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THE ARMY SUPPLY PROGRAM
5 February 1946.

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GENERAL ARMSTRONG:

Gentlemen, this morning we have the privilege of listening to the Commanding General of the Army Service Forces. We have had many of his staff here and they gave us details of the operations of planning of that organization. We are naturally concerned to hear from the head of it as to how that organization operates in the broadest sense.

General Lutes was commissioned a second lieutenant in the United States Army in 1917. He is a graduate of the advanced course at the Artillery School at Leavenworth and of the Army War College. In this war he was mostly in charge of the great problem of distribution. Ultimately, when General Styer left and he became Chief of Staff to General Somervell, he had charge of the problems of procurement, distribution and everything else within ASF.

A new so-called restricted memorandum here, which describes the future organization of the Army, which may and probably will be put into effect, assigns to General Lutes the essential and important duty of being in charge of the service of supply and procurement in the new War Department organization. In that capacity the Army Industrial College will look to General Lutes for advice and direction. We hope that we can make his assignment easier and facilitate the work of his office by giving him properly and effectively trained officers to perform the staff duties and the operating duties on the top level.

Gentlemen, it is an honor to present to you Lieutenant General Lutes.

GENERAL LUTES:

After passing through such a total war as World War II, there can be no question in our minds concerning the supreme importance of industry in modern war. It is obvious to all of us. Prior to the war the Army Industrial College contributed much to awakening our Army to the necessity for a strong link between industry and the Army; and also contributed greatly to our victory by training officers for key logistical positions in war. This College can and must continue to be a major factor in our preparations to meet any future threat against our national security. For these reasons I feel highly honored to have the privilege of addressing you today, and wish to state that my staff and I stand ready to contribute to or help in your programs in any way within our capabilities.

I heartily concur in what General Armstrong said concerning our needing your support, and I hope we can find places for many of you among the high-level key positions in the Army of the future.

The subject which General Armstrong selected for me is the "Army Supply Program." In a restrictive and literal meaning of the words, the Army Supply Program was simply a printed document which periodically set forth, throughout the course of World War II, the requirements of the

Army for supplies and equipment. In a broad sense, however, the phrase "Army Supply Program" embraces not just the document, but the system that was developed during the war for estimating the future needs of the Army for supplies and equipment; correlating these needs with the assets already in the hands of the Army; coordinating them with production capabilities in terms of facilities, raw materials, components and manpower; governing and scheduling purchasing and production; and controlling stockages and stock levels.

It is to this system that my remarks will be directed this morning. Unfortunately, it is a subject lacking in glamour. It is complicated and involved. It cannot be made amusing. All I can try to do is to make it somewhat intelligible. But the importance of this subject cannot be over-emphasized. It is the life blood of the supply process. It is the first step in that process and the one that governs all its phases. It demands most serious attention, and particularly here at the Army Industrial College.

So let us first look at the situation that existed on 7 December 1941, when the Japanese struck at Pearl Harbor. At that time G-4 of the War Department General Staff had a procedure for the preparation of so-called "Equipment Expenditure Programs." In effect these programs were a breakdown of the moneys appropriated by Congress for supplies and equipment for the Army into specific items or categories of items and quantities. They were prepared by the various technical services--the Ordnance Department, the Signal Corps, and so forth--and consolidated by G-4. They were not a complete statement of the needs of the Army, but were, rather, a statement of how to spend the limited funds that had been secured. After approval by G-4, they became the basis of procurement for the technical services.

These expenditure programs were deficient as a means of governing the supply program of the Army. They were limited in scope and did not cover all necessary items. They did not indicate when the items would be needed and therefore were not phased in time. They were inadequate as a basis for production planning and scheduling or for determining the Army's needs in terms of raw materials and industrial facilities. They were a meager but important beginning in determining the requirements of the Army and translating these requirements into feasible production schedules.

It is true that in July 1941, after Germany invaded Russia, the President directed the Secretary of War to explore the over-all production requirements to defeat our potential enemies. In response the General Staff prepared a troop basis indicating the size and composition of the force considered necessary to defeat Italy, Germany and Japan. This was the foundation on which weapons, vehicles, uniforms, all the hundreds and thousands of items necessary to equip and maintain an adequate force, were to be determined.

This troop basis and computation of munitions based thereon were completed in October 1941. It was known as the Victory Program. It did not, however, become the basis for actual procurement until after Pearl

Harbor. It was the first program which gave consideration to the productive resources of the country.

At the time of Pearl Harbor, supply, using the term in its broadest sense to include all activities from the factory to the front lines, was divided between two independent offices in the War Department. The Office of the Under Secretary of War was responsible for procurement and related activities, and in this capacity dealt directly and separately with the technical services. G-4 of the War Department General Staff was responsible for requirements, storage, transportation, distribution and issue of supplies and equipment; and likewise dealt directly and separately with the technical services on these phases of the supply process.

On the one hand G-4 was trying to determine requirements and furnish supplies to the Army. On the other hand the Office of the Under Secretary of War was trying to determine what should be purchased and getting it produced. The coordination and correlation between these two offices were inadequate. The technical services had two bosses for supply. While theoretically there was correlation bottom-side in the technical services, there was no well-established procedure for correlation top-side. It was not uncommon for a technical service to play one office against the other.

This situation was clearly recognized by General Somervell when he became G-4 in November 1941. That was before war was declared and before the creation of the Army Service Forces. He immediately initiated steps with the Under Secretary of War to bring about a better integration of the various factors involved in the supply process. At the same time steps were initiated to prepare a more comprehensive Army Supply Program setting forth more fully the needs of the Army for supplies and equipment and correlating these needs with procurement.

In March 1942, as you all know, the War Department was reorganized into three major commands--Ground, Air and Service Forces. In this reorganization, certain procurement and planning functions from the office of the Under Secretary of War and certain supply planning functions from the office of the Assistant Chief of Staff G-4 were combined and integrated in the Headquarters of the Services of Supply, later known as the Army Service Forces, thus bringing together the major phases of the supply processes under one top management. This had a tremendous influence on the Army Supply Program.

The first comprehensive Army Supply Program appeared in April 1942. It set forth the procurement objectives of the several technical services by calendar years in terms of end items. I assume you all know what we mean by "end items." They are the items as supplied to the troops. Requirements for the Navy and Lend-Lease, as well as for all elements of the Army, were included.

Each technical service prepared its arithmetical computations by electric tabulating machines in accordance with standard Army Service Forces instructions. Computations were based upon troop lists, tables of equipment and allowances, replacement factors, and other strategic planning data furnished by the General Staff. The program was then translated into terms of raw materials and facilities and furnished to the civilian War Production Board.

The War Production Board, after taking into account other programs contributing to the war effort, determined that it was unrealizable due to limitations of productive capacity. Accordingly, the Joint Chiefs of Staff revised the strategic plans, which were geared to the program; and ordered a reduction in requirements, which was reflected in the Army Supply Program in November 1942. This program represented for the first time a correlation of strategy, requirements and productive possibilities.

Requirements are never static, particularly during war. Consequently, the Army Supply Program was reissued periodically throughout the war; and interim, almost daily, revisions of the published program were made.

Now, let us examine in a little more detail the system behind the Army Supply Program--how well it worked, and its deficiencies.

In the first place, the program had to be based on the plans for prosecuting the war. The most important planning document in this respect was the troop basis as worked out by the War Department General Staff. Knowing the number of units of various types, that is, Field Artillery battalions, the number of Infantry battalions, the number of Air Bombardment Squadrons, and so on, knowing their tables of organization and equipment, the amount of initial equipment that these units would require could be computed. Tables of allowances, replacement factors, in addition to the troop basis, determined the amount of replacement supplies and equipment. Navy requirements and requirements of our Allies had to be added. Then there were the so-called operational project requirements determined by the strategic and operational plans. These were requirements over and above any tables of equipment and allowances, designed to meet specific needs; for example, materials and equipment to rehabilitate the port of Cherbourg.

Incidentally, these operational project requirements throughout the war gave us considerable difficulty in that strategic plans changed and emphasis within the theaters of operation changed. It was very difficult, particularly during the early phases of the war, to impress upon the overseas commanders the lead time we needed here to get their operational requirements into production. For instance, they might be planning a campaign eight months or twelve months from now. It was very difficult to get their staffs to realize that we had to know their operational requirements, their requirements over and above their troop basis, sometimes as much as a year or eighteen months in advance in order to have them meet the deadline date, to be on time at the place where needed. We improved that situation after the spring of 1942, after persistent hammering at the overseas theater commanders.

From the computed figures there had to be subtracted the amounts already on hand in the Army. This sounds like a simple procedure, but it had its complications. To be absolutely accurate, all the supplies and equipment in the hands of all troops, both in the United States and overseas, in storage in overseas depots and dumps, and at posts, camps and stations in the Zone of the Interior, as well as amounts in the depots of the Zone of the Interior, should have been considered.

To secure such a world-wide inventory of all items was an impractical task. In general the Army Service Forces had to adopt the practice of assuming that, once an item was issued from its depots in the Zone of the Interior, it was no longer an asset in the estimating of future needs. I might say that we cannot apply that theory right now in disposing of the surplus. This policy led to difficulties toward the end of the war and had to be modified for redeployment planning to take into consideration returns to depots and stocks overseas.

The next step was the translation of the procurement objectives, as determined by the methods I have just outlined, into raw material requirements. In other words, we started with an end item and worked back to the raw materials. One of the most vexatious problems in the early stages of the war was that of controlling the flow of materials in short supply, such as aluminum, copper and steel, into essential war programs.

An attempt was first made to do this through a priority system. This attempt failed, as could have been expected. No priority system can be successful when there is an actual shortage to meet all programs. In such cases the programs with the highest priorities get all the materials, while essential programs with lower priority get little or no materials.

The next effort was the Production Requirements Plan, which attempted to allocate materials on the basis of manufacturers' estimates instead of on the basis of end-item programs. As pointed out to the War Production Board by the Army Service Forces at that time, this scheme was doomed to failure, since it did not properly correlate the flow of materials with the various war programs.

The final solution was found in the Controlled Materials Plan, which provided for an allocation of materials down through claimant agencies in accordance with scheduled programs of requirements. In general this plan solved the materials problem. It necessitated a thorough translation of the Army Supply Program into scheduled quantities of the various controlled materials. From the second quarter of 1943 to the end of the war the Army Service Forces quarterly issued a document known as the "Army Requirements for Controlled Materials" as a direct supplement to the Army Supply Program.

On the whole the computations from these data produced requirements figures of sufficient accuracy to insure a high degree of satisfaction in the supply of the Army. In effect, they produced a pool of supplies and equipment which was drawn on to meet the requisitions originating in the Zone of the Interior and the overseas theaters and to meet the assignments of munitions to our Allies.

Certain difficulties, however, arose. Instead of one authoritative troop basis from which to compute requirements, several troop lists were being prepared by different divisions of the War Department General Staff, which were in many particulars inconsistent with one another. One troop list, prepared by G-3, showed the activation of units; another, prepared by the Operations Division, showed the contemplated deployment; and still another showed the planned sailing of units overseas. There was a tendency to buy on one basis and try to supply on another. Army

Service Forces kept insisting that one complete authoritative troop basis was essential for the proper computation of requirements. While the situation was improved during the war, the end of the war still found us with more than one troop basis. I am sorry to say that we still have more than one.

Not only were there major inconsistencies in the troop bases, but troop bases when secured from the War Department General Staff were not supplied sufficiently far in advance to allow for the proper computation of requirements and the implementation of procurement programs. It just seemed impossible to get the Staff to understand the importance to lead time in production.

This was also true of strategic and operational plans, which affected in a large measure the supply of equipment in addition to the basic troop equipment. Firm decisions on these plans were seldom made sufficiently far in advance to meet the required lead time for production. It was necessary for Army Service Forces to do its own strategic and operations planning in an attempt to outguess the Joint and Combined Chiefs of Staff; otherwise we would not have been in a position to meet the supply requirements of the operations finally decided upon.

Another problem in the computation of requirements was that of replacement factors. Of course, the Army had some experience on how fast supplies and equipment were used and had to be replaced at the beginning of the war, but this experience was extremely limited in comparison with the problem presented. Originally the majority of the replacement factors had to be determined on a theoretical basis. Manufacturers were asked, for example, to estimate the items and quantities of spare parts that would be needed for automotive equipment. The day of fire for ammunition had to be continually adjusted, generally upward.

In the case of that automotive equipment I am going to make a little personal observation. In the early stages of the war some of the manufacturers recommended that we prepare replacements for automotive equipment in sets. That was based on commercial experience. We had no real war experience by that time, where we had different climates and were operating over different terrains.

I got up into the front of Italy and began working from the front lines backward to find out just how their supply was working, in order to determine whether they were getting at the front what we were producing in the States. I happened to hit there in the winter time, when the mud was hub-deep. The cry all through the Army was for brake linings. There seemed to be nothing that they needed like brake linings. Another thing was steering gear parts, because the steering gear would break down from the drivers working in the mud.

I worked back to the base at Naples and then took a plane for the back base at Oran in North Africa, from which most of these automotive supplies were flowing. I found that they were pretty well out of brake linings. That is just an example of the practical, simple problem in the replacement factor in the field.

The main difficulty in the original system, however, was one of phasing by period of time. The original system of determining requirements was by calendar years with no intermediate phasing by months or quarters. As a result, production schedules did not adequately reflect the phasing of the actual demands, and too often actual production schedules were based on production factors without regard to military needs. The computation of raw material requirements under the Controlled Materials Plan was, therefore, based on production schedules which did not reflect the true needs of the Army. While every attempt was made to secure delivery as early during the year as possible, there was a decided tendency to keep rolling back schedules to the last months of the year. Even if deliveries were accomplished during the early part of the year, the problems of retention of necessary facilities for the succeeding year's program created by this method of scheduling were serious and far-reaching.

This failure to base requirements on a monthly schedule of estimated issues to fill requisitions resulted in a paradoxical situation. On the one hand, we were insisting that technical services and depot commanders keep their stock levels down in the United States to a 60-day level for Zone of the Interior supply and a 90-day level for overseas supply. On the other hand, supplies and equipment were rolling out of the factories into the depots on schedules that had no direct relationship to these stock levels. This is an excellent illustration of one of the most important lessons about Army supply; that is, that the supply process is an indivisible entity and cannot be broken down into uncoordinated phases such as production, stock control and distribution.

In general, the deficiencies that I have pointed out in the original system behind the Army Supply Program were not so serious in the early stages of the war as they later became. In the early stages of the war we needed so many items in such large quantities practically at once that the accuracy of our requirements computations and the controls flowing therefrom made little difference. We could use effectively practically everything that could be produced. The only danger lay in the relative importance of one item against another.

However, in 1944, on the whole, the eight-million-man Army had been initially equipped. The problem became mainly one of maintaining this Army and the replacement of equipment. In addition, production rates in most cases had reached the astronomical heights required for the all-out prosecution of the war. This situation necessitated a more careful balancing of supply against demand.

The Army Service Forces met this situation with the so-called Supply Control System, announced in March 1944. This was not a new system; rather, it was an extension and a refinement of the system already in effect.

One of the most important characteristics of this extension was a phasing of requirements by months for the immediate future and by quarters for the years ahead. Instead of creating a pool of supplies and equipment from yearly procurement objectives against which to fill requisitions, it attempted to project what would be issued from all depots here in the Zone of the Interior by months and quarters.

Secondly, the Supply Control System gave full recognition to the fact that the supply process is indivisible and cannot be segregated into water-tight compartments. It assembled in one place, actually on one sheet of paper, for each principal item, all the factors involved in projecting into the future the demand for that item and all the factors involved in projecting into the future the supply of that item. By this means an analysis could be made of the balance between supply and demand and adjustments made to bring supply into balance with demand. This is an extremely important point.

Let me call to your attention what the most important of these factors were. Take demand first. We had the initial equipping of new troops to be activated. Then we had the replacement requirements to support all the troops. Then there were the requirements of our Allies, the requirements for items supplied to the Navy, and the requirements for operational projects over and above normal equipment of troops and normal maintenance. A record of past issues of the item was necessary in order to use that experience in checking the estimates of future issues. To these must be added the stock levels that were to be maintained and any reserves. This gave us the total demand for an item.

This demand was projected into the future by intervals of time. The total supply was based on the stocks on hand and the anticipated returns to stock, which, as I pointed out previously, were ignored in the original system and which became of extreme importance after the defeat of Germany. And, finally, we had the factor of deliveries from production, with all its attendant subfactors of raw materials, labor, components and facilities.

These factors for any given item were never static. It would seem that the only persistent thing about war is the fact that plans fluctuate constantly. It is, therefore, necessary to assemble these data periodically, to analyze, and to make adjustments, if we are to prevent substantial shortages or substantial excesses.

For all the important items this was done monthly in the Army Service Forces after the inauguration of the Supply Control System. I would recommend that, if you have a few hours to spare during your course, you take a good look at that system. We even introduced into the Supply Control System a disposal level, which was determined by estimates of future needs. We started disposing of stocks above this level even while the war was going on.

The third important feature of the Supply Control System was the extension of careful adjustments of supply against demand to the whole range of the 850,000-odd distinct items of supply in which the Army Service Forces dealt. Under the original system behind the Army Supply Program a great majority of these 850,000 items were controlled only by yearly estimates of funds to be expended for procurement of broad categories. Under the Supply Control System there were 1900 principal items, representing less than one percent of the total number of items, but accounting for 80 percent of the dollar value of the entire procurement program. The Supply Control System was also applied to the remainder of the items in order to more accurately control shortages and excesses in individual items.

With the inauguration of the Supply Control System it quickly developed that the process of controlling supply was in the last analysis dependent upon basic records and paper work in depots, procurement district offices, and other installations in the field. The data for the supply control form could only be assembled from these sources.

There was a great variation in the completeness and adequacy of records in the technical services. Some did not provide all the data that were essential; others unnecessarily covered too much. There were varying definitions or interpretations of definitions of such relatively simple terms as "stock on hand." It was clearly evident that uniform methods in extreme detail were necessary for adequate top-side control of requirements, procurement and stocks.

Army Service Forces initiated various improved uniform procedures, such as stock status reporting from depots, to meet the unsatisfactory situations revealed by the inauguration of the Supply Control System. These efforts resulted in an adequate implementation of the Supply Control System. On the other hand, we did not reach by the end of the war the degree of uniformity and improvement in basic supply procedures that we would have liked to reach.

In closing I would like to summarize for you the lessons that the Army Supply Program taught us during the war.

The first, and probably the most important lesson, is that the supply process, from requirements through manufacture to delivery to the troops, must be considered as a whole. Procurement cannot be treated separately from stock control; requirements cannot be treated separately from production; distribution from procurement. To be successful there must be a control system for supply under a single directing head which takes into consideration all the factors involved in the supply process and properly integrates them. This is the only way that the Army can be properly supplied; the only way that we can avoid substantial excesses and shortages.

The second lesson is that there is no easy way for dealing with supply and its sub-phases, such as procurement. It cannot be handled in a broad way. It is just the nature of the animal that you must deal in specific items, in given quantities, by given periods of time. The control of supply is dependent upon basic records. There should be uniformity in great detail in these records and the methods of using them. To the greatest possible degree the methods should be reduced to routine mechanical processes--simplification wherever it can be gotten.

The control of over 850,000 items must necessarily be handled by clerks and lower grade supervisors who cannot be expected to exercise a high degree of initiative and judgment. The ideal would be uniform electric tabulating machinery and methods through the Army which would automatically grind out the data on which action must be taken and which would make these actions as routine and systematic as possible. Do not misunderstand me. I am not saying that there is no room for judgment. What I am saying is that the mass of detail that must be handled is so

great that as much of it as possible should be handled through system and not through the unguided initiative of thousands of employees on the lower level.

A third important lesson is one of preparedness for any future war. At the beginning of World War II we did not have a proper system for the control of supply in all of its phases, in effect or even designed. Proper methods for computing requirements were not in use. Our basic stock accounting records had been designed mainly from a property accounting standpoint instead of from the standpoint of their primary purpose of effectuating supply. We had no well-designed and tested methods ready to put into effect for the control of the flow of raw materials.

These deficiencies were generally corrected during the course of the war. But during a war is the wrong time to design and test the structure through which supply is to operate. It is like trying to build a road under heavy and increasing traffic. We must have ready for any future emergency a tested system, complete and uniform in all its details, to include forms, flow charts, and tabulating methods, for controlling supply in all its phases.

It is my opinion that we did an outstanding job during World War II of supplying the Army. Much of this success is traceable to the Army Supply Program and the system underlying it. That system should not be lost. The lessons which I have outlined should be taken to heart and the system further improved and extended during peace, so that we will always be better prepared than we were at the beginning of World War II.

I am informed that I am supposed to answer any questions that you might have.

GENERAL ARMSTRONG:

General Lutes, I would like to put a first question to you, sir. Would you say that the Army Service Forces were hampered by any failure of coordination with the Army Air Forces in the procurement program? As you look to the future, does the future organization provide for a better degree of coordination of the Army Air Forces and the Army Service Forces procurement program and planning?

GENERAL LUTES:

Yes. I would say that we were hampered with a lack of proper coordination of programs. There was some competition for raw materials, some lack of coordination, which improved throughout the war.

Of course, as you know, the requirements for the Army Air Forces, for their essential items that are peculiar to the Air Forces, are their responsibility, not that of the Army Service Forces. The requirements program for common items used by the Army Air Forces, the Army Ground Forces, and the Service Forces was our responsibility.

As I understand it, the future organization which is now being considered provides for the Under Secretary of War to supervise procurement, but only in a broad, general way. He will supervise policies and will have the power of review; but, as stated to me, he will exercise these powers through the office of the Director of Service, Supply and Procurement, which replaces the old G-4 section.

In that division, if we organize it--I might say that the plan has not yet been approved by the Secretary of War--but, if it is approved--and I think it will be--we will have under the Director of Service, Supply and Procurement a group which will perform the operational functions of the Under Secretary of War under his direction and, as I say, his review.

In that group I have recommended, and it has been accepted by the Chief of the Air Forces, that we have a high-ranking officer of the Air Forces. In fact, I have recommended that the first director be an air officer, in order to improve the coordination between the Air Forces and the remainder of the Army.

GENERAL ARMSTRONG:

Any questions, gentlemen?

A STUDENT:

Do you not think that any supply control system that we set up should be carried into the theaters, such parts of it as can be, and be coordinated with the Zone of the Interior?

GENERAL LUTES:

I am strong for it if it can be done. I think they should carry supply control into the theaters. If they keep a proper supply control system in the theaters and then keep the Zone of the Interior properly advised of phased requirements ahead, not only for immediate requirements, but keep them phased for prospective requirements, that in turn would be of great assistance to us here.

A STUDENT:

That has not been understood in the theaters. It is frequently true, I think, that there is a great need for selling that idea in the theaters.

GENERAL LUTES:

I agree with you absolutely. One difficulty we had with the overseas theaters was, of course, that many of the officers who went to overseas theaters in the early stages of the war and took key positions had been trained under the old system in the Army. They were busy night and day and had their hands full. They never had the opportunity to catch up with what the Army had been doing in the way of improving the supply methods or of improving the organization.

For instance, I am perfectly sure that the majority of them never understood the Army Service Forces organization. We have never had any desire to reach overseas into the overseas theaters, as many of them thought we did.

We had a natural desire to find out where the breakdowns of supply occurred and whether they were our fault or occurred within the theaters. They said that it was the theater's responsibility; but I am sure that there has been a great deal of misunderstanding on the organization and procedures of supply throughout the war.

A STUDENT:

With regard to the replacement factor, General Lutes, are we to take into consideration different types of battles, that is, the different terrain and the different climates where the fighting may be?

GENERAL LUTES:

Yes. That is the ideal for which we are reaching.

During the war we sent teams overseas to each theater to study the replacement requirements peculiar to each theater--peculiar to the type of battle, we will say, in the South Pacific, in island warfare; peculiar to the type of warfare in Italy, where we had very mountainous country, a very muddy country in winter; and the items of replacement peculiar to Europe. We had teams constantly on the go trying to give us those data.

We tried first to get the data from the theater commanders themselves, because that is the best source. But again we ran into the old obstacle of theater commanders and their staffs being too busy. We would get the data too late. So we sent teams over there to coordinate the theater facts in an endeavor to get up-to-the-minute data on the replacement factors for all items of equipment, which would take into consideration the different types of battles, the effect of climate, and so forth. Does that answer your question?

A STUDENT:

Yes. For instance, in the European theater we had two armies. The replacement factor for the First Army was a great deal different from the replacement factor throughout the campaign with the Third Army. The First Army moved much slower. Their rate of loss in certain items, for instance, gasoline tins, was much less than that of the Third Army.

GENERAL LUTES:

There again, if I may digress a minute to go into the field operation, in that case the army group staff and the supreme headquarters staff should take those things into consideration and play one against the other right there in the theater. We could not attempt to project

or estimate a replacement factor for an army in the field. We would look to the theater commander, who in turn should take those things into consideration. He should know whether one of his armies is going to use or is using supplies faster than another and that therefore the replacement factor for that army is greater than that of the other army.

I found that particularly true in the distribution of ammunition. I can give you an illustration of what I am saying here. This does not apply to replacements, and yet it does.

Prior to the campaign in Italy we recommended in the Army Service Forces the phasing of heavy artillery ammunition in their programs. It was turned down by various agencies in the War Department. But it later developed that high-angle artillery fire was badly needed in Italy, and we rushed into a program a little too late; also into heavy artillery ammunition.

The Italian campaign then gave data on the rates of fire for that type of artillery and for medium artillery which we had not had before. We radioed these rates of fire to the European theater commander, knowing what his campaign plans were, hoping to get the experience in Italy translated into his requirements program in Europe.

He did not accept the full data as developed in Italy, and the result was that we were constantly throughout this campaign having to up our requirements for the production of artillery ammunition. We would have them coming to us piecemeal. Finally in desperation I went over to Europe just before the Battle of the Bulge, at a time when I knew they were planning their offensive campaign into Germany, and took with me all the procurement data that we had on medium and heavy artillery ammunition. I spelled out just what we could do and what we could furnish in rounds per weapon, we will say for instance, 105, from that time in the fall of 1944 on up until the early spring of 1945.

They wanted a much heavier rate of production. I came back with a plan to increase our facilities and to produce a minimum of some 55 rounds for every 105 weapon in Europe, regardless of whether it was active or inactive. General Bradley told me that before he went into an attack he wanted 150 rounds of 105 ammunition for every weapon in the attack.

Well, during the time I was there, which was throughout the Battle of the Bulge, I got complaints from here and there. I went out and traced them down. They complained of a shortage of ammunition in this division and a shortage of ammunition in that army or corps. We would find that it was a matter of distribution under the army group commanders.

What I am coming back to is this: We had riding on the hook out there in the English Channel at the time some forty-odd ships loaded with ammunition, and there was ammunition in France; but the allocation of it under the group commanders was something with which I had nothing to do. I was only interested in getting back here and trying to

get the latest requirements translated into production. But the allocation in the field affects the type of replacement that we are speaking about, not only the type of ammunition, but all other types of items.

GENERAL ARMSTRONG:

General Lutes, I think these questions might continue for sometime to come, but you have work to do and we have another scheduled lecture later on this morning.

I want to say that this class should be particularly grateful to you, General Lutes, for your contribution this morning. These gentlemen are assembled here for a period of six months to examine the experience of this war and to interpret the lessons; and you have been good enough to do a great deal of work here for them this morning. I know that they are going to be very grateful to you in the months to come for the analysis that you have made and the lessons that you have summarized at the conclusion of your talk.

I would like to say further, sir, that we appreciate your being here, because the Industrial College cannot operate in an academic vacuum distinct from the work of the people who are carrying on these duties.

There has been too much separation between the doers and the thinkers in the world today. Certainly on this phase of the work, if we have any influence to bring to bear on this problem, we are going to see that the people who spend all their time thinking about this business and trying to teach it are in the closest contact with the operators, the people who are doing the job. Otherwise we shall fail.

In conclusion I also want to say to General Lutes that we are exceedingly grateful to him for bringing out the tremendously important integration and balance that must exist not only between the various parts of the supply program and the people who carry that out, but between the Ground Forces, the Air Forces and the Service Forces. That teamwork cannot exist unless people like the gentlemen who are here in the course from the Infantry, the Coast Artillery, the Field Artillery, and the other branches are fully aware that they have a part to play in the supply program. That part is what we hope they will learn here today and go out and be missionaries to spread it abroad throughout the Army.

And so, General Lutes, we are exceedingly grateful to you and very glad of the privilege of having you with us. Thank you very much.

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(20 February 1946--200.)