

ECONOMIC INTELLIGENCE

24 February 1950

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Dr. George S. Pettee was graduated from Harvard University in 1926. In 1934 he became a member of the Harvard faculty and received the Ph.D. degree in 1937. He remained at Harvard until 1941 when he was appointed to the staff of the War Production Board. In 1942 he transferred to the Office of War Information and in 1943 he accepted the position of Chief of the European Enemy Division, Board of Economic Warfare serving in this capacity with the Board and its successor agency the Foreign Economic Administration until 1945. During this period he undertook a detailed analysis of all aspects of the economics of Germany and the satellite and occupied countries of Europe. In 1945 Dr. Pettee was appointed Associate Professor of Political Science at Amherst College, and subsequently he was a member of the technical staff of the House Foreign Affairs Committee. His publications include "Process of Revolution," published in 1938, and "Future of American Secret Intelligence," published by the Infantry Journal Press in 1946. Dr. Pettee is at present a member of the staff of the Operations Research Office of Johns Hopkins University under contract with the Department of the Army.

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MR. NIKLASON: Any attempt to indicate the relative importance of the many factors which are involved in economic mobilization will bear very little fruit. But after you have heard our speaker, I believe you will conclude that economic intelligence is of paramount importance in planning for and conducting a war. If some means can be devised which will produce complete and accurate intelligence data, much misdirection of effort could be avoided--and, in a future war, any serious misdirection of effort may be disastrous.

Dr. Pettee is an old friend of the Industrial College, so it is a pleasure to welcome him back for the fourth time to speak today to both the Industrial College and the War College. Dr. Pettee.

DR. PETTEE: General Holman, students of the Industrial College and the War College, and everyone else present: It has become an annual pleasure and privilege for me to intrude here and try to speak on something that I think is important--and try to say it in terms that may mean something to you. Those of you who are my old friends now know I mean it when I say it is a pleasure and a privilege.

Before tackling economic intelligence, I want to spend a few moments on intelligence in general, simply to set up a couple of ideas on intelligence against which to discuss economic intelligence. I want to begin by trying to put something on the blackboard and make it clear enough so that it will mean something.

Chart 1, page 33.--Take this as the world. Up at the top is some kind of national brain taking in data on the situation, estimating the situation, and making decisions--the fundamental, high-level policy decisions. I will tag that the general staff.

There is something going on between the general staff and the world. There is a flow of information about the situation from the world to the general staff. That is the intelligence function, peeling data off the face of the earth, processing it, and funneling it up to the general staff.

There are many layers in the intelligence process. First of all, the data have to be sorted, correlated, and classified; then they have to be analyzed; finally, they have to be synthesized into top-intelligence-type judgments as to the capabilities and intentions of such and such an enemy, or what not.

On the other side, there is a stream of command and action running from the general staff down to the unit level, where the units are

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actually acting upon the face of the earth and changing the situation. In between, there are high-command-type levels--theater command, force command, or what not--and army-type or service-type levels of command. The flow here is down from the general staff to the units; the flow on the other side of my diagram is up from the world to the general staff.

There are internal cross flows within this system. The general staff not only has to know the external world, but it has to know what we are doing, also; and there is a backflow of information at all levels about our own activities. Stacy May's function in the War Production Board was just that sort of thing--the statistical services that tell the topside in greater detail how the lower echelons are doing what they are supposed to be doing.

I always thought a good classic example of the command decision at the top level was the one to Eisenhower: "You will enter into the continent of Europe and proceed to the heart of Germany," and so on--in just a very few words, on such a highly abstract level that nobody could tell from that how it was going to be done. That is a basic command decision. At the lower levels, of course, it takes tons and tons of paper to get the right bale on the right barge, the right man on the right barge, and so on, for such a thing as D-day in Normandy. It takes many tons of paper to translate the command decision, and it expands in volume just as the intelligence function shrinks in volume.

There is one other element that enters into this process. I know of no way to indicate it except by drawing a special box on the face of nature, so to speak--research. These people--the intelligence function--are studying what other people or countries outside our control, outside our social organization, are doing. There is also the research function, which is studying things distinct from what these other people study--and they are distinct not because they are domestic, not because they are foreign, but because nobody knows them yet. They are peeling facts off the face of the unknown, and, in recent times, that has become a more and more important function. Research must provide intelligence with data, intelligence must provide research with data, and the things have to correlate at lower levels.

I don't want to mess that diagram up more than I have already. To make it completely realistic is also to make it completely unreadable.

If that cycle--the flow of information, decision, command, and action--is rational, then you are using your resources to suit your purposes, and the consequences are coming out in accordance with your intentions. If the consequences are not coming out in accordance with your intentions, there is some kind of fly in the ointment; there is a failure of function somewhere in that cycle.

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Now I want to change the subject slightly, and briefly discuss an old, familiar topic--Pearl Harbor. Pearl Harbor is a priceless classic well worth studying, and a great asset, because it happens to be a remarkably clear illustration of a great number of things--a clear illustration even where it is most vague, in the final findings of all the Pearl Harbor investigations.

You may remember some of the basic findings. The Japanese telephones in the consulate in Honolulu were not tapped because of a jurisdictional dispute between the FBI and some other service. Nobody had quite arrived at the decision as to who ought to listen in on the Japanese telephones. So nobody was listening in on the Japanese telephones.

Then one morning a young private was using a radar set for voluntary practice--just for the fun of it. He saw something on it and reported that he had seen something on it coming in from the North. Nobody paid any attention because there were no procedures as yet for transmitting such a report. The set was to go into active service sometime next week. It was not in active service as yet. If anybody saw anything on it, it was his own business and nobody else's.

The last Japanese note to us was received in advance through the MAGIC system. We had the copy, it was being decoded, it was being translated. The first half was translated and passed around Washington the day before Pearl Harbor. The second half was not translated because there were no translators on duty that night. So, there, a very informative bit of information was inside our system, in a sense, so far as intelligence is concerned--it had been received and was available--but the information was not passed on.

The Joint Intelligence Committee had been ordered to be put into effect and activated sometime in September or October, but it had not been able to locate any space anywhere as yet. Consequently, the JIC had not yet begun to function. The day after Pearl Harbor Colonel Fortier was ordered to go over to the Navy and not come back until he had a room for the committee, and from then on it began to function.

You may remember, also, that Naval Intelligence was ordered not to evaluate information, only to analyze it; the Office of Naval Operations was supposed to do the evaluating. There was no clarity there as to just what evaluation meant. There was no clarity in the Naval Operations Office as to just what the function was which Intelligence was not doing because it was told not to and what was required to make sure there was no failure of function.

Cordell Hull sent a note to the Japanese on the twenty-eighth of November which some people have called an ultimatum. Hull claims it was not an ultimatum. I think, in legal terms, he is quite likely

right. In psychological terms, he is quite clearly wrong--if you attribute any psychological meaning to the term "ultimatum." The Japanese took that note as an ultimatum, psychologically, regardless of the legal issue. The rest of the Government did not understand that we had sent a note to the Japanese that the Japanese might well take as an ultimatum.

The last war warnings to Short and Kimmel, if you remember, turned out not to mean clearly what they meant to the sender.

Finally, the ships that were not sunk--I understand most of them were sunk--went hunting for the Japanese southwest of Hawaii because it was assumed that the attack must have come from there, but the attack was actually from the North. The report on the Army radar that the Japanese planes flew away to the North after the attack was not transmitted to the Navy in Hawaii until two days afterward.

There was a succession of particular failures in handling information and in its transmission and in its influence on command. I want to try to suggest to you, simply, what kind of effect those failures have on this kind of functioning organ I have described.

The failure to listen in on the Japanese telephones prevented certain data from ever entering the consciousness of any American in the system.

When the private was watching radar and reported what he saw just before the attack, something entered the consciousness of a brain in this system, but it went no farther.

As to the reception of the Japanese note and the failure to translate the whole of it, it got to the top level as soon as the translator knew it was top-level business, but it did not get there on time for the simple reason that it was not translated on time.

You may remember there was one last note to Short from what is now the Pentagon which went out slowly; the means of communication chosen did not get it to him by the quickest possible process. He received it along about noon in Hawaii; five or six hours after the attack, he received his last warning that there might be something happening. That goes in here on my diagram--between the real top center of command in Washington and the highest center of command in Hawaii.

Finally, tracing the thing around, we wind up hunting for the Japanese in the wrong direction, the consequence of the action in no wise being in accordance with the intention (Chart 2, page 34.)

Out of the Pearl Harbor case, you can get a set of failures which neatly radiate all the way around the cycle and illustrate most clearly, I think, the meaning of the cycle and the way in which the entire cycle

breaks down if there is a fundamental failure of function at any point. That, I think, is the clearest, simplest nutshell interpretation of the significance of the intelligence function and of the criteria it has to meet. And it not only has to process things without failure from its own inductive concrete data at the lowest level, through all the resorting, re-evaluation, analysis, and synthesis, as I said, but it has to make sure that the message gets all the way to the next man; it has to reach the facts of life, the fundamentally unapproachable facts of life, get some feet on the ground at the proper level, and make them inductive, in the Baconian sense; it has to yell "wolf" when there is a wolf and not yell "wolf" when there is no wolf; and it has to maintain the reception of intelligence at this higher level by maintaining its credit-- which can be done by no other method.

Now to turn to the economic aspects of war. I want to discuss briefly the significance of economics in war before I turn to some discussion of the economics of the last war and of economic intelligence in the last war.

In the first place, we are in a cold war. There is infinite discussion of it, and not all of that discussion is very penetrating or illuminating. I regard it as further in a sequence--the sequence of undeclared wars--breach of all familiar diplomatic conventions and collapse of what you might call the system of Grotius. All the conventionalized, formalized, proper procedures of relations between governments in the modern nation-state system which had been built up and which had great endurance, great stability, for two or three centuries, were, it was often remarked, in the thirties, being violated point by point in all kinds of respects. I used to think, before this war really got going, that the only monstrosity left in terms of the conventions of international law would be an undeclared peace. We had undeclared wars by the dozens, we had everything else under the sun, and undeclared peace would be the only thing left that we could have. The cold war is, in many respects, just such a thing--an undeclared peace. At this point, given the political facts of the world situation, it is impossible, without violation of treaties of some kind, to establish firm, final, regular peace with Germany and Japan, and yet we are, in some sense or other, at peace; we are, in many senses, also at war.

What is the meaning of that? For one thing, I would suggest to you--and I trust I have a sympathetic audience--that there is another side to the old point that war is too important a matter to be entrusted entirely to soldiers. I think it is possible that, under the conditions we have reached, we can add: Peace is too important a matter to be entrusted entirely to civilians.

Another aspect of this radical evolution is the extension of the logic of war backward into logistics and into economics. I say logistics and economics first, not because psychology, politics, social psychology, morale, and so on, are all unimportant, but because it is through economics

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that all the national resources, human and material, are poured into a war effort. They are poured through the economy before they reach the military. If they are ineffective in the economy, they are ineffective.

In short, I would say the classic principle of economy of force, as expounded by Foch, cannot now be applied in terms of the economy of military force alone. It has become something that you can apply clearly, in general, to the economic effort of a war, not solely to the shooting effort of a war. The enemy economy is the thing you try to break now, the way Foch tried only to break an army. Your own economy is the thing you use, through economic warfare, through war production, to back up your military means and all other means. This means no less than that the calculability of the economic aspects of all power and potential and capabilities is indispensable to the calculability of war itself, just as indispensable as the old tactical constants or the elements of strategy; and that a Grant would now find he must either know economics or lean upon economists, whereas, in 1865, he presumably got along very well knowing the classic knowledge of a soldier only.

So much for what I would assert to be the importance of economics in war. The Second World War illustrates, in innumerable ways, a gap between the mind and the facts as concerned with the economics of the war. That is so general that it is no aspersion on anybody to deal with it in terms of names, dates, and places, and I will, to some extent, deal with it in terms of names, dates, and places. I won't quote everybody. I won't quite quote all sides.

The Japanese underestimated us and most seriously underestimated our economy. The Germans underestimated our economy. They underestimated the Russian economy, and we know very well, also, that the Germans underestimated their own economy. We underestimated the Germans, the Japanese, and the Russians. The British underestimated the Germans, the Japanese, and the Russians. Perhaps least of all did the British underestimate the Americans; they at least counted on us as, by all odds, the dominant weight in the balance if we entered the battle. The British certainly underestimated their own economy for a long time in the early stages.

I want to try to illustrate the evolution of the sense of scale, because that evolution of the sense of scale is the key to the measurement of the gap between what people were thinking and what was really true. It is that gap which has to be reasonably short, reasonably moderate, if war is to be calculable on the economic side. If there is too great a disparity between what you are thinking and what is really so, the war is an incalculable war, and the consequences of action cannot be very much in accordance with intention.

First, I want to use some of the words of Neville Chamberlain, then Prime Minister of Britain, from a speech he made at a Lord Mayor's

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lunch in January 1940. That is the time when the winter war between Russia and Finland was on, and the "phony" war was on in the West. Churchill was not yet Prime Minister. The Battle of France--or even the Battle of Norway--was yet to come. Poland was down. Those were the circumstances. He sees the occasion to give a warning that war economics were going to be tougher than people were fully aware as yet. He said that war production would presently require shifting, some people from civilian work to war work. Now, as news, he said there might be some puzzlement over that because there was still a lot of unemployment in England, and people might be perplexed at the suggestion that war production could go so far as to soak up all the unemployment. But he said further, and I quote: "It is already clear to us that the demand is going to be so great for labor that there will have to be an extensive change-over from one occupation to another."

There was the war formally on, militarily on, for a matter of four or five months, and they were still discovering that there may be some need to change over labor from civilian to war production!

Substantially after that time, in 1941, Britain quadrupled its tank and gun production as against 1940--the year the English were just entering when Chamberlain was beginning to think war production was getting pretty big and going to really get very big--and doubled that production again after 1941. On some items, they went much further than that. On some big items of war production, in England, they went from double to a hundred times 1940 production before they reached their peak.

Hitler, in July 1940, after the Battle of France, made a big speech to the Reichstag. In it he said some things which I think we can now take as perfectly candid, but which were regarded as unmitigated nonsense and bluff at that time. One of the things he said was this: "Ammunition was manufactured on so large a scale and the existing supplies are so numerous that either a limitation or a change-over of production is becoming necessary in numerous sections... The total amount of supplies for the Army and Air Force and all services is considerably greater than before our attack in the west."

We were consoling ourselves that the Germans had had a very considerable expenditure in the course of that operation in the West. It was only much later that we discovered--it came out in one of the USSBS studies--that the German expenditure of expendable materials and equipment in July 1944 was seven times as great as the expenditure in the Battle of France in 1940. In July 1944, the Germans were operating a 12-month war and not a 6-week war, and in one month they expended seven times as much as in the whole Battle of France. Nobody had, in other words, in that early period, a real sense of just where the decimal point was on the economic scale of war.

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In our own case, we went through a long sequence of concepts about the Nazi economy. Back in 1935 we assumed that the Nazis were making a total effort--"cannon instead of butter." We also assumed that a totalitarian system is inefficient. Sir John Simon was especially good on that. He knew that, with sound economic principles, Britain, a rich nation, could certainly outarm Germany, a poor nation, operating with cockeyed economics based on Schacht's weird ideas. It was not until the Battle of France that the signs were reversed, and we decided: The totalitarian system is not so inefficient as we thought but, unfortunately, turns out to be pretty efficient. But we still thought of it as total. The standard American intelligence judgment, throughout the war and even before the war, was that the Germans reached their peak "last year" and they must now be in a decline because of the shortage of oil, the exhaustion of skilled manpower, the creaming off of skilled manpower for the army, the recruitment of unskilled women and foreigners, and various other factors of that kind. The effect of the blockade was rated very highly back in the early stages of the war. That kind of judgment was reflected also in our judgment of our own war economy.

In some ways--I want to emphasize this--our judgment of the enemy economy and our judgment of our own economy are not put adequately on all fours. They are not suitably related to each other. Our intelligence judgment is not based on the same calculation as our own war production judgment is, and vice versa, as it would be if we knew what is the best way to put the tape measure on somebody else's economy. Yet, in other respects, they did react upon each other.

It was after the Battle of France that we decided this war was not going to be won by our friends, or our friends with ourselves, unless we made an all-out effort. We appropriated a lot of money in the summer of 1940, and we set about going places and doing things.

You may wonder a little at my quotation of politicians on such points. I would add a footnote here. There are certain kinds of things that high political officials do not say unless they are sincere, because no politician wants to make a fool of himself, no matter what kind of politician he is. He may be a careless and reckless politician. There are plenty of those, and we all know it. But top political figures don't expose their basic estimate of the situation without being sincere about it, because their political credit rests on some kind of batting average of good judgment in the eyes of the people. I think this kind of quotation from a high official is a reliable indication of the best judgment in the minds at the highest government levels at the time the statement was made. You don't have to accept that, but I want you to understand that as my own judgment of the value of these statements.

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President Roosevelt, on 15 March 1941--our big defense program was then about nine months old from the summer of 1940--said, and I quote:

"Today at last, ours is not a partial effort. It is a total effort, and that is the only way to guarantee ultimate safety..."

"A half-hearted effort on our part will lead to failure. This is no part-time job. The concepts of 'business as usual' and 'normalcy' must be forgotten until the task is finished. This is an all-out effort--nothing short of an all-out effort will win."

Now for a concurrence in that and for a few details on scale of that all-out effort. Knudsen, who was then co-chairman of the war production business, on 6 April 1941--that is about three weeks after the statement by Roosevelt that I just quoted--said:

"The launching of our program was started last June... With the American defense program instituted in June, it was possible to place over twelve billion dollars worth of contracts promptly...so that we have placed today practically all the equipment required for one million two hundred thousand men and heavy equipment--meaning guns, tanks and planes--for eight hundred thousand additional. This we hope to have finished by the end of 1942."

That is 20 months from when he was speaking---

"The additional lead caused by the lend-lease bill and the British orders still unfulfilled adds 60 percent to the total, so that we are faced with a production job, the approximate size of which is twenty-eight billion man-hours (14,000,000 man-years at 40-hour week), to do in twenty-seven months.

"This is the biggest job ever undertaken by any country in that length of time, and it will require the maximum cooperative effort of every man and woman in the United States to get it done on time."

You know, from your own memories, well enough, how the scale shifted from there on, so that as against 12 billion-plus--add 60 percent of that and call it 20 billion--to be done in 27 months we were doing close to 20 billion in a quarter year before we got

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through finding out how high we could go--a factor of about eight as the difference between the then estimate and the real possibilities.

Not quite a year later, President Roosevelt, in a radio speech he made at the end of February 1942, was commenting on the balance of strength. In the midst of that speech he made this statement:

"Germany, Italy, and Japan are very close to their maximum output of planes, guns, tanks and ships. The United Nations are not, especially the United States of America."

It just so happened, by fortunate accident--and this greatly simplifies the research that has to be done--that it was after this that Todt was killed; Speer became war production chief in Germany; and a young man, Wagenfeuhr, who liked to fool with figures and had not been able to get anybody to let him do what he wanted to, was cleared by Speer and allowed to set up some index series. Wagenfeuhr set them up in the summer of 1942 and went back to January-February 1942 as a base period because it was convenient for him at the time. So January-February 1942 is the base period for the German index series, without any change or adjustment. In other words, their indices read 100 at the time that President Roosevelt said they were at or near their peak in production of planes, guns, tanks, and ships.

The index for planes went to 322 at its peak in July 1944. The index for guns went to 408 at its peak in December 1944. The index for tanks went to 598 at its peak in December 1944. The index for naval vessels went to 333 in December 1944. There is the coldest measure I can give you of the gap between the best prevailing judgment in February 1942 and what could happen.

The German economy, of course, accomplished that through a combination of factors. First of all, it was synchronous with Pearl Harbor that the Germans learned they had a long war on their hands. They were turned back at Moscow in the same week as Pearl Harbor, and they still did not know just how long it would be. As recently as September 1941, they had cut back war production because they foresaw the end in Russia so soon that they had no expectation of using up their stores in warehouses. After Pearl Harbor, the Germans knew that they were in an unmeasurable war, in a 12-month war.

Then Fritz Todt, who had been regarded as a genius, especially by us--this great man who bestrode the horizon in terms of the war economy--was killed in an accident; and a casual, bright boy, who was a pretty good architect and who happened to have Hitler's personal backing, succeeded Todt. This man, Albert Speer, who knew a great deal less economics, with increasing political support and political pressure,

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if you have the stuff to win. But the whole point that I want to suggest is that we cannot count on any such business in another war. There are many opportunities to waste your assets in war. If you can afford to waste no more than 20 percent in order to win, and your wastage is running 30 percent, you are going to lose.

Now, if you set out to snow somebody under, assuming he is at the peak of his possible activity, and he can gain further economies in fighting by shifting more and more to a 1916 kind of war--more shooting and less gasoline--and he can make tremendous logistic savings in the course of retreat toward his own homeland, and so on, and triple his munitions production, and then you snow him under--that is a kind of war you cannot expect to repeat. If your calculations are that bad, you could win that time only because, with your allies, you were so much stronger. Give somebody the position, geographically, that Hitler held, play it like duplicate bridge, leave out the ace in one of the defending hands represented by Russia in the Second World War, transfer that to the dummy--make just two or three cards different in duplicate bridge hand to play the war over again--and I don't think you could afford to miss a trick. That is my point.

I did not mean 1.2 was a precise estimate of what is a good tolerance of error. One point two is certainly a vast increment of precision as against a factor of 8. The factor of 8 was a slap-dash guess. I don't mean that you could, without very arduous work--I am not sure that you could even by very arduous work--actually assign any such factors.

QUESTION: I would like to get back to the diagram that you drew showing the effects of the various German moves upon the British--I believe you were specifically referring to them at that time--first Hitler's ascension, then Czechoslovakia, then Poland, and then France. In each case, the move was interpreted in one way or another by the public. Now, in Churchill's first book, "The Gathering Storm," he tells about how he repeatedly spoke or wrote to various members of the British Cabinet, at the time, calling attention to the significance of these events, and yet, apparently, he had very little luck in selling his ideas. Are we now prepared in this country to do a better job on interpretation of events than Great Britain did in those days? Is there any way in which we can prepare ourselves?

DR. PETTEE: I think it would be perfectly feasible to do a better job than the British Government did. I did not mean to pick on the British Government in that case the other day. I don't remember specifying anybody at all. The wiseacres in Britain, France, and America shared that interpretation of the course of Nazi history.

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know whether President Roosevelt thought we were really going all-out at that time, but I think the people did. We thought that we were making prodigious strides in being the arsenal for democracy, but we were nowhere near an all-out effort. We were still building 3.75 million motor cars in 1941, and so on. That effort, compared to what we did after we really got into the war, was very puny. From that, it would seem we could say the only way a democracy can really prepare for war is to go to war. My question is one of speculation on what would have happened here and there around the world if we had gone to war in 1940 on the fall of France, or as France was falling.

DR. PETTEE: The President you quoted used to refer to certain kinds of questions as "iffy" questions. That is one of the "iffiest" I have heard. You have to provide more premises than you have as yet. The President might have gotten a declaration of war out of Congress without adequate public excitement, so to speak; in which case, our effort would have dawdled after we got in. On the other hand, you may propose as an alternative premise that the collapse of France scared us so much that we went in whole hog, wholeheartedly, half hysterically, and got the same kind of national effort that we did after Pearl Harbor. And, of course, you can specify dozens of alternative premises for the same kind of proposition. Without specifying those, you have nothing to work with. It could have come out either a shorter and quicker war or just about the same kind of war.

QUESTION: Dr. Pettee, during your talk, you commented on how we underestimated our economic potential and the economic potential of other countries during the past war, and you concluded by saying that in a future emergency we should be right within a factor of 1.2, I believe. Do you mind elaborating on exactly what you meant by that?

DR. PETTEE: Supposing that out of a gross national product in this country of, say, 250 billion--call it a quarter trillion to be simple--we actually could put up to 60 percent into a war effort, leaving 40 percent for civilian needs. It is difficult to tell this thing until afterward. I am positing there is a reality there and that it is knowable if you straighten out your brain and really get down to brass tacks. If, by retrospect, your error is no greater than 20 percent, you are certainly doing vastly better than people ever did before; you have brought the error down to quite a degree that does not interfere with calculation of the war. Your war calculations are going to be reasonably realistic if you get your error down to 20 percent. Your error, if it is up to a factor of 8, or anything of the kind, makes basic calculation absolutely nonsense.

You can blunder through a war, fumble through a war, or, as the British say, muddle through a war, in spite of such a scale of error

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DR. PETTEE: That could well be. I think there is one loose factor left in your question so far. You referred to the tendency to underestimate the potential of a nation in war. You are referring to the present years, I gather. Now, of course, we are not in an all-out, hot war, and, in so far as we are in something that in some ways deserves the name of peace, the considerations on feasibility are entirely different considerations. The considerations, governing the decision that the sum of 40 billion dollars--about 20 billion of which is for defense and foreign aid--is about all the national budget we can stand, are based on questions of how much would produce inflationary pressures and what is the healthiest condition in which to keep this economy so that it is growing in its real muscles and bones for any probable future hot war.

Those considerations are not on all fours at all with what a maximum war effort could be. Ipsa facto, any judgment that we could now guess right on what we could do in a war does not prove at all that we are guessing right on what we can do in this cold war. I don't know that we could not spend 50 billion or 60 billion a year under cold war conditions without wrecking the national economy if we faced up to the thing on the public relations side, and let's say we could and did sell the people on the urgency of the conditions. I think if we did, they would stand the taxes, or the further borrowing, or whatever was involved, and we could do it without any serious degree of inflation.

As for the more general point with which you started your question, I think the judgments of the economic capabilities of a nation today are, at any rate, on much better footing than they were 10 years ago. They are a great deal closer. I don't know just how close.

Certainly, in the Russian case, we need a great deal of refinement before we can test feasibility properly. We have some concern that there is a tendency to assign the Russian steel--call it 20 million tons a year--in such fashion as to assume the Russians can make 20 million tons of tanks, 20 million tons of submarines, 20 million tons of cannon, and 20 million tons of everything else. And on that I think the input-output type of approach, aside from the direct literal products as designed by the designers of that system of analysis, has very valuable by-products in training people to think more or less straight about the size of the pie and about how many wedges cut at what angle at the center of the pie you can get out of 360 degrees of pie of any given size.

QUESTION: Here is another one along the speculative line, Doctor. You quoted President Roosevelt the other day as saying, in his 15 March 1941 speech, "Today at last, ours is not a partial effort. It is a total effort...nothing short of an all-out effort will win." I don't

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would have gotten into the war approximately at that time? Or what do you think history might have portrayed for us? That is a hard one to cover, but I am interested.

DR. PETTEE: It is one that can be covered by the same kind of method I was using. I remember particularly a remark by Admiral Stark--there were similar remarks by others--quoted in Sherwood's book on Hopkins, in which Admiral Stark, in a memo to Roosevelt, said, "The Lord knows, Hitler has every excuse in the world to declare war on us now if he wants to. He will when he wants to, and not sooner." There were other remarks showing that, in the minds of some people on both sides, America was altogether an informal belligerent already at that time.

There are some other figures I didn't use. I read a quotation the other day from Knudsen about what a whopping program we had for 12 billion dollars worth of contracts, and so on. By the end of November, before Pearl Harbor, we placed something like 64 billion dollars worth. That was a matter of eight or nine months later than Knudsen's statement I read, but it was still before we were a formal, declared belligerent.

You can pay your money and take your choice on that kind of data. Offhand, I would say we were a belligerent in everything but name. Our top brass knew it, and there was not any illusion about it. And, ipso facto, I would say we would have gotten in just as much as necessary eventually. I presume that might have slowed the war down a bit.

That is the best answer I can give to that one.

QUESTION: In your examples of discrepancies between predictions and fact as later developed, there was a very great underestimation of economic potential. What are your ideas, then, in regard to the present cycle of feasibility testing? So long as that inclination seems to be present, it would look as though it would lead the Joint Chiefs to cutting the cloth to far too small a pattern. When a strategic plan of the Joint Chiefs of Staff is referred to the three services for the determination of military requirements which are then submitted to the Munitions Board, the Munitions Board, together with the National Security Resources Board, measures the requirements against the industrial and economic potential of the Nation to support war on the scale envisioned by the strategic plan... Are we likely to underestimate the American economy?

If there is that strong tendency to underestimate the full potential of a nation in time of war, it seems that the Joint Chiefs would always be basing their strategic plans on considerably less effort than the Nation would actually be able to support.

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Third, I dealt, or tried to, with economic intelligence judgments in the Second World War and the very marked discrepancy between the judgments and the facts in the early part of the war, and, to some degree, indicated what kind of errors, principally in the premises, had to do with the errors of judgment.

Fourth, I raised the point made in the Acheson-Lilienthal Report relative to atomic energy, that in a growing and changing field, unless you get your own system at the forefront of knowledge, you will not know enough to take care for yourself.

Then, finally, I tried to point out a few of the things which, it seems to me, deserve more emphasis than they generally receive in the present intelligence picture. There are, of course, several books and a good many articles and a great deal of thinking about intelligence. On the economic side, I felt that one of the keys is the expertness of classical, conventional economists in only one of the four aspects of the economy, requiring further attention to the other three in order to make economic intelligence more realistic.

I also tried to hammer on the idea that intelligence is not purely a matter of collecting, sorting, and repackaging information, but that it takes real brains. There are mental processes involved, and it takes good brains to execute them.

And I wound up with a diagram in which I attempted to introduce an approach to the idea of how the minds of people who are concentrating on a subject continuously may wind up "out in left field" with conclusions that are altogether different from what the same minds, with a fresh start, would arrive at from the same data if they took all the data at once instead of reacting to them in series.

Those are the principal high lights of what I meant to get across last Friday.

DR. REICHLER: We are ready for questions.

QUESTION: Doctor, I was quite interested in the chain-reaction diagram you had on the board, with the historian sitting over here second-guessing, so to speak. While you said it was difficult to be placed in that position, I wonder if you would be willing to place yourself in the position of second-guessing in this regard: Churchill's memoirs lately have brought out quite a bit about the goings on between President Roosevelt and himself immediately after Pearl Harbor Day, and this morning's "Times-Herald" had quite an editorial on that reaction. Assuming--which is hard to do--we did not have a Pearl Harbor and that there was no other cataclysmic action occurring, do you suppose we

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that constant down to not bigger than 1.2, or something like that. And I will leave that as a conclusion.

GENERAL HOLMAN: Dr. Pettee, this certainly has been most stimulating and interesting, and I would like to ask right now if you will please give us a raincheck for the discussion period so we can come back and really get into some of these things you started us thinking about. I am sure there would be a lot of questions.

Unfortunately, we do not have time for a discussion period this morning, but we are going to look forward to having Dr. Pettee with us again--and very soon.

Thank you very much

The discussion following Dr. Pettee's lecture was conducted on 27 February 1950.

DR. REICHLEY: I won't bother you with any introduction because, if you don't remember the introduction of, and the lecture given by, Dr. Pettee last Friday, well, something is wrong. So I will just say that Dr. Pettee is here to continue the discussion period. We are going to ask him, first, to give a very brief review of the essential points of his lecture of last Friday morning. Dr. Pettee.

DR. PETTEE: Thank you. General Holman, Dr. Reichley, and everyone else: I am gratified to hear that there is something wrong if you don't remember what I said last Friday; I am not sure that I remember all of it. I hope none of you brought your notes; you might spot a discrepancy between my recapitulation and what you thought I said.

I tried to begin with a brief formulation of the intelligence function in relation to a cycle of thought and action, within which any failure leads to a failure of function in action and discrepancy between consequences of action and the intentions.

The second point I tried to make was related to the importance of the economic aspect of war, and I endeavored to indicate that, in my mind, there is a real relation between the growing economic importance and the growing informality of war and peace and all the procedures associated with them. So that the cold war can be, strictly, just as warlike as any war ever was, rationalized in terms of the choice of how much of what kind of war to have at any given time, but with the economies on both sides as the prime instruments and principal targets.

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Let "O" be an event. Let "X" be an impression. Start with Hitler's decision to rearm in 1935. That yields an impression in our minds: He may be dangerous, but, fundamentally, he cannot be very dangerous because Mussolini is against him, everybody is against him, we will contain him, England will start to rearm, too, if he goes too far, and so on. In other words, a flock of stuff came out of the ether--positive things we knew, because we had learned them. They were great truths. Not everybody knows them, but certainly all Ph.D.'s know them.

We come to the next move. He reoccupies the Rhine. What is the impression? The French and the British missed an opportunity to stop him. They could have stopped him cold there without any trouble. Why in the deuce didn't they?

Comes the next move. We will call it Munich. I am going to skip plenty because there is not room on the blackboard for all of them. We react to that in this way: There was the great opportunity. The Czechs could have fought, the Czechs could have taken Vienna, Hitler could not have taken Prague; and if the British and the French and the Czechs had fought, the Russians and we would have been rid of Hitler right off, quick and easy.

Comes the attack on Poland, with its revelation that the German Army was able to do something that, in many minds, it could not do because of "General Mud," "General Winter," and the great superiority of long-term Polish noncom's over the German quickies, who had not been in the Army long enough to know how to fight. We decided: This shows the Poles were nowhere near so good as we thought they were.

Then comes the Battle of France; this thing is really something.

Now, the thing the historian does--and the historian is frequently overly superior in his attitude about it because he does not appreciate what he would have thought if he had gone through these impressions in series--is this: He has some prejudices out in the air of his own times, but they are not the same as the ones I have mentioned, at any rate, and he arrives at something I will call "X¹." The proposition I present to you is that X does not equal X¹ (Chart 3, page 35.)

Furthermore, in some cases, if you study the thing historically, in a number of situations, as on this judgment of war economy--Russian, Japanese, German, English, American, and so on--and the facts of war economy, you are tempted to think that you can insert a constant that will straighten it out: X times 8 equals X¹, or something like that. I would like to present to you as the simplest criterion on economic intelligence that the value of that constant should be made as small as possible. Offhand, I would think, for the next war, we will not be very happy unless we get the value of

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parts of what subjects are involved in the action problem that you must deal with. So, normally, the intelligence material has to be taken apart, classified, and regrouped--regrouped at least twice--in the course of the procedure.

That, in itself, is an oversimplification of the series of complex transformations, involving intellectual brainwork, that must take place between the input and the output.

We are still influenced in the whole intelligence system, I think, very much--too much--by the idea that the indispensable ingredient is data; that if you make sure you get all the necessary data, you are "in," that is all there is to it, because, fundamentally, the output contains the data that are in the input. That idea grossly neglects and underestimates the input of brainwork by the people who are there doing it. There is no more relation between the data contained in the input and the data contained in the output than there is between your salary and your tax when you make out your form next month. You have to go through steps which transform certain figures you begin with into certain figures you end with, and if you don't go through those transformations, you don't come out with the right answer. If you don't go through them correctly, you don't come out with the right answer. These transformations are not mere rearrangements. The indispensable ingredients in the input are the ingredients put in it by the brains.

I often thought during the war that if anybody gave me staff, time, and the microfilm of the enemy press, I would be delighted to undertake to get just as good estimates of every factor in the enemy economy as anybody else could get from all other sources. It would have been a cinch. We were snowed under with data. We had ten times too much. There was, sometimes, the missing fact that was hard to get and very important. I don't mean to underestimate that for a moment. There are important facts that you need. But, in general, it is far easier to get ample facts to calculate from than it is to make the calculation. If you do not have the exact facts the method calls for, you look around and find others that will serve the purpose. If you have any ingenuity, you can find plenty of facts bearing on the subject from which to calculate an answer. Brainwork is the thing we are sort of trained to neglect. It is part of our ideology of rationalism that real brains don't count.

Finally, there is a complex principle that I will try to introduce in a simple manner--it is related to objectivity, to the scientific principle called "parsimony," to using the fewest possible unnecessary premises--in an effort to illustrate to you in a little less baffling way this matter of the hiatus between what I might call the stream of consciousness on the war economy and the real facts of the war economy.

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done--work more urgently needed by the defense services than by anybody else, work for which the defense services can more readily provide a modicum of money than anybody else--which are not purely intelligence. They certainly should serve intelligence, but they should certainly serve the other side also--the development of the input-output technique.

As the method develops, it should be applied in its best and most fancy form to our own economy and our own planning, and it should also be applied, obviously, in the best simplified approximate form that can be worked out, to an enemy economy. If you have the method you ought to use it on both, not on one.

That creates problems which are not yet clearly understood and not yet clearly analyzed, as to how to gear in and develop the procedures and relationships between research and intelligence, between research and the services in general--all parts of the services. That is simply one of the problems of intelligence organization now--to learn how to get along well with research of this type, which is not of a purely intelligence type.

There are a few general problems in the intelligence field. I don't know whether the ones I am choosing are well selected, but I am giving them priority of attention here to rattle off briefly because I think they need more emphasis than they have had and more than most others need. I am picking them on that basis. They are not necessarily the most important, but they are, I think, the most important to mention because the least attention has been given to them relative to their importance.

It is often noted nowadays that the intelligence input comes in, in terms of source, classified by source--some pieces of paper that represent the sources it comes from. The intelligence output has to be classified in an entirely different way. So it all has to be taken apart and put together again. The point I want to make is that it has to be taken apart and put together at least twice, not once, in the intelligence system, because the raw material, the bottom level, is all classified by source. Intelligence analysis is largely based on regrouping it, evaluating it, analyzing it, synthesizing it, in terms of subjects. You work up your basic stuff on the Italian steel industry, on the Norwegian cabbage crop, on the price of eggs in Shanghai, and so on, from all sources. The final output, of course, does not go up to the top level entirely; it goes straight across the board, too. The intelligence judgment is an estimate of the capabilities and intentions of the enemy, or something like that; while the lower levels are giving tailored, spot answers to all kinds of things, also. Whereas the information is classified by subject at the point of analysis, at the policy-making level it is classified by action problem, and the action problem is in no respect uniform in compartmentalization with the subject classification. You have no idea what

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What should the share of wages, share of profits, the slice for taxes, be, and so on, in splitting the national dividend? And there are fundamentally ethical considerations involved.

There is the institutional economy--the organizations, the corporations, the partnerships, the contracts--the whole institutional system by which the economy is organized, in disregard of the money; often in disregard of ethics, one may add.

And there is the material economy, which is, in a sense, a thing the War Production Board discovered, or rediscovered--the War Industries Board had already discovered it once, but it had been largely forgotten--and that is the economy which does not exist unless things are going on that you can measure in terms of time and space and matter and energy. If there are not things that you can measure in tons, calories, miles, and hours, there simply is no economy of any kind--exchange, ethical, institutional, or anything else--and if you can do a thing in the material economy, you can do it because, in one way or another, you can solve the other three problems. The great single principle of the war economy was to make the other three cease to inhibit, in any way, shape, or manner, the material economy as oriented to war requirements; to make the money economy serve the operation of the economy for war requirements; to make everything else serve it.

The economists, until moderately recently, have been far more interested, I think, in the exchange economy than in the other three, and one reason for somewhat unrealistic judgments until more recently arose out of that concentration.

To meet that, there are new elements in present economics, some of which are of particular pertinence to just this kind of point. I don't know whether any of you are familiar--I presume some of you are and many of you are not--with the technicalities of what is called the input-output system, or inter-industry relations. That system requires, as near as I can gather an impression, about five million dollars worth of research encouragement in the next few years in order really to pay off with what economists like to call dynamic models of the economy which can really serve procurement planning, programming purposes, and really serve air defense purposes, in identifying bottlenecks that are either difficulties for the production planners or procurement planners or good targets for the enemy. It is of great pertinence to either of those purposes; and as such elements develop in modern economics, in the profession, in the conduct of economics, in the interests of economists, economics will be far better geared, far better tooled up, to serve the kind of consideration required for national security in the kind of cold war we are living in than economics was 10 years ago; ipso facto, to serve economic intelligence.

Obviously, bringing in the input-output kind of thing illustrates why I put research into the diagram. There are elements of work to be

"This is a growing and changing field. New advances in Technology may be confidently expected. It therefore becomes absolutely essential that any international agency seeking to safeguard the security of the world against warlike uses of atomic energy should be in the very forefront of technical competence in this field. If the international agency is simply a policy activity for only negative and repressive functions, inevitably and within a very short period of time the enforcement agency will not know enough to be able to recognize new elements of danger, or the beginnings of a course of development having dangerous and warlike ends in view."

In a field in which calculation is absolutely essential to the policy-making process, the decision-making process, and the conduct of operations, and in which the factors are variable and there is fairly rapid development in the course of time, if you are not in the forefront of knowledge, you don't know enough to do the calculations that you have to do, and to do them realistically and within reasonable limits of approximation. I would maintain that applies to this whole economic side of war at least as well, on all the evidence of how difficult it is to become reasonably accurate, to know the possible disturbances in the whole conduct of war arising out of the errors of estimation and judgment in that connection, of which you can find plenty in the last war scattered all through it. I maintain that the thing cannot be done properly unless you can get some of the people concerned to the forefront of knowledge on the problem. And that has to work into this diagram. If you don't have people--"indians"--down in the intelligence levels who are at the forefront of knowledge on this matter of economics, you cannot know enough about economics to keep the thing cleaned up.

How do you do it in economic intelligence? I am certainly not going to tell you I have a blueprint for it or anything like one. There are a good many ideas on how to operate intelligence better than it has been done, how to operate it up to snuff, according to certain criteria that are familiar.

I begin on economic intelligence with one observation on economics. The economists, before this war, were, I think, predominantly trained in, concerned with, preoccupied with, one aspect of an economy--the exchange aspect. Commerce was the thing they were really studying. I think there are four aspects of an economy that one can identify readily that are of more or less equal importance and of which that is only one.

There is the exchange economy.

There is the ethical economy. In everybody's mind are the questions: Who gets more than he deserves? Who gets less than he deserves? How should the pie be cut? Should the coal miners get more than they are getting? Should college professors get less than they are getting?

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tricks and traits of production techniques began in a sense with Taylor's efficiency system around 1910. In another sense, they began with the introduction of the first high-speed steels during the First World War. That might have been a thing that was so ill-understood that we did not know how to estimate the true war potential of the modern economy.

However, if I may quote one more passage to you:

"We have learned from the revolution, that under certain circumstances war can be carried on without money and even in spite of the complete absence of all customary means, that once a state is engulfed in revolution the revolutionary system opens up new and uncalculated resources, and that such a system can carry off a triumph over the wisest theories of political economy; and finally that the stagnation of trade, sacrifice of industry, loss of ready money, deficit in receipts and destruction of the tax system, and all the evils from which one commonly infers the decline of a state, may be only relative evils, and that a great nation need not fall so long as any energy remains, if only that of criminals; but only when exhaustion is total."

That was translated from the German written in 1800 by a man named Von Gentz, who was amazed and irritated and stimulated in his own day by the demonstrations of the French Revolution that the war potential of a country was far beyond the calculations.

Can we afford the scale of gap between the mind and reality that is illustrated by that sort of business? Do any of you want to undertake to win another war not knowing within a factor of five the economic war potential of either our side or the other side? Do any of you want to try it again? All wars are won by one side or another, or stalemated, so it is not impossible to conduct a war on those premises by any means. All wars have been conducted quite adequately on whatever premises were available, just as Mark Twain put it in respect to horse races. He didn't get around to saying that you don't have to know which horse will win in order to conduct a race, because the other aspect is so obvious: All you have to know is that you don't know which horse would win in order to conduct a horse race. That is why you conduct the horse race. In a large sense, that is true of war. You don't have to have wars only as soon as you can fully calculate them. But, still, I present, do you want to go into another war without knowing where the decimal point is?

At that point, I want to turn to the inevitable topic of atomic energy--one cannot leave that out of any talk on anything--because there is a special aspect of the relation between the facts and our minds which has been made in that connection and which I think applies far more broadly than it has been made as yet. I quote from the Acheson-Lilienthal Report--it is almost exactly a paraphrase of something in the earlier Baruch proposals:

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The contrast between the Spartan impression and the rather flabby reality of the Nazi economy before Stalingrad rests on four factors.

In the first place, there is the clear evidence that the Nazis did not, in fact, expect to fight a big all-year war.

Second, in consequence of this, the resistance to serious sacrifice was always superior, politically, to the claims of the war managers. Suggestions that a plant be closed met the opposition not only of the management but also very often of a politically potent Gauleiter, who assumed responsibility for the immediate interests of his area. (Even in the Nazi system there were people in positions to act as some Congressmen act.)

Third, the control system was never developed until 1942 and later simply because it was not seriously needed. It must be emphasized that throughout this period the German economy met the limited demands placed upon it, not only without evidence of strain, but also without controls. The Wehrmacht supply offices were, until well into 1942, Germany's only war mobilization agency and exercised power only over munitions-producing enterprises.

Fourth, there is positive evidence--this you can put in your pipe and smoke and resolve your own future attitude on it if you are ever in a position to exercise yourself on such an attitude--that the German military leaders were singularly inclined to abnegation in the matter of demands for weapons and ammunition. The impression they leave is that they were perfectly satisfied with what they had, no matter how little it was. Kesselring, in Italy, was a model in that respect. It did not matter whether he was outgunned two to one, three to one, or four to one--he never yelled at the German economic authorities back home for more weapons; as if he could not be expected to win a war without equality. He didn't complain seriously in spite of all deficiencies--an admirable trait of character. But I am not sure it is a trait that helps win wars necessarily. It is a very admirable trait of character in an enemy, I guess.

There is a gap illustrated between what people were thinking and what was going on. What they were thinking did not prevent them from doing something approaching the impossible. Once the chips were down, and they knew they had to go as hard as they could, our own economic war managers did pretty well. The Germans did pretty well after Stalingrad. The British did very well. The Russians, I presume, did very well, judging by the results. I don't know just how they did it.

I want to present the question, Just why was there such a disparity? It is, of course, possible that it is this thing called the Second Industrial Revolution. It was not well enough understood. All the now

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of course, and a gradually deepening sense of desperation, such as our bombing, the siege at Stalingrad, and things like that came up, set out to do things with the German economy, in part at least, because he didn't know he couldn't. The Germans redesigned products, simplified operations, trained labor by special methods, began to put out of production plants that were using good materials for unnecessary production, and began to get some of the effects that we already had.

Pearl Harbor, among its legacies to us, had given us six months of "no nonsense" effort in our whole war economy program. As early as May 1942, roughly six months after Pearl Harbor, the "M" order on steel had prohibited the use of steel for thumbtacks, paper clips, coat hangers, and so on, for the duration of the war. The Germans did not prohibit the use of steel for thumbtacks, paper clips, and coat hangers until two years after we did. Yet we thought they were at a total level of effort long before that and we ridiculed them every time Goebbels came out and talked about a total mobilization. He did it about three times after Pearl Harbor in the course of the war, the last time in 1944. It was beyond our imagination that he was sincere each time. He had discovered new depths of what total effort could mean, and he was regarding the last one as the fraud and the new one as sincere, when we were regarding each one successively as a fraud. The Germans were discovering what you could do in a war economy when you had to.

One of the most important, and obvious, things the Germans did was to study in industry the relative efficiency of different plants and try to bring the inefficient plants up to the level of the more efficient plants. Any of you who ever saw the comparative real-cost figures, labor-cost figures, or anything of the sort, on our aircraft industry, or our shipyards, know how wide the disparity ran between the most efficient and least efficient producers. It ran as wide as six or eight to one. If you could bring the least efficient producers halfway to the level of the most efficient, you could make tremendous gains in the efficiency of the war production system. The Germans hammered at that. I want to nail that one particular point because I want to transform it to another use later.

The general picture of the German economy that emerged after the war was over is a sort of narrowly held revelation. Few people were interested enough to study it. Few people have found themselves in spots like yours where you may have to study it because somebody tells you to. Consequently, it is vastly less well known and less widely known among people to whom it would be significant than is the memory of the old impressions about the German war economy. In general, it runs something like this:

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Churchill, obviously, is the outstanding exception. There were some other exceptions--Dorothy Thompson, for example, after an initial error. You may remember the time she interviewed Hitler before he became Chancellor, back in 1932, and she came away and said she had just one impression: This man will never be Chancellor of Germany. After that erroneous conclusion, she became rather prophetic. There were other good prophets you can point back to.

Incidentally, in historical circumstances, there are, very often, individuals you can find by hindsight who, obviously, somehow got their minds on the right track, understood the sequence, and knew pretty well what was going to happen next. The problem of analyzing their method against the prevailing conventional method which was wrong in each case is an extraordinarily difficult one. I am not sure it is as difficult as it is supposed to be, for the simple reason that I don't think anybody has ever sat down and done a very systematic effort to analyze the two patterns of thought and interpretation--the right one and the wrong one--figure out just why the the right one was right and the wrong one was wrong, and prescribe the means and methods for getting on the right track instead of the wrong track.

The most important key, I think, in all those cases is in the choice of premises; it is not in the logic. John Simon was just as good a logician as Churchill. At the time of the French Revolution, the people who were all sure France would fold up were just as good logicians as the men who overestimated instead of underestimated. But the things that one man accepts as data and another man does not are the key. John Simon assumed that you could not do things with an economy that he didn't know you could do with an economy--and anything that he didn't know was not so. Schacht's economics were not so bad as some British and American economists thought they were.

I mean in no way to imply one nation was worse than another in this connection. In the case of British policy, it happens to be somewhat clearer than ours because the British were making commitments on their judgment on Germany from 1935 to 1940, when we were not. That makes the British a better historical case to examine in that connection.

I think an analytic job could be done on this matter, comparing the isolated prophet, whom nobody could understand when he spoke up, with the prevailing judgment. There are two problems, of course. Not only was he right when nobody else was, but, also, why, when he shouted, did nobody listen, nor did anybody understand when he did listen? Nobody could understand, in 1937, that, when Churchill spoke up, he was talking sense and the other man was not talking sense. The audience thought the other man was talking sense until the facts came out. It deserves examination and study, and I think

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there would be some good results if you get such a study.

ADMIRAL SABIN: Doctor, I regret very much that I missed your talk the other day, but a statement you made in your high lights interests me, and I would like some clarification on it. You stated that the Acheson-Lilienthal Report indicated that a nation which did not keep in the forefront of knowledge would not be able to take care of itself. What I would like to have you clear me up on is your definition of "knowledge." Do you mean knowledge of what the other fellow is doing in a particular line, or knowledge of the general subject itself, on which you must keep ahead of the other fellow? There is a difference there.

DR. PETTEE: I mean knowledge of the general subject itself in a case like that. The Acheson-Lilienthal Report applied it not so much to a nation as to an international organization. In that case, the international organization for the control of atomic energy would require a large research function, because if it did not know just as much as anybody else did, it could not police the thing. It is like hiring to catch bootleggers a policeman who would not know alcohol from flour if he did not keep ahead of the subject.

Foch wrote a third or fourth introduction to his "The Principles of War" in 1918 in which he said that the great thing he left out of the book up to that time was economics. In 1918 he was beginning to appreciate economics in war.

The thing that underlies all these peculiar, mysterious, anomalous features of the situation, and its rapid change since 1914, is the dynamic growth of bodies of knowledge--physics, economics, psychology, and others. These bodies of knowledge are changing the means by which to pursue national ends and the means by which to effect other people's national ends favorably or unfavorably, changing the real situation in which men are living in the modern world. In those fields in which there is a rapidly changing body of knowledge, if intelligence and command don't keep up with the forefront of that knowledge, they are liable to find the other side running rings around them and moves being made that are unintelligible until their results are seen. You cannot assess enemy capabilities and intentions, or your own, if you don't understand these things.

When I say that we must keep at the forefront of modern economic knowledge, I don't mean, necessarily, school economics. You may have to find that the professors are all wrong. But somewhere some of the engineers must understand what you can produce in a country in war. You must be extremely open-minded to recognize the good thinking that is going on and sort it out from the bad thinking. But if you don't keep at the forefront on that subject, there is every possibility that the enemy may. If he does and you do not, you are going to have some gruesome experiences. If you do and he does not, then you are going to have a good time.

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QUESTION: Presumably, the factor of 1.2 ought to be applied to our capabilities of assessing Russia. Would you care to give us some of your ideas as to wherein we could improve information received about our potential enemies so that we would not miss by more than 1.2 in assessing what we think the other fellow can do economically and his potential of manufacturing, production, and so on?

DR. PETTEE: That is a question on which I will have to give a rather amateurish answer. There are people who have been working on Russian economics steadily for the last four or five years. I am not one of them. I don't know everything taking place on that, at all. I think there are a few fundamental, hopeful lumps of rock out of which to build your house in that field so that it won't fall down on you, or cave in under you, as the case may be.

One is what I would call maintaining in your analytic method, whatever it is, at least a thread of a regard for the gross facts. Let me illustrate what I mean by that. The Russians were hit in June 1941 by the German attack. It was clearly a tactical surprise. It was equally clearly not fundamentally any strategic surprise. The Russians have certain kinds of sense--tactically, diplomatically, and so on--of which we are acutely aware. I think it is perfectly clear they knew they were running the risk of an attack by the Germans, and they so conducted themselves. If they had half the wits I think they have on some subjects, they must have known that.

The German attack intruded into Russia as far as Stalingrad. That was about comparable to somebody hitting us through New England and going as far as St. Louis. You can list the cities: Kiev, Kharkov, Stalino, Odessa--half a dozen big steel-coal cities down in the Donetz Basin. I cannot remember all the names for the moment. The Russians sell space for military advantage, but nobody ever sells that kind of space for only military advantage. When the Germans were taking the Donetz area and going on through to Stalingrad, I am convinced the Russians were not just selling space for military advantage. It is not the kind of space you can sell that way.

Yet the Russians, come the time of Stalingrad, were able to put on the action they did--and in winter. You may know far better than I the scale of war they were able to conduct from there on. I understand it as a war in which about 500 divisions were engaged on both sides, together, most of the time for about three years. Regardless of all questions as to whether the Russians were making 14 million tons or 18 million tons of steel, regardless of all questions as to whether they could put 60 percent or only 40 percent of their gross national product into war purposes, it is perfectly clear that they were able to bear a role surpassed by probably nobody but Germany and ourselves in the sheer scale of how much we did in that war. I am not sure that, in some ways, they did not surpass us by a great deal. They were one of the three or four great protagonists engaged in that war.

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That gives you something to go on. Anybody who writes down the Russians because we have four or five times as much steel as they have, I think, can readily correct himself from that historical basis--the gross facts of the Second World War.

We were able to put on a very big show. They may have done it with gadgets that we cannot use, such as fighting a 1916 shooting war instead of a 1940 gasoline-burning war, and so on. I don't know just how they did it, but those gadgets are part of their economy. They don't have to run 20 million cars in order to avoid a breakdown of war labor. War labor cannot get to the job in this country without millions and millions of cars running every day. All that rubber and gasoline is committed to the civilian economy to maintain the war effort. I presume the Russians walk. They live closer to their work, of course. It is not all morale.

QUESTION: With reference to the diagram you drew, showing the processes of normal intelligence, the collection and dissemination, with the hypothetical general staff brain that you referred to; recalling, also, the organization for national security that we have--where do you think this hypothetical economic intelligence brain should be when that sort of intelligence is synthesized and coordinated with normal military-type intelligence?

DR. PETTEE: There are a number of considerations bearing on that. I think it is far easier to make a list of the criteria you would have to consider in order to arrive at a right judgment than it is to propose what the right judgment would be, because you would apply those considerations to facts and circumstances, and I cannot specify the facts and circumstances under which you would decide it.

With that evasive action to get you off my tail, I would say, as an offhand guess, the center of it should be in CIA, with a definite and big NSRB finger in the pie. Under that, there should be branches probably in each of the three services and a big one in State. ECA ought to have a finger in the pie, probably through State or indirectly any other way. I don't see any possibility of assigning economic intelligence to a single agency, and I don't presume anybody else does. Offhand, that means that an interagency committee--the old poison--has to be relied upon. I think, perhaps, the most fortunate outcome might be for NSRB to chairman it and CIA to provide the secretariat.

Is that an answer?

QUESTION: Yes May I continue that point? NSRB, in working on the manpower question, for instance, is doing it purely from the national side. When you compare our manpower with the Russian manpower, of course, on a man-for-man ratio, we are outnumbered many times. But if economic

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enemy intelligence on manpower were handled on the same criteria that NSRB is doing it for the United States, you can see we are getting right back to what you are advocating, that is, "economic intelligence." This material should be synthesized and given to some high-level central agency--perhaps the President, and NSRB, his adviser. In this way, our economic enemy intelligence and our normal enemy intelligence would be coordinated at the highest level for best use by our national mobilization agencies.

DR. PETTEE: NSRB has, in a sense, to be the logistics division of the "general staff" of the Government. Some NSRB people accept that as a fair paraphrase of their own sense of their mission. It has an interest in the same sense that war planners always have an interest in intelligence.

Aside from that, in the sense of keeping at the forefront of the subject, and so on, I think one of the everlastingly important things is to see that you are analyzing both sides of the same method--if you think you know what the best method is. If you don't know what the best method is, then analyze both sides by both methods, not one by one and the other by the other.

Throughout the war, there were cases in which it was an extraordinarily simple trick to raise the standard of the intelligence job. For instance, on the German tungsten requirement, we could have gone down to the War Production Board to find out what our tungsten requirement was and why, and then found an engineer who knew something about Germany and could give us some light on the differences between German and American practice. We used far more tungsten steel than the Germans did, and they used far more tungsten carbide than we did. These practices made real differences. There was a real saving, in their favor, on the tons of tungsten required to remove so many millions of tons of steel in lathe operations.

Compare the methods when you are using different methods to solve identical problems in relation to different countries--your own and external countries. I would say it ought to be absolute SOP. The two methods must be compared; there must be an effort to comb them out, pick the better features of each, develop the best common method, and, if there remain any substantial doubts as to what is the best common method to apply to both countries, maintain some competition and some duplication, because duplicate effort is often an indispensable means of developing the kind of method you should have before you eliminate duplication.

QUESTION: Sir, in trying to figure out the economic potential of any nation, we always have to take into consideration the civilian "take"--whatever the civilians must have to keep on going. In the

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present planning of NSRB, I believe the basis used is what the civilians got in 1944. We have had many people appear on the platform and say that is wrong, that we can do more, we can take more, but we have not had anybody say how much or how to figure out how much more. Do you have any ideas on that?

DR. PETTEE: There are a few things you can develop as what some of the smart boys call parameters. I hesitate to use the word. One of them is this problem of how much use of automobiles is "essential civilian" in a country like ours, where the automobile became very numerous as much as 30 years ago and cities have grown in accordance with the existence of automobiles. You could not run Washington for a minute without them because there is no decent rapid transit or anything of the sort, and the average person lives eight miles away from his work and could not walk to work. If all automobiles were knocked out, only 10 or 20 percent of the workers could get to work by bus and trolley, and so on. The essentiality of the civilian automobile is, in some respects, proportional to its age in a case like that.

Give us five years to undertake some dispersion and decentralization, and if you have somebody with any brains in on it, why on earth can't you get cities of roughly 100,000 people built around things like Boeing at Wichita, in which most people would live within two miles of their work? I have heard people say that would be very bad because the enemy could get the plant and all the labor force with one bomb. He would get only one plant and all its labor force with one bomb that way. With the typical mixed American city, in which everybody crosses everybody else's route from bed to work, knock out everything with one bomb, and you get not one factory and all its labor force; you get one factory and 2 percent of every factory's labor force, and nobody works the day after because nobody can get to work. There are such things that you can play with, and work out factors on, that will influence the result by a certain degree.

There will remain some things, on the psychological side, that would be extraordinarily difficult to measure. I don't know whether you can, by any manner of means, predict that the American people will be in a mood of, let's say, pessimistic firmness--people who expect to get licked, like the football player who makes all the tackles on the losing team. If you can get them in that mood, well and good; you can put 65 percent into the war effort and 35 percent into civilian needs. If you can get them in the "money player" attitude--we are going to win but only because we are going to surpass all past performances and we know we can--that is ideal. To predict whether you can do it or not, you must have the mind of God, because you have to predict whom the President will choose for head of the War Information Office, whom the President will choose for everything else, what speeches they

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will make, what events will be arranged for their impact, and what events will be arranged, fortunately, for our side by the other side--like Pearl Harbor.

I think the thing can be squeezed down. I don't think we can tell ultimately with perfect precision, or anything like perfect precision, what proportion of national product can go into the war effort, but it can be squeezed down a good deal. We can guess closer than we did in 1944.

QUESTION: I should like to ask two related questions. The first is: Do you think that the inter-industry relations data for the United States for, say, the year 1944 could be made applicable to a future year? And, secondly, do you think that we have, or can get from Russia, sufficient industrial data to allow us to build an input-output table for Russia even approximately enough to do us any good?

DR. PETTEE: As to the year 1944, if you had very precise data, they would be pretty satisfactory in some relations and not in others. The aluminum industry's output in 1944 was going to aircraft in considerably higher percentage than it is now, I presume. Take the copper industry--its output was going very largely to ammunition cases at that time, and only a very small fraction is going to that use now. If we should get steel shell cases in the next war, you can see immediately that the input-output on the copper industry would be knocked cockeyed. We would not need a couple of million tons of copper for the shell cases if we were making them all out of steel. In those respects, what the boys call a static input-output table--I presume that is what you are thinking of--would not have a very great actual planning use in another war.

The place where it would be of most use would be in the procedure of developing that subject. As nearly as I can make out, there is something like five million dollars worth of work to do on the input-output system in the next five years to make a really highly effective tool of it. It is already a useful tool, which, I dare say, already pays for itself well, but it is at present a half-baked, green prototype of what it may become.

As for the Russian case--and the only way you can tell is by trying, I presume--I would say that if we might hope to have an input-output table with 300 lines and 300 columns for our own country (That is what is being worked on as a dynamic mathematical model. It would not be based on 1944, so you could not interpret it for any other year), we might never get beyond a static model of 30 lines and 30 columns on the Russian economy, for lack of essential data. It may be possible to squeeze the Russian data out far better than that. I cannot tell. There are certain uses for which even a relatively

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crude input-output table on Russia would suffice; for instance, to safeguard us against attributing more than the total Russian steel to the total Russian steel-consuming products, or less than the total Russian steel to the total Russian steel-consuming products.

The input-output table would maximize our intelligence in one constant respect; as soon as you were sure of anything, it would have a reflexive impact upon other things. You would squeeze out precision throughout the table from any increment of precision at any part of the table, to some degree.

QUESTION: Sir, the magazine "U. S. News and World Report" last week had an article which stated that regulations and controls would be imposed within a matter of six hours of commencement of war. I have received the impression throughout this course that the American people would not be receptive to regulation and control such as existed in Britain during the last war. I think that is an underestimate of the American people, personally, but would you give us your views on that, particularly in view of the fact that it is almost inevitable that the country would be subjected to direct enemy action?

DR. PETTEE: The Russian, the Germans, the Italians were all engaged in the Spanish War of 1936, 1937, and 1938; and the Russian, German, and Italian people had no cause to feel completely excited and enthusiastic or desperate about it in any way, shape, or manner. In that kind of situation, I think we would somewhat resist regulation and control. That, of course, would not be the real McCoy. However, if we are in a real, all-out, hot war with Russia, I think the American people will take all regulations we had in the Second World War, and then some, without any quibbles. In fact, I imagine they would rather tend to demand them, and, as often happens, the people can be and might be, on such an occasion, ahead of the Government.

If these regulations are all supposed to go into effect within six hours, there is either an agency in Washington I never heard of or "it ain't so."

QUESTION: Dr. Pettee, is there any method, or can you suggest any method, or system, of logic which will help the military man in reducing the margin of error he makes in his assumptions?

DR. PETTEE: There is a school of thought, or a system of thought, or a subject--whatever you want to call it--called semantics, which is, in my mind, relative to the problem of choosing premises, about comparable to the system known as logic since Aristotle as a means of handling transformations of your data after you have your premises.

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Logic--this may turn out pretty crude, but let me take a fly at it anyhow--is a means of proceeding, after you have chosen your premises, in such a way as to introduce no fresh errors that were not already in the premises. That is all it is, all it ever was, and all it can be. Incidentally, that is all mathematics can do for you. Either of them may eventually, at some point, help you recognize an error, but only if you introduce new data. They never can do it if you don't introduce new data, new observations.

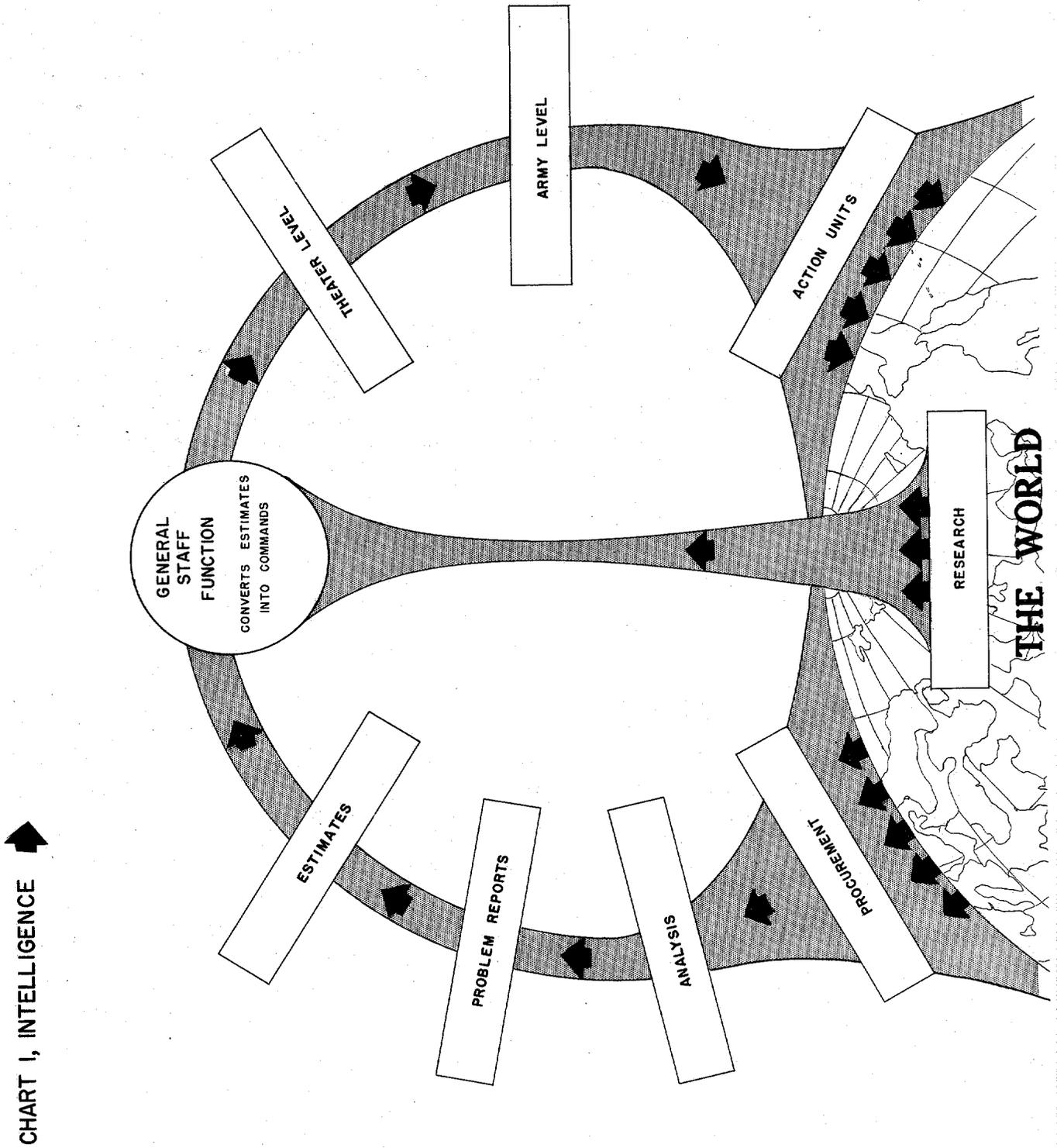
Semantics is interpreted about five different ways by five different books, and the definition of semantics is quite different in each of the books. I am inclined to share the view that it can support the broader definition and that it is the nearest thing to a systematic, established tool by which to approach the analysis of premises, of the intervening processes between the unapproachable external objective world and what percolates through your senses to your mind, in order to locate errors in it, and to learn how to avoid those errors. I might add that Francis Bacon foreshadowed all this. Read Hayakawa's "Language in Action" and then read Francis Bacon, and you will find Bacon had this all clear in his head 300 years ago, and everybody who has read him since has missed it.

QUESTION: I asked that question because I was wondering if we are approaching our military education in the wrong way; whether we should not go back and study philosophy, and so on, instead of continuing what seems to be a trade-school complex.

DR. PETTEE: I don't think so necessarily. Go to the library, look at all the books on philosophy, and consider which ones you would probably be told to read if you took a course in philosophy, and I think, offhand, you would, as in most educations in this world, find that nine-tenths of the things the professor told you to read are not worth reading. Once in a while you stumble on something good. This is not just my observation. "The Education of Henry Adams" and a lot of other highly respected books are saturated with the same feeling. On the other hand, it is always regarded as either funny or "fighting words" if you come out and say it on ordinary occasions.

DR. REICHELLEY: Dr. Pettee, you certainly have given us plenty of your time--Friday and today. I think we should allow you to go back upstairs and go into some mental cogitations for another year. We will be looking forward--at least the faculty will--to being astounded next year. We all appreciate your efforts on behalf of this school.

(11 April 1950--350)S

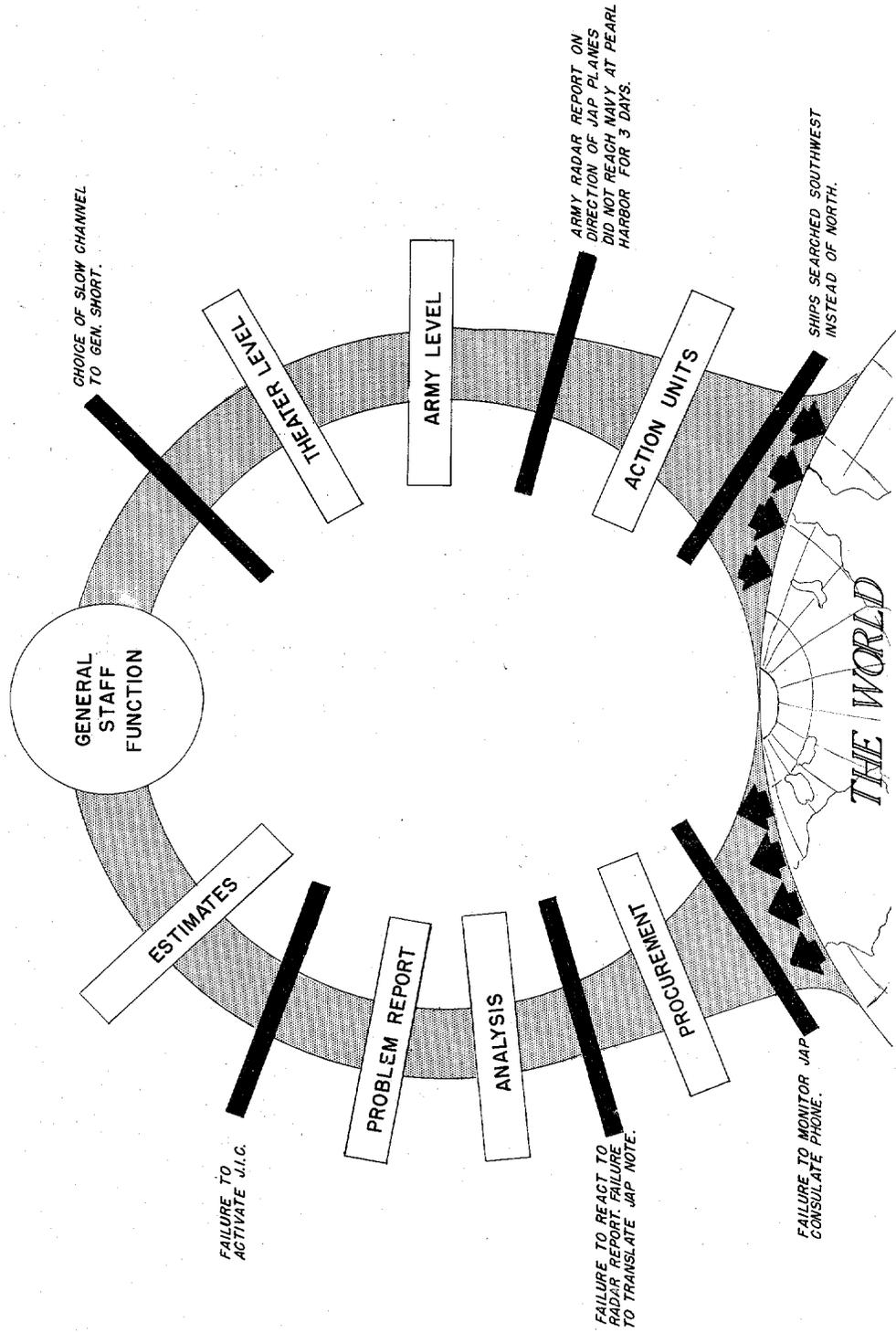


COMMAND & ACTION FLOW



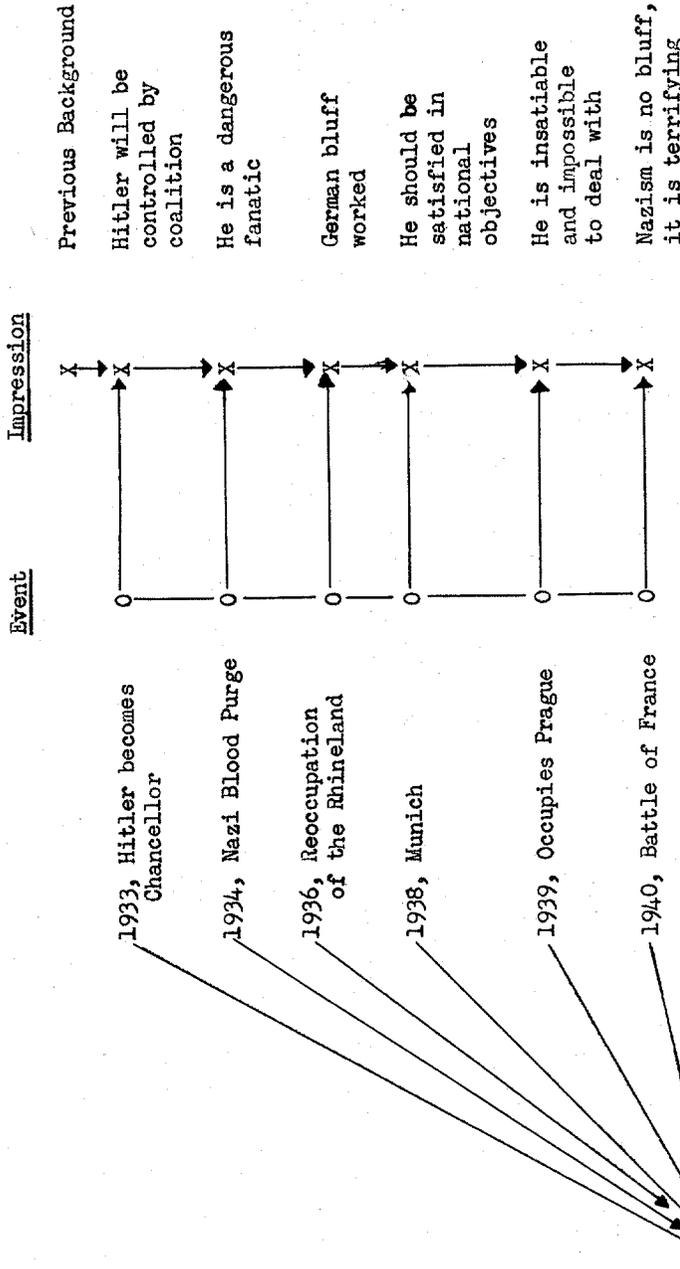
CHART 2. FUNCTIONAL BLOCKAGE OF INTELLIGENCE AND COMMAND AND ACTION, IN PEARL HARBOR CASE

NOTE: THIS IS MEANT TO ILLUSTRATE SPREAD OF FUNCTIONAL BLOCKAGE AROUND THE FUNCTIONAL CYCLE, AND RESULTING FAILURE OF RATIONAL FUNCTION, AS INDICATED IN PUBLIC ACCOUNTS OF PEARL HARBOR SITUATION. IT DOES NOT PRETEND TO BE DEFINITIVE.



INTELLIGENCE FLOW

Chart 3



Key-- O is an event or occurrence

X is an impression or interpretation formed in time sequence, by reaction of fresh event upon previous impressions.

X' is a fresh re-interpretation of all the events, after the last of a series

Note: The suggested series of impressions is not meant to be taken as certainly the correct version of what impressions were dominant. What is claimed is that for any reasonable version it would remain true that X ≠ X'