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THE MEASUREMENT OF WAR POTENTIAL

A lecture delivered
at the Naval War College
on 4 September 1953 by
Colonel Bruce D. Rindlaub, U.S.A.

Gentlemen:

I have been asked to talk this morning about "The Measurement of War Potential." Back in Washington when we ask people to talk about this subject we give them about the same title and scope I have been given—but when they talk about it, most cover only a small, restricted area of the subject as a whole. If I weren't here among friends and among other officers of the service who have some compassion for another who has been put on the spot, I wouldn't talk about the whole subject either. But I am going to do that this morning in so far as I am able.

I would like to change the title of the talk, though. To me, the word "measurement" denotes an ability to find a numerical answer. The subject of "War Potential" is so affected by intangibles, which are not subject to numerical evaluation, that you don't come up with any numerical answers when you are through. So I would like to title my talk: "The Comparison of War Potentials."

This morning I am going to talk a little bit about what "war potential" is; we will discuss the things that go to make up war potential—the elements which are contained within it; following that, I will talk very briefly about a method of approach to this subject. Before concluding, I would like to say just a word or two about the progress which has been made in the United States in handling this study.

To most of us, the words "war potential" are very familiar. You hear them frequently—but what do they really mean? You

seldom find two people who have exactly the same idea of what "war potential" is. Overall, there is pretty good agreement. I think we can say that "war potential" is "the potential capacity of a nation, or a group of nations, to exercise force — ultimately, military force — to cause another group of nations to do the bidding of the first group." We all agree, generally, that this is what it is but we are apt to forget that behind the military power, the military force, which most of us think of, there are the things which make that force possible. There is the support given by the civilian population; there is the support given in the political field by the Government — both in the international and domestic affairs; and then there is the psychological and ideological support, which is an inherent part of any people.

Granted that war potential is the potential ability, or capability, to exert force in any world conflict — what kind of a conflict are we talking about? There are a great many economists who say that you cannot even touch the subject of "War Potential" unless you set up, first, a particular restricted strategic situation in a particular restricted geographical area. I don't believe they are correct — I think we can take a much more general approach than that. But we do have to place around our consideration of the subject some sort of boundaries so that we know we are all talking about the same thing.

In this atomic age there are, broadly speaking, three directions that a major war may take: First, there is a possibility that one nation, through an overwhelming superiority in initial force or surprise, may so destroy its enemy's economy that its power to produce, to mobilize, is completely destroyed — and victory comes almost immediately; there is a second possibility that the capability of both sides for an atomic attack may so outweigh defensive capabilities that, in the strikes which commence hostilities, the industrial powers of both sides are destroyed and cannot recover for a period of years. In this case victory is going to depend upon initial military strength and available stockpiles

of supplies and equipment, plus military strategic considerations. There is a third possibility that neither side has the initial capability of destroying its enemy's economy to the extent where it cannot mobilize its industry and its men. The war, after the initial opening of hostilities, gradually reduces to a temporary standoff, while both nations mobilize their industries. For us that means a period of a couple of years.

The third possibility is the type of war in which we engaged in both World War I and World War II. In my opinion if either of the first two possibilities exist for us in the future — we are going to lose! My personal opinion is that if we have another major war, and it is a short war, we are sunk. Since the first two possibilities both concern only initial military strength plus factors of supplies and strategic considerations, they do not cover the whole of the area of "war potential." I would like to assume for this morning that the third possibility is the one which exists and the one which we are talking about, because that is the one which encompasses the whole field of "war potential."

Of course, there is a fourth possibility which I haven't mentioned. That is the possibility of a "cold war." But that is an entirely different situation — and I am going to sidestep it for the purpose of this talk.

What "time" period are we talking about? It is important we know that because nations are continually changing. Populations in most countries are increasing; some are decreasing. New factories are being built and old factories are becoming obsolescent, or obsolete. New deposits of minerals are being found; other deposits are being exhausted. In industry and in the military forces, technological changes are constantly making changes in the product, the efficiency and effectiveness of man's work. The alignment of governments and the stability of those alignments are continually changing. It is an entirely different thing to talk about the war potential of any nation or group of nations now than to talk

about the war potential of that same group of nations for a war which starts a decade hence.

So we have to put up two boundaries to our study of "war potential": first, the boundary of the kind of a conflict we are talking about; and second, the boundary of time. We have to fix our study, initially, somewhere in time.

I have been asked to say just a word about the importance of the study of war potential. From the viewpoint of national strategy, the study of war potential is very much like the "estimate of the situation," which has to be made by the tactical commander, or higher commander, in the field. The first thing you learn to do as a tactical commander is to learn that you must discover, to the best of your ability, the capabilities of the enemy and the capabilities of your own forces. Without a detailed and sound knowledge of those capabilities, you cannot make logical and effective strategic or tactical plans or tactical decisions.

The same situation exists on the national scale — unless we know the enemy's capabilities and our own capabilities, and know them thoroughly, we cannot make logical and effective national plans or national strategy, either in the field of diplomacy and politics or in the field of the military. We haven't done so well in the past with the subject of knowing the potential capabilities of various nations. If you recall, in 1942 President Roosevelt made a radio speech in which he said in effect: "Now — at this time — Germany, Japan, and Italy have reached their maximum possible production of ships, guns, planes and tanks." Then, you remember, in the period between 1942 and 1944, Germany increased its production of planes and ships three and a half times; it increased its production of guns over four times; and it increased its production of tanks almost six times. Our estimates weren't very good. And our estimates of our own production capabilities were almost as bad. If we are really going to be able to make logical plans, we have to know capabilities. We do know a lot

more now than we did in World War II — and we will probably never again fall into the trap which we fell into early in that war.

It is obvious, then, that this study is essential on the higher levels of Government. Is it important at lower levels? Well, of course it is. Every theater staff needs to know enemy capabilities and friendly capabilities. Staffs working on target designation systems must know enemy potential capabilities, that is, enemy “war potentials,” because they must select the targets which are going to weaken that potential in the most effective way and in the most rapid way. We didn’t do very well in our selection of targets against Germany, as you all know. We didn’t knock out its electric power system, which might have changed things a great deal — even early in the war. Now, I think we understand such things much better than we did before.

Even in local areas military commanders must know what is what about war potential; even there plans can affect the enemy’s power to exert force. I don’t think it is necessary for me to dwell on this any further. As you go more and more into this subject and gain an increased understanding of it, the value of it becomes so evident — you don’t even question it any more. The fact is that it is of value to every man of the grade of those sitting in this room and to every civilian in an important position in any Government agency dealing with international affairs at all. Furthermore, strangely enough, it is of much more benefit to, and much more used by, the strategists than it is by the logisticians. Strategists are really the ones who need it. Unfortunately, in our school system (I am giving you my own personal opinion now), it is the strategists who learn the least about this subject. The logisticians — who already know and have absorbed a great deal about it — learn the most, or are exposed to the most.

What is “war potential” made up of? You read books and see how a great many writers divide it up into “military,” “eco-

nomic," "psychological," "ideological," "sociological," and so on, factors — and these are all factors. But what do they do with the subject then? They talk about each of the factors — and then most of them stop. Actually, what we are interested in in a study of war potential is not only what the factors are, but how the factors are interrelated; how they get put together to make up the total of war potential. I am not proposing that any one system of breaking up war potential into factors — and there are several systems — is any better than any other. When you get into an argument like that, you get into semantics — and, usually, in the end get nowhere.

For this morning, then, let's look at "war potential" from an entirely different point of view. There are really two classes of factors, as I see it: There are factual elements — the things which, if you can get information about them, you can count; you can put them in statistical tables; you can add them, you can multiply them, you can divide them, you can subtract them — and come up with a weighted result at the end. There is another class of factors, or elements, which consist entirely of intangibles.

For instance, on the factual side, you have the resources of the Nation — the material resources, the factories, the land; you know how much the factories are producing at the present time, you can count on it; you know how many acres there are, you know how much of that acreage is in production and you can get up tabulations; you know how much steel is produced; you can count the manpower; you can count the size of the labor force; you can count the size of the labor pool — that is, the people of certain age brackets who are available to be put into that labor force, and you can get a pretty good idea of the percentage of that labor force which can be put into the Armed Forces.

On the other side, you have all those intangible things affecting the utilization of the maximum capabilities of the Nation as derived from its material and human resources; you have things

like education and ability of the people; its ideologies; its willingness to submit to the control of a central government; its religious customs — all of those many, many things which affect both the political and military sides of international conflicts.

The maximum capability of a nation might be compared to a rubber balloon, which you give a child to blow up. You know the maximum diameter to which this balloon might be blown without breaking, but you don't know to what diameter the child is going to blow the balloon. Perhaps the child loses interest and gets tired before the balloon is completely expanded. He has then blown the balloon only a fraction of what you consider its capability, as far as reaching a diameter is concerned. Perhaps the child hasn't the skill to blow the balloon to its maximum diameter — he doesn't know how to do it without letting the air leak out, so he blows it only part way. Here, again, the diameter of the balloon reaches only part of its maximum capability of having a certain diameter. Then you get a strong youngster without much skill — he blows away at that balloon and, finally breaks it. You have a balloon which has lost its capability for having any diameter at all.

The study of the war potential of a nation, or a group of nations, is very much like this problem of estimating to what diameter the boy is going to blow the balloon. You have to estimate the extent to which the people and the government will be able, or willing, to utilize the resources of the country. Are the people going to fight, struggle, work in the factories and produce to a maximum under various wartime conditions? If you are going to have any reasonable war potential, you have to determine the fraction of the maximum potential capability of the nation which is going to be actually utilized in case of a war.

Now, let's talk for a minute about what goes into the detailed makeup of war potential. I like to use some simple, visual analogy when I talk about an abstract subject such as this because I think it is retained better in our minds if we do. I like

to think of national power as an ax, wielded by a powerful hand. Within this ax — the head of the ax, the handle and the hand — we can consider are all the elements which go together to make up war potential.

I am going to talk first about a single nation because that is simpler. You can see in this picture that the Armed Forces are really only a small part of the ax, but they are a vital part, the cutting edge. But the cutting edge is useless without the weight of those things in the head which serve to drive the edge into whatever material it strikes. Without the handle, the head of the ax is useless because it is the handle that allows manipulation of the head. Without the hand to pick it up, the ax lies unused. Let's see what makes up the weight of the head of the ax. Directly behind the Armed Forces, we have the munitions industries — those industries which produce only a minor quantity of things in time of peace. They produce the things which are unique to the use of the Armed Forces. These are the industries that have to be expanded a hundredfold in an emergency situation — by expansion, by the conversion of other industries, and by the creation of entirely new industries. These changes involve the training of people to man those industries.

Behind the munitions industries, we have the manufacturing industries — the industries that take the raw materials and turn them into component parts and end items, both for the civilian economy and for the Armed Forces.

We have to find out, if we are making a study of war potential, what those industries are producing, what they can do for us in production for war emergency, and how they can be expanded or converted.

On the other side, we have service industries — that is, the transportation industries which carry the raw materials to the factories and finished items to the consumers; the communications industries, the doctors, the lawyers, the wholesalers, the brokers, and a myriad of other industries which give service to the whole

economy. Most of them are essential in peacetime and have to be expanded in wartime. A few of them are nonessential. We have to figure out the ones which are nonessential and see whether we can get any parts of our wartime labor force through the cutting out of the unessential services. That unessential part applies, also, to the manufacturing industries of course.

Behind all of these industries — the manufacturing, munitions, and service industries — are the extractive industries. These are the industries working the farms, the mines, the forests, and the oil wells. They get the materials from under the surface of the ground and from the surface of the ground and furnish them as raw materials to the manufacturing and munitions industries. When we have shortages of materials, we have to depend upon our foreign economic relations — our economic arrangements with other nations — to get those materials in time of war.

There is no nation which is self-sufficient with regard to resources. Our position with regard to many of the resources, especially minerals, is far from good and getting worse all the time. If we can't get things — for example like manganese, without which we cannot make a ton of volume steel, we are going to be in a pretty sorry way if war comes. So, we have to set up and maintain our lines of communication and our relationships with other nations which will enable us to get the raw materials that we lack.

Behind all of these other things in the head of the ax, is the land itself; that is, the climate, the soil — its physical characteristics. What will it produce in various parts of the world? What are the effects of the size, shape, and location of the various countries which we are talking about? A long, narrow nation like Chile is nowhere nearly as efficient as a relatively compact nation — like France — either in internal communications or in the uniting of its people. So we have to consider all aspects of the land itself.

In discussing natural resources I touched only on material resources. I did not mention our equally important human resources. Our other resources are useless without man to develop and use them. In a study of war potential, we have to find out everything we can about the human resources — how numerous they are; how much ability they have; how much skill they have; how many are coming into the fourteen-year group each year in the future; how many are in the age group bracket in which is included those individuals acceptable for military service; and how much of the age group bracket acceptable for military service must stay with industry, rather than go into the Armed Forces. If we are going to get our maximum support for the Armed Forces, we must leave a major part of our labor force with industry. It doesn't do any good to pull all the skilled manpower away from industry; the Armed Forces are helpless if we do.

I said that the head of the ax was useless without the handle to manipulate it. Let's call the handle of the ax the Government. The Government is going to have a great effect on our war potential. The stability of the Government and the effectiveness of the Government in dealing with both international and domestic situations have a vital effect on national power. I am not talking about the type of government here, either, because in this type of study we are not concerned with the type of government. Whether we like the type of government or not, whether it is Communistic, totalitarian, socialistic, democratic, Federal or any other kind is in itself immaterial in a study of this kind. What we want to know is how effective it is; how it is going to get the people together and cause them to work for the Government's aims; how effective it is in planning in international relations and for domestic development. The effectiveness of government is one of the keys to the utilization of the maximum resource capabilities of the Nation, both human and material.

I said that without the hand to pick it up and wield it — the ax is useless. That hand is the other one of the determining

things about the utilization of our capabilities. The hand represents the will of the people to make the most of a nation's maximum capabilities. To what standards of living will the people of each nation allow themselves to be lowered and still put their maximum energies in supporting a government's objectives in time of total war.

I have run over this very rapidly, because of lack of time. What I have said is just one method of looking at the subject of "war potential" and the things it contains. The elements dealing with manpower, foreign relations, government, psychological attitudes, will —are all intangibles. But if we study all the elements within this ax and hand, we can come up with a total of the material resources of the Nation which are available and then get some idea of the probable utilization of those resources under different types of conditions. We can find out a good bit about the effectiveness of use of these resources.

There is one thing that we sometimes forget, though — that is, that only a part of the Nation's resources are available for the direct support of the Armed Forces. The Armed Forces are useless without the supplies of materiel and equipment which are furnished by the civilian population. We must maintain our civilian population at some level. We have to give them what is really a very large fraction of the total production of the goods and services of the Nation. That fraction varied, say, from 40 percent to 60-65 percent for different nations in the last war. We had available only 40-45 percent. Different people give you different figures, but it was somewhere around 40-45 percent of our total for the support of the Armed Forces. The rest of it had to go to the civilians. Because in any economy the worker can't work unless he can get to the factory. Our distribution and our growth of suburbs around manufacturing areas have been such that we depend upon private transportation for the worker. We don't have a central transportation system which will take care of him. So even in time of total war, we have to furnish a percentage

of the workers with private automobiles; we have to furnish them with gasoline; we have to furnish them with automotive parts. Our distribution system for food in the United States is worked out on the basis of each of you having in your house a small refrigerator, a small unit of refrigeration. Our food distribution in the United States would fall down completely if we threw out those small-unit refrigerators. So we must have them in time of war, we have to maintain them, and we have to keep them up. You can look at thousands of problems like that one with which a planner is faced in the United States. Of course it isn't so bad in Russia, for instance, where you can shove the population down to, say, a diet of black bread and beans and maybe one suit of clothes every year or so. The Russian worker lives in barracks next to the factory and can walk to work. He doesn't need quite such a large percentage of the productive capacity of the nation to do the same amount of work that our population does. That is a very important thing to bear in mind — and I am going to come back to it again later.

So far, we have been discussing, principally, a single nation. To be practical, we have to talk about a group of nations because in this modern world that is the way the exercise of eventual power is carried out — by one group of nations against another group of nations. The war potential of a group of nations is not the sum of the war potential of the various nations involved. Some of the nations will be weak — and those weaknesses must be made up from part of the strength of the stronger nations. Weaknesses in strategic location have to be protected. Lines of supply have to be protected. We do have in some of the more powerful nations surpluses which can be given to some of the other nations without very much effect on the total war potential of the stronger nations. This tends, of course, to raise the potentials of the single nations.

We have inherent weaknesses in any grouping of nations because among any group of nations there are differences in ideals,

in approaches to political, military, psychological, and economic matters which make it impossible to get the decision which is probably the most effective decision. The decisions have to be weakened because they are compromises; they have to be reached through compromises. This is true to a considerable extent, but for different reasons, in a group of totalitarian nations where one nation is apparently running the rest of the show. You have to consider both the advantages and the disadvantages of a combination of nations.

I have discussed so far, principally, the current resources of any group of nations; that is, the capabilities of the nations for fighting a war in the immediate future. You get into another, more difficult problem when you start talking about wars years or decades hence because nations experience changes. But you find out through trends the things which will tell how nations are developing, what their war potentials may be in the future. Of course, the further you get into the future, the more you are guessing; you can't get away from that. You can examine things like projections of the size of the population and size of the labor force — demographers are doing that sort of thing all the time. Through the study of educational systems you can see how the skills and abilities of the population are developing or changing. You can get some idea of the changes which are taking place through technological progress. And if the study doesn't involve something too far in the future, you can get a good many estimates as to the new factories which are apt to be built during that period and the increase in production that will take place. You know the long-term trend of most nations in the expansion of their gross national products; that is, their total production of goods and services, which for us, on a long-term basis, has been running about 3 percent per year for a good many years. So, if you are talking about a war to start years or decades in the future, you have to apply to what you find out about a war starting tomorrow all you can gather about the trends which influence the

changes in the total capabilities of each of the nations you are considering.

I am going to talk for a very short time about methodology, the methods that are used. I am not going to say very much because I think that most of what I know about it is expressed in that monograph on "Economic Potential for War," which I wrote rather hastily last March and which I think has been made available to you. I am going to cover this on a very sweeping basis, then. I am going to talk about spreading the study of "economic potential" into blocks. I am going to name the blocks one after another, but that doesn't mean that the student considers only the things in the first block before he starts in with the second, of course. He does a lot of his study concurrently.

One method of approach that you can take is to study first, look up and get all the information you can, on the material resources of the country; what the factories are producing in each country; what their maximum capacity for production is; what their mines are producing; how much food they produce. Do they need more food? What do they have to import? You consider all of those factual things about the production capacity of the nation at the present time for each nation you are considering. Most of this you can get through open information. You don't need to have access to a lot of cloak-and-dagger stuff for this. Even on Russia, most of it comes from open information. Of course, there are limited areas where the information is hidden — and we are just not going to get it! But most of it is available in the United Nations publications, newspapers, periodicals — it is the type of thing a nation can't hide. With the exception of a very small group of men in the United States, most of our students think that the Russians can't hide theirs — and in the past at least have not been trying to distort the information they put out.

Your second block is a look at your human resources — the size of the labor pool; the size of the Armed Forces and the labor

force which can be derived from that labor pool. You examine the ability and skills of the population of each country.

These two blocks give you a factual basis to start out on. But they only tell you how much each country, or group of countries, is producing at the present time of the items which they are now producing. Those aren't the items which you want produced in time of war, usually. So you have to get into a more difficult aspect now. As your next block, you have to try to find out how, through expansion and conversion, these factories can be made to produce the things which are needed in time of war; how fast factories now producing those things can be expanded; how fast new factories can be built; how fast factories building nonessential items can be converted to the production of essential items, and how much they can produce; how fast your labor force can be trained to operate the new production lines; what resistance there is going to be to the people moving from one locality to another — and that is not a minor problem, it is one of the toughest problems there are especially in Europe; and how people will move from one job to another, from one type of work to another — whether they will be able to do the other job or willing to do it. All of those things are in the intangible field, but are the things which must be applied to the factual information to set up your block of what the maximum production is that the country can probably have in terms of support for the military forces.

So, you have that block of maximum support through production and you have the block of expansion of the labor force — which I mentioned in connection with the last one, but which really should be a separate study. You will get more of that, I am sure, in your Manpower Course so I won't discuss it now, except to say that even in a totalitarian government you can't always make those shifts in the labor forces that you would like to make. You remember that before 1936 Germany had the K.K.K. organizantial programs (I won't attempt to pronounce

the German words meaning "kitchen, children and church") in order to relieve unemployment by getting the women out of the factories. Then along came the war. The Germans wanted to get those women back into the factories, but the population had been conditioned by the other propaganda and programs to a point where neither the men nor the women wanted the women back in the factories. For purely political reasons, a totalitarian government had to accept the fact that women were not going back into the factories, although they paid a terrific economic price for it. So there are problems here that have to be gone into — intangible things that have great effect upon a country's war potential.

Then, we find out something about the probable will of the people to support the Government because, after all, you can have all the capabilities, all the resources of the world, but if the people decide they don't like this war and are not going to fight hard in support of it, are not going to struggle, are not going to work, and are not going to accept low standards of living — your war potential is pretty low! Your maximum capability is high, but your actual war potential may be practically nothing. That has occurred in history, too, if you think back.

As the final block (and this is a stumbling block that most people very nicely sidestep and I am not going to say anything more about it other than the fact that it exists), if you are going to make a complete study and carry the analysis of war potential to its ultimate conclusions, you should attempt to estimate the probable damage to industries and to your Nation which is going to take place in the initial attacks in the opening of hostilities. That gets you into pretty much of a dreamworld — that is why people don't like to talk too much about it.

After a study of all of these blocks and all of these factors, you do come up with something, not numerical — "this Nation is three point six times as strong as that one" — but you do get some pretty good ideas in the back of your mind as to what the relative strengths of various groups of nations are. The more

experienced you are, the longer you study these nations, the more intimately you get to know them, the greater access you have to all of the facts — the more acute is going to be your opinion.

I think I have said enough to show you that, although the statistical side is extremely important and essential, you cannot arrive at a final comparison by taking statistical data, alone. That is one place where I think columnists are doing this country a great disfavor because many of them are showing tabulations which give the impression that this country is three or four times as strong in its productive resources as the Soviet area, and the free world is much, much stronger. This would be very comforting if it were true, but an analysis of these facts shows it definitely is not true. For instance, they show that we produce 1.2 million tons of steel against Russia's much smaller production. That should be very comforting to us. But we forget the fact that the percentage of the steel required to support the civilian population, the essential support for the civilian population in Russia, is very, very low. They need some, but very little, whereas, in the free world, we need a major part of all our steel production just to support our civilian population.

I thought I would say a few words in concluding (and they are only going to be a few) about the progress toward a logical methodology in this subject in the United States. Unfortunately, we haven't made a lot of progress. The subject is brand new. In the modern world, before World War II, people didn't consider total war; that is, the involvement of entire populations as a part of fighting a war, except for those countries which were actually overrun. The civilian population wasn't considered a part of the fighting force in a war. In World War II, of course, throughout Europe all of the countries were in a total war status while we approached it. But we only approached it — because, actually, our standard of living during World War II rose continuously; something that probably will never happen to us again. Next time, we will probably be in a total war situation. So, a real

study of this war potential — your “total war” situation — only started after the last war.

We do have some obstacles which have made this study difficult. The one major one is that in so far as the Soviet areas are concerned, until recently we had very few students who really were expert in the subject. Young men weren't interested in studying Soviet areas as graduate work to get their doctor's degree. There is a wealth of information which has not been analyzed due to this earlier shortage of students of the USSR. I do not mean that no progress is being made, because a great deal of progress is being made — and in the last couple of years it has been made very fast. We really are getting somewhere; but the study, after all, is still in its infancy. Actually, military officers have a great advantage in this subject, an advantage over many people who are actually making the governmental studies because if you talk to them you will find that most of the economists and political scientists working in this field are experts. They are experts in a very narrow field. Most of them have great difficulty in backing up and looking at the overall situation.

For instance, one economist (I have had quite a few of these experiences with them) may have been working, say, on the machine-tool industry all his life. He comes into a government organization and he generally feels that if we can just solve this machine-tool problem and get the comparison between the machine-tool production in the Soviet area and in our country, we have solved the economic war potential problem. That is the way they feel. Sometimes we forget that an expert is sometimes defined as “a man who avoids the small errors as he sweeps on towards a grand fallacy.”

Actually, any one of you can add a great deal to this subject because you tend to look at it from the “overall.” After all, it is worth while to remember that in the final analysis each of your own respective necks in another war is going to be largely dependent upon the success which we have in estimating enemy

and friendly capabilities and basing our planning and our strategy upon those capabilities.

I would like to leave, then, just this thought with you: Any analysis we make must consider the factual information and the tabulations which mean a great deal to us and tell us a lot about all the nations we are considering; but, that same information can lead us far astray unless we bring in with it, intertwine with it, and apply to it all of the intangible factors that I have been talking about today. You might just remember in the back of your minds that the ax lies unused without a hand to wield it.

BIOGRAPHIC SKETCH

Colonel Bruce D. Rindlaub, USA

Colonel Bruce D. Rindlaub, USA, attended Yale University and North Dakota Agricultural College, and was graduated from the U. S. Military Academy in 1929 with a B. S. degree. He later did postgraduate work at the University of California where he received a B. S. degree in 1933 and a M. S. degree in 1935, both in civil engineering. Service schools attended also include Primary Flying School, March Field, California, 1929-30; Engineer School, Fort Belvoir, Virginia, 1936-37; and Industrial College of the Armed Forces, 1949-50.

From 1930-41 Colonel Rindlaub served successively with the 2nd Engineers, Fort Logan, Colorado; the U. S. Engineering Department, Pacific Division; the Works Progress Administration; the 14th Engineers, Fort McKinley, Philippine Islands; and with the ROTC unit at Texas Technological College. At the beginning of World War II, he was serving as District Engineer in the Boston district. From 1944 until 1949 Colonel Rindlaub filled various key positions in Army Engineering in the Pacific and Far East. He was on the faculty of the Industrial College of the Armed Forces from 1950-54. In July of this year he was assigned as Chief of Staff, Sixth Armored Division, Fort Leonard Wood, Missouri.