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PROBLEMS INHERENT IN THE DETERMINATION OF REQUIREMENTS

27 October 1947

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PROBLEMS INHERENT IN THE DETERMINATION OF REQUIREMENTS

27 October 1947

COLCUE NICKELSEN: Gentlemen: In order to get you started on the next part of your course, we are firing the opening gun in the battle of Requirements today. While you have not completed your work in Economic Potential, we feel that you are ready to start thinking about the next subjects. Those of you who are assigned to Requirements will only be expected to do such study, prior to the 10th of November, as will not interfere with completion of your work in Economic Potential. You have already received your curriculum book and information as to your assignment to Requirements or Technological Progress. Your specific assignments in Requirements will be given to you on the completion of the course in Economic Potential. While only one-half of you are assigned to Requirements, it is felt that all of you are interested and want information about this subject. Since you will all attend the lectures and the oral presentations, those of you who are not assigned to Requirements will get as much as it is possible to get, without requiring study time that should be devoted to Technological Progress. These lectures and the oral presentations will cover the salient points of the subject which, with the bibliography of reference material given in the curriculum book, should give you a pretty good background understanding for future use in your careers.

In Requirements, as in most subjects, we find considerable confusion in discussions and questioning of lecturers because of slightly different interpretations of the meanings of terms used. In an attempt to avoid some of this time-wasting confusion, I hope to clarify for our mutual understanding what we mean when we talk about Requirements.

In general acceptance, the term Requirements means: (a) what, (b) how many, and (c) when. This definition is correct but confusion results because each agency, industry and individual interprets it to mean the "what, how many, and when" to fit his particular case at the time he happens to be thinking about it. Discussions, questions, and answers go around in circles resulting in annoying frustration because each of the participants is basing his interpretation on a different premise.

The first objective of economic mobilization is the production of the military end-items, and their maintenance items, necessary to support the war effort. True, this means the quantity and kind of items necessary to be placed in the hands of the using forces when they need them. In order to achieve this objective, maintenance of the civilian economy--at least at the level necessary to insure the required production level--becomes just as important as the production of the military items themselves.

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Political and economic strategy and support of allies may become as important as our own military effort, and hence production for foreign aid, such as lend-lease or economic warfare, may be of as much urgency as production for our own forces.

From the standpoint of economic mobilization, we find it necessary to forecast what these needs are in order that we can take steps to have on hand the required items when they are needed. Lower conclusions are shorter-term forecasts of their needs and expect these needs to be filled from stocks already produced. As a general rule, these shorter-term forecasts arrive too late to permit the delay involved if orders are then placed for the production of the items. In order to differentiate between these two, let us call the first "requirements" and the latter "requisition needs." Requirements are therefore a prediction of requisition needs and provide the lead time necessary to permit the production of the stock that will fill the requisition needs when they appear. My use of the term "lead time" in this particular context accords a little different from the interpretation placed upon that term by a production man. In this case, I am thinking of lead time as the period from the time the military indicates the quantity of it is needed to the time that they are actually produced, not just from the time the order for them is placed on the manufacturer to the time they are produced. Requisition needs, under this understanding, are converted to requirements and when requirements have failed to correctly predict requisition needs. As we progress into a mobilization period, the experience of filling requisition needs will refine itself with the requirements by the accumulation or shortage of stock. For civilian items, it can't be the same view of the term requirements. The requisition need for civilian items is what the trade is trying to buy to meet the demands of the public.

Let me attempt to clear up another point which as it happened was raised by some of you in your questioning on a previous occasion. In the overall requirements we included the forecasts of military requisition needs. Since this is the understanding we have adopted of requirements, it means that the requirements include an estimate of stock required to fit the force to be mobilized. This must be true because it can only be presumed that the military requisition needs will be so balanced since they will be submitted by that force. Consequently in your analysis of methods used to determine requirements you will be expected to evaluate how well the methods under consideration will provide a promptly balanced stock.

Mr. Donald Wilson makes the following statement in his book "Mars and Democracy," (p. 90).

"Mr. Bruce placed special emphasis upon the Industry Committee which had been vital to him in his last war. He thought that Industry

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Committees might be the answer to many of our most worrisome problems. I found out later that he was right, and it was, undoubtedly, too bad that we did not get around to the development of these committees until the WPP was rolling along."

Shortly thereafter in the same part of the book, Mr. Wilson also states:

"The former head of the War Industries Board knew what he was talking about when he expounded the ticklish subject of requirements and declared that they should be centralized in one agency so that soon morning that agency could know just what had been ordered out of the nation's economy. Later on, when I was made head of WPP, I tried persistently to do this, but it was then too late. The program had grown so big that it was completely beyond control."

In another place Mr. Wilson states:

"There was a man who had been all the way through the production end of a great war, and I feel that on this occasion he gave us a precise picture of the essentials needed for coping with our future problems, although, of course, we had a comparable job in a war which was many times bigger than the one in which he served."

Mr. Arug in a Report of the Chairman, WPD, "Our Production Achievements," in speaking of general problems states as follows, (p. 1):

"One of the most difficult, and one that was never fully solved, was to determine exactly what production goals to aim at. As the procurement agencies and the War Production Board gained experience, requirements estimates came closer and closer to the mark, but it was never possible to make an exact science of such calculations, even as applied to military needs. And the extent to which the civilian economy could be sacrificed at the particular points without adversely affecting the war effort could not be precisely calculated; it had to be determined by trial and error."

These quotations give the views of three men who certainly were in position to appreciate the importance of knowing the over-all requirements if they were to effectively fulfill their responsibility of insuring the production necessary to the war effort. Let me indicate certain things about the requirements that they were talking about:

a. If adjustment to productive capacity was to be quickly and efficiently implemented, then the amount of capacity, the possibility and rate of expansion of such capacity, or any other adjustment in the industry could best be gleaned from a representative group from the industry concerned, such as an industry advisory committee.

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b. These men were interested in the over-all demand on an industry basis so they could match production rates to demand rates. They were interested in requirements in these terms because that was how they could make use of them at their staff level.

c. The requirements that wanted had to be more than an summarization of quantities of end-items on a time schedule. They needed requirements broken down into industry or commodity loads, such as steel production, bearings, rolled brass strap, castings, etc. In other words broken down into loads on the final fabricating industries and the supporting industries. This meant requirements had to take peculiarities of the two industries concerned.

d. They were speaking of requirements in a war mobilization context.

Considering requirements from the viewpoint of these men, Mr. Krug makes an interesting observation. Let me repeat this part of his quotation: "—estimates can closer and closer to the mark, but it was never possible to 'fix' an exact science of such calculations." This indicates that accuracy was of course striven for but these calculations were nevertheless considered to be estimates, with all that the word implies. The necessity for a definite answer was paramount to an exact accuracy.

The point I am trying to emphasize by these quotations is that in selecting a method to use in determining requirements we must look first at what kind of requirements we want and then select a method that will come most closely to giving us those results. Three fundamental considerations appear to be:

a. Time--The requirements are to be used for what purpose.

 Peace procurement
 Mobilization planning
 War mobilization

b. Place--The requirements are to be used at what staff or agency level.

c. Item--The requirements are for what kind of an item.

I have analyzed the requirements that are interested in at the moment in accordance with these three considerations. The rank decisions go to the allowable length of time for the computations, the degree of accuracy, and the peculiarities of the item or industry concerned. The salient result of this reasoning is that we must drop "try" and "approximate" in our concept of requirements. There is no "exact" method of determining

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requirements that is good for all purposes. In spite of the great volumes of talk for standardization, mergers, unification, and what not, we must accept the idea that each method must be tailored to produce the result desired. In peacetime procurement, accuracy and fiscal considerations become the guiding light. In mobilization planning and war mobilization, the length of time to get the final result becomes very important.

For the purpose of further classifying of the atmosphere let us consider a question that is often asked:

"Does a requirement that is not filled cease to be a requirement?"

When this question is asked it is not done so with the differentiation we have made between requirements and requisition needs; so, let's take it up under those two headings, but, for simplification's sake, stick to the military version only.

a. Requisition needs--requisition need that has not been filled upon presentation at the proper point. This level produces a command decision based on stocks available, or obtainable, and justification of need, presumably taking into consideration operational plans. If the need is approved through the channel of command, subject of distribution of stock is sure until demand filled; steps will then be taken to increase the requirements to make up the deficit, if necessary. If the stock can not be made available by any means, then, certainly, the command channel at some point will be forced to take appropriate action which may involve substitution, changing the operational plan, or disregarding the requirement.

b. Requirements.--The other situation is requirements which has been cut or disapproved. In this case we must remember it is a forecast built up by some responsible agency and every one has some doubt as to the absolute accuracy, including the factor of safety that has been included. By means of having claimant agencies meet together and review their claims and possible production capabilities it is usually possible to set an adjustment that would satisfy the needs. To measure the feelings of those concerned, the unfilled balance was usually deferred and, as time passed, actual consumption gave a basis for corrected requirements. If no such solution could be found, recourse could only be had to changes in plans, providing for substitutions or command decisions requiring the responsible service to cut back its requirements and proceeding in spite of the shortage.

The net result of this is, as you have found in your experience, that there is no categorical answer to the question propounded. Each case is decided on its merits, taking into consideration the circumstances of the time, the place, and the item.

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So far I have only attempted to lay down a common ground on which to base our discussions. The problems to be encountered, after having accepted this common ground, are many and varied. These problems differ for each time, for each staff or agency level, and for each item.

Considering purely peacetime procurement, our military expenditures are such a small proportion of the country's over-all production that little consideration is given to its effect. In general, no stocks are held of basic raw materials, contributory materials, or productive capacity. A short term force situation or issue experience and expected issue needs of the using service and adjusted to fiscal resources, determines the procurement instructions issued to the procurement offices of the procuring services. These are the military requirements that are passed on industry. Long-term requirements are built up by each procurement service for budgetary purposes, each according to its own methods and controls. These requirements do not become a load on industry until converted into the short-term forecasts.

Considerable thought has been paid to what is given to stabilizing factors of determination in peacetime that will be similar to the manner that is to be used in wartime in order that the system can be more quickly and easily expanded in wartime, as well as to avoid the necessity of sudden change ever during such "difficult" circumstances as the transition period. It is felt to give lip-service to this is futile; but now practical and feasible it is, with the necessary political and budgetary limitations both on personnel and procurement, as matter still unclear. It will be interesting to see what you feel to be feasible by your students and questioner of the speakers and senior advisers you bring before me.

Mobilization planning requirements have one feature that I think is well. We can throw the ubiquitous pocketbook out of the window and determine our requirements as we think they should be determined, without regard to the cost in terms of dollars and cents. To so require would be based on certain plans and one should be careful in talking of these, as to whom one refers to. These are general mobilization plans or specific mobilization plans. Specific mobilization plans--often referred to as color plans--in general are more limited, or at least assume certain specific conditions to be taken into account. A general mobilization plan envisages a maximum effort both in force and time schedule. In such planning, there is always an "if and when," which refers to the requirements for forecasting for an indefinite time without any certainty of stability of the factors used in the determination. All the elements affecting production that have been experienced in wartime, as well as any new elements introduced by changes in technology, political considerations, availability of resources or war concepts, should be taken into

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account in such computations. The introduction of civilian, foreign-and-economic-warfare requirements has involved us in considerations that we are not even certain should be military responsibilities. To find, however, a general acceptance that mobilization planning is not very effective unless these latter are included. Provision for transition from peacetime methods to wartime methods should also be included as you will find in your study of World War II experience that this was a most critical period as many were confused as to when and how to "shift gears." The creeping "W-day," a failure to "start the" mobilization Plan," and the use of piecemeal adjustments is a situation that should be avoided if at all possible, in the future, by mobilization planners; but the selection of a method of determining requirements should be so designed as to work through these hazards even though they do occur again. Another salient feature of mobilization requirements that is often overlooked is that at the best they are only used to start programs and that in a civil-war mobilization period corrections to fit known facts are made as quickly as they can be assimilated. With the vast experience we have had in regard to the length of time it has taken to develop military requirements for such plans, it is easily seen that speed of arriving at a result is a most important consideration.

In a war mobilization, requirements involve both long-and short-term forecasting. A plan based upon the known specific conditions of the time is evolved. Programs are built up based on the needs of this plan and productive capacity that is or can be made available. Requirements are determined on the basis of these programs and adjusted to productive capacity at various staff levels. Finally, claim agencies will coordinate their needs with one another and the over-all productive capacity at the top level. Programs must be adjusted as necessary to fit the requirements that can be filled and even strategic plans may have to be modified to fit the adjusted programs. The approved plans become the basis for allocation of resources and productive capacity. Civilian, foreign-and, and economic-warfare programs must be included. A breakdown of end-items to basic raw materials and contributory materials must also be included. Speed of decision is a prime requisite. Practice tells all industry is hovering on the door of every government office and agency waiting to know what they can make that will be considered an essential product in the war effort. They want this information so that their particular industry. Failure to tell them and to give them orders just delays the production for the war effort and has a deleterious effect on civilian morale. These orders cannot be efficiently distributed until the requirements have been worked up or the Mobilization Plan is written. It's been accepted as a starting point. The resulting requirements become the long-term forecasts and are converted to short-term forecasts for military items by procurement institutions before procurement agencies. Civilian short-term requirements come through buying demands from the normal trade channels but are kept in accord with the long-term forecasts.

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by means of allocations and rationing. For example, economic warfare, and such needs are handled in the same manner as military needs, sometimes, but not always, by the same responsible services. If conditions are such that the mobilization Plan is implemented these same processes become necessary to adjust the Plan to the known conditions. The outcome of the Mobilisation Plan is the saving of time in the start-up of production. Adjustment is necessary, but it is not conceivable that any forecast, especially one determined under the conditions of a mobilization plan, could be accurate enough to not need adjustment when it falls into the category of "short-term forecast". Changes can only be expected to be the rule rather than the exception in the volatile course of a war period. The only alleviation of the problems of war production requires that as be exerted by the requirements people is to pass as correctly as is humanly possible in the first place and to suffer the effects of a plan to last only one.

Requirements must serve certain purposes to be stiff at agency level, hence the st. ds sol et a must be followed to get results that are applicable. Our military requirements have been started at the technical bureau or service level. In so very as I have explained for the various "times" but end up in the last analysis in procurement instructions. At this level must be known, in writing, the amount of allocated material that will be used when and where placed. Orders must be placed in definite amounts for the vast numbers of different items to which each service bears responsibility. Order initiation must be maintained between items that must be delivered together and maintenance items must follow in accordance with the needs of items produced and in use. Requirements for contributory material must match the requirements of the end-items. This means an exact count-out, in the earliest or gear for checking the need for adjustment, on a wide variety of items. In these requirements are computed an exact quantity as it really will be, or practice, the in system of prediction at a rate per period which will give the quantities determined nearest to the time schedule desired. In practice this idea is usually left entirely to the producer by the time's military and the contract. In civilian items the responsible agency can and check their purchasing controls against inventory balances in the commercial trade establishments, but they will have plenty of complaints from sources that will serve as guides to their investigations. Looking at requirements in this light, accuracy to the last decimal place in estimators loses its importance. I guess that is correct as to the order of magnitude for the item is sufficient. This is more nearly true for the long-term forecasts since they are only "guiding figures" to be used by the ordering time committees.

A supervisor; st. ds section such as DCIO for logistics or SSP will have stiff supervision and formulate policies but have little to do with the requirements themselves, except to see that the program is progressing satisfactorily. Checks may be run on certain items by such means as the

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Supply Central System to insure the meeting of programs, but the actual determinations are made at the service or bureau level. As these are only checks, accuracy is only expected within an allowable percentage degree and insistence on the last decimal point becomes meaningless.

The Munitions Board coordinates the claims of the military services. In World War II the Board stepped out of the picture, and let the military services go as claimants before the FB Committees. The net result is that the Munitions Board did not compute or need requirements. Whether it will not in the event of another war period is not known and is considered in its present reorganization. It is apparent from the wording of the law that it will have coordination of mobilization plans requirements of the military services. In peacetime procurement the Board has definite responsibilities with regard to procurement assignment, but it is doubted that this will have to do with requirements except in some unusual circumstances.

The top level depends on the military services to keep their short-term forecasts up to date, costs and production rates in line with approved programs. Hence the interest at this level is in the long-term forecasts upon which programs, allocations, and rationing are based. At this level military end-items allow themselves to a certain extent their own fate since control of production is exercised through the allocation of raw and contributory materials. Therefore the claimant agencies were principally interested in obtaining the allocation of such materials as would insure the production of the end-items that their service and theater need as necessary. End-item requirements had to be adjusted to fit the allocation of materials to services obtained at this top level. Claimant agencies come to an agreement or are forced to accept a decision which will determine the program and allocations. The responsibility was a poor one because to be reasonably right and responsible in its timetable in its discussions. If it fails in either, changes will occur personnel-wise to correct the situation.

Now we come to the area. Requirements people are faced with a Herculean task when it becomes necessary to consider the myriad factors that must be taken into consideration. By assignment of procurement responsibility this is broken into segments, but these segments overlap at many points because of their mutual dependence on raw and contributory materials. Whether to provide for this overlap at each staff or agency level or from top side becomes a hot point. In the main the efficiency with which this problem is solved will determine the success of the production program. Each item has its particular peculiarities and impediments. A method that permits time difficulties to delay answers will cause unit inefficiency. A system that will give a quick answer, that takes into consideration the peculiarities of the item and is reasonably correct,

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will permit production to start or be adjusted, where s, a selected service, is neither nor correct as when it comes, he is already caused an unfavorable delay. By peculiarity's of the item, I do such things as I intend to determine how much termination of a certain kind to a "first option button, which we may, if we like to, do without.

This discussion is been moderately kept in the zone of broad aspects. Later lectures and seminars will take up more particulars, including contractor materials, service requirements and foreign-like requirements. This discussion is intended to give us this moderate idea which to consider requirements and to impress the point that each stand discussed should be first definitely placed as to time, place, the item.

QUESTION: I remember, according to Donald Nelson's Book, that just before he finally left, there was a big fight, which he describes, I believe as being between PB and the Army, with the Army wanting PB to control only materials and PB wanting to control both materials and end-items. Could you throw a little more light on that?

COLONEL WICKES: I'll tell you a little out of my own now. Colonel Neis, do you know about that?

COLONEL NEIS: I don't believe I can add any clarification to that.

COLONEL WICKES: You will find a very good answer in Secretary Forrestal's statement before the congressional committee. In that statement he clarified the point that the difference between Mr. Neis and the services was not so much of who ought to run war, but an honest difference of opinion; that they were trying to live together and figure out how to do the job in the best way; that the services were not attempting to take control away from the civilians, but that the services, as soon as their entire program planning had been completed since the war--had emphasized the point that control should be reserved by the civilians and that they wanted the civilians to retain the control of the responsibility.

QUESTION: The statement I referred to was not made immediately before he left, there was somewhat of a delay. At the time, he fired his principal assistant, who had been keeping the raw-material side in line and the pricing of the Army and the Navy; and he maintained control under Mr. Nelson. Then, very shortly after that, this same question came up again--and he went to China!

COLONEL EVERETT: It might help the Captain to read the testimony of Donald Nelson before the committee that was investigating the Birch statement. Nelson was the last witness on Thursday afternoon, and his testimony was very short; but it did emphasize his thorough belief on

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conviction that WPB, or whatever agency has top control, must retain the priorities control of materials. That seems to be contrary to the impression you apparently got from the book. I suggest you read that testimony.

COPYRIGHT OF QUESTIONER: I didn't get the impression that he wasn't in favor of controlling materials; he favored both controls. He was trying to get control of materials and regulate them in the Controlled Materials Plan which he already had. He wanted to superimpose upon that a control of end-items--valves, let us say, that could be used, for example, in making rubber or high octane gas, and so forth. He wanted to keep tight controls on that, whereas the services, particularly the Army wanted WPB to have control of materials only. According to Donald Olson the Army insisted that it should determine the use of the components made from the materials allocated to the Army.

COLONEL WEAVER: For his later thinking, I suggest you read his testimony.

FURTHER COMMENT OF QUESTIONER: In the papers the other day, there was mention of the testimony of Mr. Beruch to the effect that he had been offered the chairmanship of WPB in 1943, I believe it was, but that he was taken sick, and about ten days later the President changed his mind. It may be that even a slight thing like an illness caused a shift at that time. I don't know.

'COLONEL NEIS: Colonel Nickelsen, both the Army and the Navy wholeheartedly subscribed to the scheduling program on valves and other vital end-items of that nature. They were thoroughly in agreement in respect to the Controlled Materials Plan which preceded the scheduling plan. Initially there was a considerable amount of trouble. The rubber coordinator, and the fuels coordinator, and the synthetic gasoline group were all bidding for valves. That interfered with the destroyer program and the landing-craft program. They saw the fallacy of each of the groups trying to get production on those various components, and, voluntarily, they went to the War Production Board and asked them to provide limited control of scheduling on more or less the vitally required end-items.

I think the Captain has gotten the wrong impression if the book has indicated to him that the Army and Navy were not wholeheartedly behind the scheduling program. They really were behind it.

QUESTION: Sir, one of your statements left a slight question in my mind. I raise this point at the dread risk of being considered sympathetic to the Bureau of the Budget. Nevertheless, the thought of tossing all considerations of cost out the window raises a question in my mind, and I wonder if you might not elaborate on it.

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Realizing fully that the main objective is to win a war regardless of the cost, we might anticipate--win in these great United States--that at some time we might have to give some consideration to costs. I feel reasonably sure that our British cousins will do some of that in this post-war. We also might face that proposition to some time.

COLONEL MICKELSON. The first thing we must do is place the "time." We are talking about mobilization plan only. That is where the start to cost was made. In a general mobilization plan where we are considering maximum effort in the shortest time possible, you will, it seems, the first purpose is to determine how great a maximum effort can be obtained and then it's adjust that plan to the forces necessary to win a particular war in which we might be involved. What I mean when I say that is that disregard dollars and cents is just as such a plan we consider a maximum effort only in terms of available resources, available manpower, and the available productive capacity to put that maximum effort. We don't intend to buy too much material. Consequently, we are not spending anything and we don't have to finance it with money or costs. Then the war comes and we have very definite limitations, we'll put adjustments in our plan to suit the circumstances at that time. This is where I spend the money, not when we are planning the planning.

COMMITTEE MEMBERSHIP. The plan might be placed, I think, at that subsequent time when we have to spend the money.

COLONEL TOMASI. That is true. That emphasizes the point of the attempted to make; that is, a mobilization plan, planned in case of war mobilization, can never be anything more than a starting place that we immediately begin to adjust with the actual current one at hand.

QUESTION. Colonel, I have heard what might be termed "off the cuff" estimates that the amount of wasteage caused by inefficient time requirements was probably 20 percent of the total cost of the war, or, say, 10 billion dollars. I would like to ask whether there has been a research in that subject and what the answer was.

COLONEL MICKELSON: Yes, I think Congress has attempted to do such a search. I can't recall the specific references. But there has been considerable comment from time to time as to the amount of supplies we carried the war with. As a planner, I have never been able to figure out how to end the war with zero property in hand. I don't consider it's just because material we have on hand in the various theaters of war for which we have very little use now. I think it took your question pertaining to transportation at some time during the period of the war.

RESPONSE: That's right.

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COLONEL MICHAELSEN: I know of no specific instance of that; perhaps someone else here does. But if you see stocks building up as you do long, you can cut back the production rate and absorb the stocks on hand. With the control and with the impossibility of getting more production than is needed right up to the end of the war, I don't think we have any appreciable amount of overproduction.

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