THE APPLICATION OF ELECTRONIC COMPUTERS TO MILITARY OPERATIONS

10 April 1956

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General Edwin William Rawlings, USAF, Commanding General, Air Materiel Command, was born in Milroy, Minnesota, 11 September 1904. He was graduated from Hamline University at St. Paul, Minnesota, with a B.A. in 1927. He was appointed a flying cadet on 19 February 1929, and was commissioned a second Lieutenant in the Air Corps of the Officers' Reserve on 15 February 1930. On 8 May 1930, he was appointed a second lieutenant in the Air Corps of the Regular Army. After various duties at air bases in Hawaii and in Texas he was assigned to Wright Field, Dayton, Ohio, in September 1935 and became assistant chief of the Administration Branch in the Field Service Section, Materiel Division. In August 1937, he enrolled in the Harvard Graduate School of Business Administration, completing his studies there in June 1939. He spent the following four years at Wright Field, serving as assistant budget officer of the Statistical Branch Air Corps Materiel Division; assistant budget officer of the Materiel Center; and chief of the Production Resources Section, Production Division. Still at Wright Field, in October 1943 he was named administrator of the Aircraft Scheduling Unit in the Office of the Assistant Chief of Air Staff for Materiel, Maintenance, and Distribution for the Air Force. A year later he was given additional duty as chief of the Readjustment Division of the Air Technical Service Command there, and on 30 August 1945, he was appointed chief of the Procurement Division ATSC. The following January he was named Special Assistant to the Commanding General of the Air Materiel Command there. In June 1945, he received the degree of Doctor of Business Administration from Hamline University. He was assigned to Air Force headquarters in Washington, D. C., on 1 November 1946, and was designated Air Comptroller. He was redesignated Comptroller of the U. S. Air Force in September 1947, and two years later his title was changed to Deputy Chief of Staff, Comptroller. On 28 July 1951, General Rawlings assumed command of the Air Materiel Command at Wright-Patterson Air Force Base. This is his first lecture at the Industrial College.

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GENERAL HOLLIS: Gentlemen: The subject that we are going to discuss this morning is one that has been touched upon, and only touched upon, by previous lecturers during the course.

I am delighted that we are to have a full fifty minutes devoted to the future of electronic computers in logistic systems in the military service. I think they have a tremendous future.

Today we have one of the foremost authorities on the subject in the Armed Forces, an officer with prodigious logistic responsibilities of his own, the Commander of the Air Materiel Command, General Edwin W. Rawlings. It is a great pleasure to introduce him to this audience.

General Rawlings.

GENERAL RAWLINGS: Thank you, General Hollis. Well I can see that I miscalculated a little bit here, with all the visitors we have around us. I suppose that some of you will be disappointed because you either will hear substantially the same talk this afternoon over at the Department of Defense, where they have asked me to take part in a symposium, or you have already heard me when I gave a talk very similar to this before the American Management Association in New York recently.

In any event, I am very pleased and happy to be with you here at the Armed Forces Industrial College. Your work here, it seems to me, is an embodiment of that partnership between the military services and industry which is the foundation stone of our national security. Such teamwork which has made American airpower possible is a basic premise of your curricula, and your studies broaden and deepen the constructive mutual understanding essential to a winning combination.

This is a particularly heartening atmosphere to one concerned, as I am, with Air Force logistics, for today, more than ever before

in history, the combat readiness of our Air Force in a threatening era is dependent upon the responsiveness of its logistical support, upon the effectiveness of the teamwork behind the striking power.

Should an enemy attack this country tomorrow, the decisive phase of the war would probably be numbered in days and weeks. Prior to that critical period, the combat potential of the United States Air Force must be ready for the task assigned. Its rapid employment will be directly proportioned to the speed and the flexibility of the logistic system that is supporting it.

The development of practical atomic and hydrogen weapons has imposed upon the Air Force the necessity for a kind of reflex logistics, as quick and as precisely directed as the interplay of impulse and response between nerve and muscle. To be effective in support of modern weapons and strategies, our logistical reaction time must be measured in hours--not in days--not in months.

This is the objective of our logistical management in the Air Materiel Command. General Hollis has asked me to tell you today something about one important new approach which we are making to this objective--electronic computers.

We believe that these systems offer great promise of stimulating many vital areas within our support cycle for greater speed and flexibility of response. It is interesting to note, incidentally, that our whole experience to date in phasing electronic data-processing equipment into our logistical system has been an outstanding example of teamwork. Whatever progress we have made in the Air Materiel Command is the result of the joint efforts and contributions of a great many people, both in and out of Government, to whom we are much indebted.

They are, first of all, the creators of the system, most of whom have given us a degree of cooperation far beyond the dollars and cents limits of our contracts with them. Companies like International Business Machine and Sperry Rand have contributed notably in research and production resources and in helping to adapt our operations and our people to these systems. Expert consultants, like Dr. Aiken of Harvard, Dr. Sam Alexander of the Bureau of Standards, Dr. Hurd Good of the University of Michigan, and the Sunderland Company, have put their knowledge and their experience at out disposal. Government agencies, like the National Bureau of Standards, are now helping us with the major problem of personnel training, and on this major problem they give us the benefit of their specialized talent. Much credit

is also due to the civilians in business and industry, too numerous to mention, who, as fellow pioneers with these equipments, have generously shared their experience with us and allowed us to learn from their mistakes and inspirations, as well as from our own.

In return, I believe it can be fairly said that the Air Force interest, in actual financial investments in the development of electronic computers, has been one of the important factors in their rapid development in this country. In 1948--I happened to be the comptroller, so I was able to do it--the Air Force provided funds to Mockley Eckert through the Bureau of Standards for the development of the forerunner of the Univac system in this country. The Air Force has today one of the most extensive programs for the development and application of this type of equipment. The interservice-industry partnership in this case has been instrumental in producing not only a major logistical tool but also a prime moving force for the lasting enrichment of our peacetime economy.

Now, I think some brief preliminary explanation of the size, nature and basic imperatives of the Air Force logistic job is probably necessary here today for your understanding of why electronic systems are vital to our Air Force logistic operations, and then how we are applying them.

Our Air Materiel Command, as you know, largely concentrates all of the logistics activities of the Air Force. This is one of 17 commands of the Air Force. It is charged with worldwide logistics responsibility for the entire Air Force. We buy, supply, and maintain all new Air Force equipment, with very few exceptions. The operating commands, including the combat forces, such as Strategic Air Command, Air Defense Command, SAC, et cetera, are our customers. Also, we work very closely with industry, and our operations in a number of respects parallel those of a civilian business, greatly magnified, but with some very significant differences. In fact, we have often been called the biggest business in the world.

Our assets, public assets held in trust by us, total approximately 36 billion dollars. Actual expenditures for Air Force aircraft and related equipment during the past fiscal year totaled a little more than 11 billion dollars. Of course the dollar figures are not the only big ones in our operation, but they are reflective of the size. Our inventories, for which we are responsible include about a million and a

quarter items, separately defined, and during 1955 our depot system processed something more than 41.5 million individual items and about 4.5 million tons of equipment for our air bases around the world.

Our whole command, which since January of this year has included major overseas depot facilities in England, France, Spain, French Morocco, and Japan and the Philippine Islands, as well as 15 depots and various other units within the United States, is manned by about 225,000 people, military and civilian, but substantially civilian. We enjoy the unique and sometimes confusing distinction of supplying and servicing air supplies in a dozen different languages under the MDA program.

Now, this entire organization is directed toward one purpose--the D-day readiness of the United States Air Force. That is why we are in business. We must have at all times a ready-to-go airpower to defend ourselves in the event of attack and to strike back immediately, and we must be able to support that airpower unfailingly during the crucial opening phase of any war that might be thrust upon us. The massive destructive force of thermonuclear weapons, coupled with the development of long-range supersonic bombers and guided missiles which can deliver such destruction, certainly has radically altered the meaning of preparedness.

In World War II, as you all know so well, we could and we did buy the time for preparation. I don't believe we can do it in a future war. We would have to fight it and win it with the weapons which are in our hands when it hits, before the enemy can blast at the root, the sources, of our fighting strength.

Logically, this means that the Air Force must develop supply and support operations of unprecedented speed and flexibility. We must cut drastically the lead time between fighting units needing and having necessary equipment and supplies. The complex nature of modern weapon systems and the worldwide scope of the Free World's air defenses both tend to make the logistic system massive and sluggish. Yet, if it is to be effective in accomplishing this sole objective of reflex support for the lightning strategies of modern air force, we must reverse this tendency. We must create and maintain a logistical system consonant with the speed and the mobility of our air weapons of today and of the future.

As long ago as 1948 we began to realize that electronics might be a master key to speed and precision in such a logistical system. By that time it was apparent that air logistics were already seriously limiting the flexibility of evolving supersonic airpower. In World War II we supported airpower by stockpiling. That expedient was rendered impractical for the most part by the increasing complexity and the cost of postwar air materiel and by its rapid rate of obsolescence, also by the necessity for maintaining an air alert along a worldwide front for a cold war of indefinite duration. Our planes were already nudging the sound barrier, but our logistics were straining along behind them, somewhat like the old overloaded Stanley Steamer. We could not support a fighting force with the same speed with which we could thrust it initially against an enemy, and our total effectiveness could be realistically measured only in terms of the lowest common denominator.

During World War II, for us in the Air Force, the average lapse of time between requisitioning and receiving an item of supply in an overseas base was something on the order of 5-1/2 months. The actual movement, the transport, of the materiel accounted for only about 20 percent of this time, and the rest of the time was consumed in the processing of paperwork data, data essential to the procurement of the right kind and amount of material and the control of it within a worldwide supply system.

That ratio is substantially the same today. Airlift can help us to reduce the transport part of the supply cycle, and we have been developing our air-transport capability steadily within the past five years, but still this is only 20 percent of the time job. On the big 80 percent paperwork area, only a powerful and broadly effective new stimulus can offer us any real hope. It seems to me that in this area a real hope does lie.

To the Air Materiel Command, the advent of electronic systems was a little like a glimpse of the Northwest Passage. We needed it badly; we knew where we wanted it to take us. We did not, and we still do not, know, certainly just how close to our goal it can bring us, but we already have solid evidence that the direction is right.

I need hardly express to you the paramount importance of sound data processing to this mission of ours. We must order great quantities of complex equipment, some of it as much as five to seven years in advance of its actual usage. We must estimate in terms of specific

items and equipment total cost the materiel requirements for keeping our Air Force combat ready in flying trim all over the world. We must maintain effective control over a vast and constantly shifting inventory which is spread about the globe. Some 350 recurring reports--I am sorry there are so many, because we have been working like hell to cut them down--are required to cover every phase of operations from industrial mobilization to surplus disposal. They flow through our headquarters regularly. They represent the apex of a veritable mountain of data compiled throughout our decentralized organization. They are the primary bases upon which we must make our management decisions concerning what and how much to buy, what assistance industry may need to produce it, how long it will last, how it must be packaged, stored, and transported, and what facilities will be required for servicing it.

They are a major factor in determining the real responsiveness of our support to the D-day readiness requirements of our customers. In view of the vital role which data processing plays in our operations, we have had a two-prong program for the use of electronic systems from the very beginning of our investment in them. One part of the program is designed to utilize the equipment as soon as possible to help us with our current problems, the problems we face today. In the other phase of the program, we are taking a broad look at our entire system to see whether substantial changes should not be made which will permit the fullest utilization of the potential of these equipments. In this phase we hope eventually to augment our electronic capabilities by the use of the new and powerful mathematical and statistical tools, such as the operations research and linear programming, which are now being adapted to business-type problems.

We have by now waded fairly well into the first and the immediate phase of this program. Our Univac at Headquarters AMC has been in operation for almost two years. From it and the IBM 702 installed more recently at our Air Materiel Area Headquarters at Oklahoma City we are getting valuable results within an ever widening perimeter. We have already used these systems for budget computation, requirements computation, the application of actuarial techniques for casting engine removals for overhaul, spare parts procurement analyses, engine and airframe spare-parts management studies, and many others.

By the end of this year five additional computers will be installed at other depots within the United States. Each of our remaining depots will be provided time on these equipments to test applications peculiar to their own responsibilities. In other words, we are going to use some cross-servicing between our depots to learn about these equipments.

All of our 15 United States depots, which represent the 15 decentralized management centers of the Air Materiel Command, are charged with studying specific applications for electronic data processing equipment which will improve our total support capability, and in so doing effect better management and more economical operation.

Our primary objective all the way through this task is increased responsiveness of the system to demand--the right thing at the right place at the right time. The experience gained from these seven computers will give us a basis for determining what additional computers, if any, will be warranted for an integrated system. In addition to the large computers already installed and on order, we are rapidly phasing in some smaller equipment, such as the IBM 650, at most of our depots. In some of these installations they serve primarily to supplement our conventional punch-card equipment. In other places they will probably be subordinate auxiliary equipment to the larger capacity computers.

In acquiring our computers, we have used a definite policy of utilizing the equipment of more than one manufacturer, and on a rental basis. We realize that this presents initial difficulties and complicates the exchange of data and machine programs between installations. We feel, however, that this is more than offset by keeping more than one manufacturer interested in our problems. There is nothing like competition. It always generates improved equipment. This is a factor in our decision to lease it, since we are going through this period of very rapid development.

The very rapid evolution of Air Force weapons and strategies has impressed upon us indelibly the importance of looking ahead. Computer applications, which seem almost miraculous today, will in five or ten years have become only bad habits if we permit them to become deeply entrenched standouts against progress. The temptation is very strong, particularly with these costly equipments, which are always at a premium, to make them pay off as soon as possible in terms of immediate output. Of course we all have to realize some steady amortization of this investment, but we are convinced that we must also make definite provision for the growth factor in electronic management. We must provide time and facilities for planning and the accumulation of research experience which will show us the way to new fundamental principles in the optimum use of this moving force.

This second phase, the longer range effort of our development program, is also fairly well launched. While some of this work is going on at our depots, the bulk of the effort is concentrated at our headquarters in Dayton and in the Rand Corporation Research Organization, a research organization which has been of much assistance to us in the past. Rand has established an active, full-time logistics group which is studying completely new concepts of logistics for us. Their programming techniques are being attempted to determine optimum policies and actions. Mathematical models are being formulated to test alternative systems. Probability analysis is being used to attempt to forecast demand. Automatic data processing is being studied to permit completely automatic handling of data following their initial insertion into the system.

These are only a few of many promising long-range studies currently under way.

At AMC Headquarters we have established a five-year development program for the utilization of electronic data-processing equipment. This is cheap and is monitored by a special division of our controller activity. Planning includes every foreseeable factor we can come up with from the organization of command and evolving capabilities of the equipment, for our personnel training, et cetera. We have also recently established a logistics-system advisory committee, which is responsible directly to me, for recommending appropriate command action in matters pertaining to logistics-system research, and planning and integration of new methods into our current operation.

Although we are well into this double-barreled program, the problems still before us are many. Electronic computers are not the panacea they have sometimes been pictured to be in the over-simplified good old American faith in the machine. There is gold in those hills, but it is not lying around on the surface to be picked up merely for the price of a computer.

I am sure the problems we have encountered are undoubtedly more or less common to most organizations that are pioneering this new type of equipment. It won't think for you. You have got to do the thinking.

First, of course, we have a critical manpower problem in finding, training, and then keeping personnel qualified to use and to develop

this equipment. After a year and one-half of active operation, our logistical processing development activities are still only about 60 percent manned. And this is in spite of the extensive and varied training programs on which we have had help under way on the outside. Many of our earlier people were trained by the manufacturers of this equipment. The National Bureau of Standards is under contract to us to train middle-management personnel and instructors who can pass on the necessary skills to others in our present work force. We are contracting with civilian educational institutions to train officer personnel in this new Air Force specialty.

Now, in one very major respect we have altered our earlier thinking on this personnel problem, and I think we are at variance with some of the acknowledged authorities. The crippling shortages of highly trained specialists have forced us to turn to the training of our own people to a greater development than at first seemed feasible. Our experience has shown that the results are generally encouraging, where a careful preliminary selection is made. I think this helps us later on in insuring that our people will not be displaced from the job.

Secondly, we are discovering these are computers, not compensators. Essentially rigid systems, they can be only as accurate as the data fed into them. If the data are incorrect, all the machines can do is arrive at a wrong answer many times faster than would a clerical force or a punch-card operation. You may laugh at that, but it is not purely a negative quality when speed is of the essence. It is probably better to discover a weak spot in a matter of hours than have it emerge after days or weeks of manpower expenditures, because, unfortunately, we are all working with the same basic data. I think we forget that sometimes. But, to rely on the system to winnow the wheat from the chaff in this manner certainly dissipates the advantages which it offers and negates its real capacities.

We have found data discipline, cleaning up the approaches to the machine, to be one of our major problems. I think that, in the rush to utilize this sort of equipment, some users have been unduly disillusioned concerning the capabilities of the machines themselves. They underestimate the amount and importance of the groundwork which must be laid, and the resulting disappointments tends to warp their appraisal of the systems themselves.

Most of us have been forced to sober reassessment of this factor in the early stages of our experience with electronic computers. In

our Air Materiel Command we are strongly emphasizing data discipline, precision in the preparation and transmission of data, the realinement of electric systems for easy transition to electronic processing, the elimination of inactive items and inaccuracy from our master files. This is slow, slogging work, but without it a system of great potentialities can be completely compromised, and this is especially true in a large scale, decentralized operation such as our Air Force logistical system.

It has been very heartening to discover, however, that once we do establish sound data discipline, we have already taken a big forward step in improved management. As some of our people have expressed it, when you have the necessary preliminary work done, things begin moving along so much better that you wonder if you really need a computer at all.

Of course we need them, because there are very strict limitations on how far even the most perfectly controlled data system can take us without them. However, the approach to the problem does help us clean up our current procedures. But it has been a revelation to us what a guide and incentive to more effective management in general on an overall basis the care in the feeding of these machines can be.

Now, our final, and, I believe, our most significant major problem is that of rethinking the entire job cycle to make the most of the electronic data-processing equipment. The obvious and immediate payoff on these machines is their ability to accomplish each step of an existing work procedure with superhuman speed and accuracy. But their greater potential for the future lies in the opportunity that they offer us for synthesis, for entirely new and greatly condensed combinations of job elements--drastic shortcuts to our ultimate objectives. If we possess imagination and a little boldness, the flexibility to redesign our working patterns in consonance with the capabilities of these machines, instead of limiting the machines to our present patterns, we can truly develop them into fundamental and powerful management tools.

Now, this rethinking is no easy task. It goes against the grain, the smoothly channeled habits of human thought. Past experience itself can become a liability if it presents a mental block to radically new angles of attack upon a new problem. None of us, unfortunately, is entirely free of this human tendency to cling stubbornly to the past. The larger the operation involved, and the greater the pressures upon it for output, the more difficult major shifts in direction become.

It seems to me that two elements are essential to accomplish the rethinking job. First, we must find or develop directive manpower which is possessed of a high degree of creative imagination, coupled with a wide and thorough experience of the particular operation involved, as well as of the specific capabilities of the electronic equipment. What we need is a combination of rebel, dreamer, and workhorse, capable of boldness of conception and the kind of nonconforming originality of mind that can strike through entrenched traditions and sanctified habit to entirely fresh solutions. It is damned hard to do.

Secondly, our top management must create an atmosphere, or what we might call a climate of progress, which will encourage the emergence and development of these qualities within our own work force, and insure them the facilities and scope for optimum results. The competition for this type of manpower in the open market has already reached the point of diminishing returns. Those of us who have a stake in the future of electronic systems must give serious thought and effort to growing our own talent, to doing a responsible, forward-looking job of cultivating our own personnel backyards. We shall be seriously risking our investment in these machines if we fail to cover it with an adequate investment in the men who are the final measure of their capabilities, and the research which can exploit their full potential.

In conclusion I would like to emphasize that we in Air Force logistics have great expectations of electronic computers. We believe they are opening the way to faster, more flexible, and more economical support of our Air Force, that they can help to give us, for the first time, a logistical system which is sharply responsive to the requirements of worldwide supersonic airpower.

At this stage of our experience with them we are aware of definite limitations and problems in their utilization. The solutions, like getting our aircraft through the sound barrier, may take a little time and a lot of teamwork, but we are confident that these solutions can be found, and that these electronic systems will become an increasingly potent force in our arsenal of airpower for peace.

Thank you very much.

GENERAL RAWLINGS: Gentlemen, I am sure there must be a few questions. I will be happy to do my best.

QUESTION: Sir, actually, I have two questions. One has to do with the rental policy that you are following. Does this mean that you will also have to use the companies, like IBM, to do your repair work in time of emergency, or are you training your people to do repairs on these machines? The second question I have is, is it true that most of these pieces of equipment are located in critical target areas?

GENERAL RAWLINGS: That's something like a 100,000 dollar question. You asked about six. On the first point; in our rental policy actually our equipment is under a lease-rental agreement, which means that we could apply the rental to the purchase price. We have had great discussions on this problem and decided to take this course for two reasons. One is that it is a risky program, early in its life, and we had to directly buy or procure a complete computer. Obviously the manufacturer is the one who knew how to make it work, and had to, if he was ever going to sell any more, so he had a continuing interest in it.

Secondly, we did not have the talent to do the second job you talked about, which is to repair these equipments. We are having difficulty getting the people to lay out programming and schedule the problems, and we would have even more difficulty in getting the kind of technical talent that, in my opinion, is required to keep these equipments going. So I suspect, regardless of whether we had purchased the equipment or not, we would still have to contract for the overhaul and upkeep of the equipment. I think this in the long haul makes more sense.

As far as worrying about emergency periods is concerned--this is always a question that comes up. I don't think we are any more vulnerable in terms of getting this sort of service under contract really than we are in terms of other factors, such as tornadoes, floods, and a lot of things that can happen. In an atomic period I don't think this is important. This is only my personal conclusion, with which many of you would disagree.

Let's see; the last question was on vulnerability. Here again, it seems to me, we have a comparable situation. We feel--I feel--that we have already minimized our vulnerability because we have 15 depots decentralized management centers, instead of having everything concentrated in one headquarters. We have the capability of reproducing tapes on alternate equipments so that we will have a complete set of records that we could use on another piece of equipment. But,

in terms of burying them under the ground or moving them 10 miles from the base of operation, I think we are just whistling up wind.

QUESTION: Sir, I have been looking into Project Mass, which is an Army effort, I think, somewhat along the same lines, the spare parts program. Is the Air Force application across the board, or are you confining it to some special part of your supply problem at the present time?

GENERAL RAWLINGS: You are talking about scheduling of the parts required for overhaul?

STUDENT: Yes, sir. Well, the Army, of course, is attempting, through electronic transmission and the use of these automatic machines, to support the Seventh Army in Europe with repair parts as an initial venture.

GENERAL RAWLINGS: Oh, well, I think the program you are talking about is a broader program than simply electronic computers. It is a broad overall management look at the whole logistic system. Actually, I talked with your very able General Palmer several times on this problem and the approaches to it. We are both working on exactly the same things. These are to speed up the supply cycle, to cut down on stockpiles, to resupply by as rapid means as you can, depending upon the economics of the situation. So the answer is we are both working in that general area.

Now, let me give you an example of one of the things we have done that ties into computers. There is another piece of equipment called the transceiver. The transceiver is a gadget in which you can put a punch card and it reproduces the card at the end of the circuit, whether it is wireless, radio link, or cable, or telephone line. By this kind of device we are able to transmit and will be able to transmit back from Europe requisitions with no possibility of transcription errors, and with an automatic check, instantaneously, where we have been spending eight, nine, ten, or twelve days airmailing requisitions.

What does this mean? In engines alone it means to us 20 million dollars for every day that we can cut down our supply line, either stock level or pipeline. Each day 20 million dollars. So we are putting a lot of effort into this kind of thing. Of course, associated with that is the feeding of these data into the computers where the problem is one that requires this sort of application.

We are working generally on the same kind of problem.

QUESTION: General, my question is not on your main subject of electronic computers, but on one of your opening remarks with regard to taking over the command of the depots overseas. For a long time we have been reading, of course, that supply is a function of command, and I am wondering if this on the surface seems to be taking away from the commander in the field his capability to take care of his supplies. I am wondering how that has worked out with the theater commands.

GENERAL RAWLINGS: Of course you are really asking the wrong guy. I am the logistics man, not the commander. But I think it would be interesting to you to know a little of the background, because obviously this is a major revolution in logistics.

In this kind of situation where you've got very potent weapons, things happen very rapidly. You've got to have your system organized so that it will react very rapidly. We've got a lot of specialists in the business, specialists in logistics, specialists in delivery systems, specialists in the weapons themselves, and so forth. But this thing is so complex and involved that you have to try to organize your efforts to get the most reaction out of the system and do it economically.

It seems to us that, having the depots where we were storing large amounts of supplies overseas was an uneconomical use of our resources, because we had stockpiles there that ran into much, and very little flexibility, because we didn't have control of it back in the ZI where we had our master depots, where we were doing the buying, laying down the repair cycles, and so forth. So we started talking about this problem in the Air Force and worked with the combat commands, and I think this is one of the very important fundamentals.

A logistics operation exists only for the combat commands and, if you really operate this way and really work this way, for all practical purposes, the commander has got his logistics. If I have a commander sitting with Larry Kuter over in the Far East and he does not satisfy Kuter within the realm of the capabilities of his resources, he is going to get fired just exactly as though he were working for Kuter. I am sure that Kuter is going to get more supplies through this system than he would get if he had them under his own control.

This is not all honey and roses. We have had some problems. I visualize we will have more problems, but I still think in this kind of situation that we are going to be able to do a better overall logistics job. By the interchange of personnel between logistics and combat units, I think we will have an understanding so that we will be able to get more out of our resources and really support this force every morning so that it is ready to go. I don't want any logistics guy in my operation who does not look at it that way.

We are not running depots to have beautiful depots. This would be wonderful. This is one of the troubles of the Hoover Commission and these other people who look at our stuff. They forget what we are in business for. We could run beautiful depots and have beautiful production lines, and we would not be taking care of the real mission we have in life, which is to be sure the fighting forces are ready to go every morning with the maximum degree of economy and that we can support them through the critical phase.

If we all look at the problem that way, I am sure we will do a very much better job and the combat commanders will be happy.

QUESTION: General, getting back to your transceiver proposition, I can see that this will call for a separate logistics communications system, probably even down to the customer basis, through depots interconnected. This was studied in one of the commands, and we have always been able to get tactical communications and pay for them. But the bill, right offhand, to pay for additional logistics communications systems, was tremendous. Would you care to comment on that?

GENERAL RAWLINGS: Yes; this is a very important point. Communications obviously are essential to controlling anything on the basis of the area you have to control. We have our communications people working very closely with our other people, and with the theater communications people, on this problem. You probably know better than I that there are many developments in the communications field, with multiple channels and new techniques coming up, all of which are increasing the capacity of the system. It seems to me that this is a part of this new thinking that we commanders have to have, that is, that you can't fight without logistics, so you have got to have enough logistics communications to take care of being ready to fight.

After it starts I think we can take some risk, but, as long as we are ready to go every morning, and your operations load isn't going to

come, really, until after you start fighting, if you have the force ready to go, you can certainly get off a number of missions before you load down the system with a lot of logistical stuff.

We haven't really thought the problem through to its ultimate conclusion. However, I don't think it is going to take as much requirement for communication capacity as a lot of us think, when we really analyze the problem. But everybody wants his own, of course. That is why we have big bills.

QUESTION: General, I am wondering if you could give us a couple of examples--you gave us one--on how this darn machine has worked and helped you at the Air Materiel Command to pay for itself.

GENERAL RAWLINGS: Yes; let me give you two examples, one an example of the thing we did not do, that a lot of people wanted to do, and then I will give you an example of one we have done.

You can prove that you can pay for a computer in a big operation if you run your payroll on the computer--you can actually prove it. It will reduce enough people so that you can pay for it; but, it would take many hours, and in my view it would be an uneconomic use, even though you paid for it, to run payrolls. So I would not let my people do it, although it is a comparatively simple job.

Now, an area where a lot of money is involved is in spare engines, when you have just developed a brand new engine--take the J-47, for example, because this is one we have had experience on--trying to figure out how many hours it is going to be until you have to pull that engine, put it through the overhaul cycle, and then go on down the line for the whole fleet, where you have 1,200 to 1,500 aircraft using the engine--trying to figure out how many you should have in your reserves, how many you are going to have in the overhaul line, et cetera--it is a little bit of a complicated problem, particularly where, every time you have a problem in the field, a UR goes back to the contractor and he figures out a new way of fixing a piece, and does fix it, and it improves the life of the engine. So we have put a lot of effort into actuarial studies of engine life.

It is almost impossible to do this rapidly enough by hand, so we have done this on our computer. There are a number of factors. It is like anything else. You can't say this was responsible of itself, but taken together, here are the factors that have been working to cut down J-47 engine requirements:

First, we were able to get input back to the manufacturer rapidly enough so the engine itself, the basic engine, was improved. This makes a lot of supply problems, because you have to throw away old parts and get new ones, and so forth. That's a small problem.

Secondly, there is the top overhaul program, where we found it was possible to replace minor items at base level, which originally we had not considered we could do.

Then--new concepts of handling your engine requirements. For example, we are airlifting engines--and the reason we are is because they are very expensive items--to Europe and to the Far East.

The total of all of these efforts has cut the requirement for J-47 engines by several hundred millions of dollars. This is what you can do. This is one of the examples of what we have done with the computers, and are doing with computers.

QUESTION: Sir, I have a question on the flexibility of this system. In view of all these changes, can you get the ramifications of the various aspects of the program? Does it require complete new preparation of this data disciplining, or is that a continual process which is coordinated somehow so there is no time lag?

GENERAL RAWLINGS: Data discipline, of course, is a continuing problem. If you are talking about the design of the system to meet the kind of equipment you have, that you obviously have to do for each project you take on. Also, we are trying to, as I alluded to in my talk, look at the whole system to see whether we should redesign our whole logistic system in order to capitalize on these equipments. We don't know the answer to that yet. But there are limitations. We don't want to be carried away completely. The old human brain is still pretty necessary, not only in putting in the right question, but in doing the right thing when you get the answer. The machine won't do that for us.

You do have to work on this data discipline all the time. You do have to think about the interchangeability of data. If you are worried about the question of different kinds of equipment, generally you will find that each manufacturer has developed converters, so you can convert data from one type of equipment to another by going through an intermediate process, so that whatever total system you end up with will be compatible.

QUESTION: General, my question more or less follows on the last one. Have you been able up to this time to establish any criteria of where you draw the line, relative to what is necessary for anyone to achieve an objective, whether you receive somebody who has the right thinking? Have you found any necessity for rethinking about that?

GENERAL RAWLINGS: I probably would be doing something else if I had that one figured out. But I think it is like anything else. You can pretty well tell the people who have the right kind of thinking when you have them present a few things to you. Obviously the ones who seem to do the best thinking move along the fastest, if that is what your question is. At least, that is the way we run our business. If they are not very responsive or forward thinking, they are not around too long.

STUDENT: May I follow that? The only thought I had was that I thought you might have some criteria, like time, the time factor, which would indicate how long it takes to get the system going, so that if it takes longer than that you don't use it.

GENERAL RAWLINGS: No, we have not refined it to that point. It is still pretty empirical. I don't think there are any formulas you can apply to it. The fundamental point that we have constantly in mind in what we are trying to accomplish is to have our system responsive so that we can support these combat forces every morning. This is terribly important if you are going to capitalize on your bomb capability, your air defense capability. You want to be sure you don't have this equipment sitting down here, half of it, unable to go, because of lack of a few parts--that sort of thing.

This is fundamental in every approach we have to the problem. This is the way we start on it, and on a compromise, based on problems of people, problems of dollars, et cetera. This is the one we always try to protect.

QUESTION: General, do you have any expectations of saving clerical personnel with automatic data-processing equipment?

GENERAL RAWLINGS: Well, you have probably read the literature on this problem, and any time you talk about mechanization, you always worry people about their jobs. I had experience years ago with IBM when we first put it in. We had a problem. The way it actually works today is, there are different skill levels, different kinds of jobs

involved, and usually the people who stay have a capability of working into another job, upgrading--that sort of thing. So, in terms of people, people having a chance to work, I don't think you have any worry.

On the other hand, you can save a lot of people in terms of doing this job. In other words, a lot of the clerical personnel that we have all been using will not be necessary when you capitalize on these equipments. But I think most of us find that the clerical personnel turns over awfully fast anyway. This is an area of high turnover. I don't think it will create any kind of employment problem. They have never found that in industry or any place. I don't think we have to worry about it as long as we understand it and talk about it.

QUESTION: General, you mentioned the difficult problem you have on personnel, the shortage of people, in the training program in this area. The thought occurred to me that since the ARDC Research and Development Command has been in this, quite a few of us have worked on it. We have one up in Massachusetts; we have one down at Cocoa, in Florida; one at Oakland, which I helped to install. They are putting a man out at Holoman, and one at Egbert. I wonder if you are having any luck in getting personnel from the research and development field who have experience in this area, who might help you.

GENERAL RAWLINGS: Well, of course, as you know, the original application of this technique was in scientific areas. There were ballistics and engineering problems, and so forth, and I suspect that every big research outfit in the country has a computer. Generally there are different types of computers, and they have not been primarily built and adapted to the business problem.

What we are trying to do is transfer our techniques so that we can capitalize on the capability of these equipments, but in the business field. I do have one or two people who were in the research and development business that I was able to talk General Power out of. The field is not very fertile, I am told, in terms of numbers for my use. He needs them all. I suspect, the way this thing is going, that he will probably use them, will really need them all. We will have to develop our own. I am sure this is nothing peculiar. We've all got this problem in all departments; not only in this field but in every field. Personnel is the greatest problem of the Department of Defense, to get the right people to get things done.

COLONEL WIRAK: General, on behalf of the College, I want to thank you very much for a fine presentation.

GENERAL RAWLINGS: Thank you. I am very happy to be here.

(7 May 1956--450)O/mmg