the French carriages as the MI's come in. This requires careful planning and is further complicated by the fact that the ammunition for the new MI gun, due to its longer cartridge case, will not fit the old guns. So the ammunition program has to be kept in step.

14. Ammunition Components. Another problem is the proper use of ammunition components which are on hand. The sudden stop of the World War and the resultant closing out of war contracts left us with a very unbalanced stock of shell forgings, cartridge cases, fuze bodies, etc. Salvage of good components from ammunition which has become unserviceable has further upset the balance of these stocks. Our procurement plans, therefore, have to be based upon using them to best advantage.

15. Loading Plants. It is very difficult to place Accepted Schedules of Production for complete rounds of ammunition. The various components are too dissimilar. This fact, added to the unbalanced stocks of components on hand which I just mentioned, means that there must be loading plants established for the assembly of the components. Due to the importance of this problem it has been decided to make these government owned and operated. The present tentative plans, which are not yet approved, call for first phase loading plants and second phase loading plants. The first phase plants are ~~improved~~ improvised production plants which are to undertake the loading and assembly of available components at the earliest possible moment. They will make use of existing buildings and facil-

ities at Field Service establishments. Second phase loading plants are large production plants to be constructed for the loading and assembly of ammunition components to be manufactured. In this they will be assisted by the first phase plants. Picatinny Arsenal with its present equipment will, of course, take care of a certain amount. We are establishing three renovation plants with which we expect in time of peace to renovate deteriorated ammunition. At the outbreak of an emergency there will be some renovation work still to do, of course, but it is expected to complete that as promptly as possible and then to use the renovation plants for loading and assembly in-so far as possible.

16. Manufacturing Proving Grounds. Another special problem which the Ordnance Department has to face is the question of additional proving grounds for acceptance tests. Aberdeen Proving Ground will be entirely inadequate in a major emergency for the proof firing of all the guns and testing of lots of ammunition which will be procured. It is expected to install six of these proving grounds, the basic plans for the lay out and operation of which are contained in the unit war plan of Aberdeen Proving Ground.

17. Accessories, Equipment and Extra Parts. One of our biggest tasks is the computation of requirements for extra parts, accessories and equipment. At present practically no progress is being made on this important work due to lack of personnel. It is not a particularly hard task to compute the requirements for sets of essential parts, etc. pertaining to items to be manufactured after the sets are once agreed

upon, but to figure out the parts necessary to maintain guns, carriages, etc., which are on hand, is a very complicated problem. The War left us with entirely unbalanced stocks of spare parts and it is necessary to compute the requirements for each individual part.instead of computing by sets. In spite of the fact that we compute requirements for essential parts only, the number of such reaches well into the thousands and the work involved is tremendous.

18. Optical Instruments. Another problem which is being given considerable study is that pertaining to the procurement of optical instruments. This involves in general two separate problems; the procurement of the necessary metal components and the production of the optical elements. There might also well be added another problem which is involved in the assembly operations. We find it impossible to apportion complete instruments due to the fact that very few facilities are capable of producing the complete items. Facilities can be located that are capable of producing the metal parts, but relatively few facilities exist which are capable of producing the necessary optical elements. The real problem, therefore, is the procurement of these optical elements. Frankford Arsenal is working on this problem and it is rather probable that it will be necessary to have a War Reserve of optical glass.

19. Hydro-Pneumatic Recoil Mechanisms. The procurement of hydro-pneumatic recoil mechanisms is another puzzle for us to solve. These are extremely difficult to manufacture. During the last war, satisfactory mechanisms were produced by certain commercial companies, but it was only after considerable experimentation and after many difficulties

had been surmounted. The knowledge gained by these companies will no doubt have been lost to a great extent by the time another emergency may arise and therefore the Department has adopted the policy of making Rock Island Arsenal the principal source of supply in an emergency. It is not believed that the capacity of this arsenal will be sufficient to take care of our total requirements, but all orders for such mechanisms are being placed there, leaving to it the problem of securing such assistance from commercial facilities as may be necessary.

20. Strategic Materials. In the design of Ordnance materiel every effort is made to insure the best product possible. Usually, limitations as to weight or size make it necessary to utilize the best materials without paying much attention as to their strategic value.

In recent designs, however, this question has been given due consideration and good results have been obtained. For example, in the latest tanks, there are no alloy steels used other than the armor plate, the engine crank shaft, and certain of the more important gears, Considerable progress has also been made in the elimination of such materials as silk, shellac, antimony and tungsten.

21. Changes in Manufacturing Methods. Another problem which faces the Ordnance Department and which must be under constant consideration is the constant change and development in manufacturing operations.

a. Cold Working. For example, the cold working method of making cannon has a marked effect upon the production programs for guns and descriptions of manufacture for the old shrinking process are becoming more or less obsolete for smaller calibers.

b. Centrifugal Casting. A new development in cannon manufacture is the centrifugal casting of guns by which molten metal is poured into a rapidly turning mold and the metal is cast upon the sides of the mold in the shape desired. The results which have been obtained from this method are most promising and may further revolutionize the making of small guns.

c. Seamless Tubing. The adoption of seamless tubing for the manufacture of projectiles in place of the old method of punching them out of a billet bids fair to have considerable effect upon production schedules of shell.

d. Machine Tools. The rapid changes in the machine tool industry also require careful consideration. Since the war the machine tool industry has gone ahead by leaps and bounds and many machines believed to have been very fine a few years ago are now obsolete. Competition requires commercial firms to have the very latest machine tools for speeding up manufacture and thus a description of manufacture which involves the use of certain machine tools may be almost useless to a commercial firm equipped with much more modern types.

22. Factory Plans. To make War Planning complete and in order to get reasonably accurate estimates as to power, labor, new construction, etc. it is absolutely necessary that the commercial firms who have Accepted Schedules of Production prepare factory plans. They are really the heart of our procurement planning but unfortunately constitute one of our hardest problems. No funds are appropriated for this purpose and a good factory plan will cost anywhere from $5,000 to $15,000 if not more. Most firms are loath to undertake this work without some

assistance from the Ordnance Department. This is particularly true for firms which have agreed to make a product foreign to their normal out-put. For instance it is not difficult to get factory plans from the Caterpillar Tractor Company or the Colt Automatic Arms Company because the War Orders which are placed with them are for the identical items which they are making in peace time, and a factory plan is extremely simple. To expect a factory plan from an airbrake company for producing carriages is a different proposition. At a meeting of the District Chiefs two weeks ago a resolution was unanimously adopted to the effect that if real progress is to be made in factory plans, each district should be furnished with one or more production engineers, either officers or employees of the Ordnance Department, who could devote their time exclusively to energizing and assisting commercial plants in this work. We have no way of forcing factories to make these plans, and all we can do is urge them. It is believed that as more descriptions of manufacture are made available, it will be somewhat easier to get factory plans.

23. Educational Orders. This leads me to the last of the special problems, and that is the question of Educational Orders. You are probably familiar with this idea, but in case you are not, it is briefly the placing of small orders with commercial firms in time of peace to give them experience in manufacture. At present this is prohibited by law if the work can be done at arsenals. Attempts have been made for new legislation to permit this procedure, but so far without success. Returning to factory plans I might say that in the legislation which it

is hoped to have passed providing for Educational Orders will be a proviso that a firm with whom an Educational Order is placed will have to make a factory plan for that item. Of course even if legislation is secured it is not hoped that there will be any appreciable amount of money appropriated, so that the actual number of factory plans thus produced will probably not be very great but once the idea is initiated and legislation secured there will be opportunity for growth. We feel that Educational Orders and factory plans are extremely important factors in true procurement planning but so far it has been impossible to make much progress in this line.

SECTION VII - WAR RESERVE

24. No discussion of procurement planning is complete without some reference to the War Reserve. Practically every military authority now seems to be agreed that with equal starts new man power can be supplied to the fighting front well ahead of new munitions which have to be produced. This is particularly true of Ordnance materiel and in order that the supply of Ordnance to the fighting troops may be sufficient and adequate until such time as industry can meet the demand there must be a sufficient War Reserve. If such a War Reserve is not sufficient or up-to-date there will be an interval in any major conflict when our troops will be without sufficient guns and ammunition. War Reserve is computed for what we call Essential Items only. That is items which are absolutely necessary to the fighting troops and which cannot be procured in the time and quantity necessary. Our War Reserve is computed by comparing the cumulative requirements with cumulative esti-

Essential Item List

mated production and taking the maximum deficit or discrepancy between the two. That should be the War Reserve.

A few figures concerning our War Reserve may be interesting. These are as of the first of last January.

Value - 2 Army 1927 - Seacoast - Overseas Projects.

Equipment	$335,000,000
Ammunition	900,000,000
Total	$1,235,000,000

Cost to Fill Deficits

Equipment	$ 69,000,000
Ammunition	377,000,000
Total	$ 446,000,000

Cost to renovate Unserviceable -

Ammunition	$ 7,000,000

Cost to overhaul Unserviceable -

Equipment	2,700,000
Total	$ 9,700,000

Total Cost to make Ammunition Reserve complete & Serviceable	$384,000,000
" " " " Equipment " " " "	71,700,000
Grand Total " " War " " " "	$455,700,000

As you will notice the equipment deficit is not serious in total. We could equip Six Field Armies reasonably well. But in a few specific items, the shortages are very serious, notably antiaircraft.

The deficits in ammunition, however, are much worse. In general, at the approved rates of fire and with troops going into the Theater of Operations according to the schedule of the 1928 General

Mobilization Plan our ammunition supply will be exhausted in two or three months and it will be another six months or so before any large quantity can be forthcoming from new production even under our most optimistic hopes.

I have now tried to give you a picture of the way we are organized, how the organization is supposed to work, and some of the difficulties which worry us. I thank you very much for your attention and if there are any questions anyone would like to ask either now or in my office, I am at your service.