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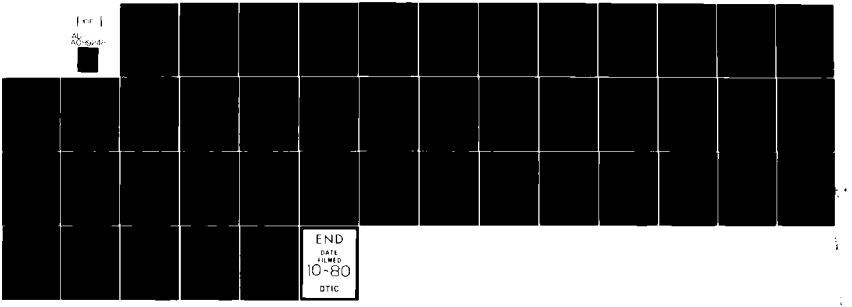

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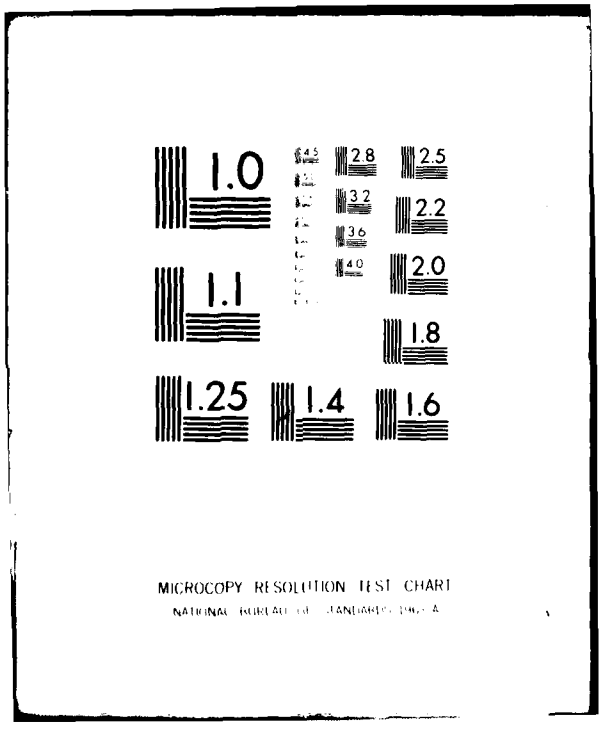
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LEVEL II

CONARC TRAINING WORKSHOP

FORT GORDON, GEORGIA

5-7 OCTOBER 1971

Sponsored by

US Continental Army Command

Hosted by

US Army Southeastern Signal School

Final Report - In Seven Volumes

VOLUME I

GENERAL: Opening, Closing, and Dinner Sessions

GENERAL RALPH E. HAINES, JR.
Commanding General
US Continental Army Command

BRIGADIER GENERAL IRA A. HUNT, JR.
Deputy Chief of Staff for Individual Training
US Continental Army Command

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CONARC TRAINING WORKSHOP
Fort Gordon, Georgia
5-7 October 1971

Volume I - General: Opening, Closing and Dinner Sessions

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CONARC TRAINING WORKSHOP
Fort Gordon, Georgia
5-7 October 1971

FINAL REPORT ON CONARC TRAINING WORKSHOP

1. Reference is made to CONARC letter ATIT-SA (27 October 1971), subj: Interim Report on CONARC Training Workshop.

2. Referenced letter distributed an Executive Summary as an Interim Report on the CONARC Training Workshop, which was held 5-7 October 1971 at Fort Gordon, Georgia.

3. The report will be published and distributed in seven separate volumes:

AD-A089248 a. VOL I - General: Opening, Closing and Dinner Sessions.

A089249 b. VOL II - Computers in Training Speciality Workshop.

A089250 c. VOL III - Educational Television and Training Films Speciality Workshop.

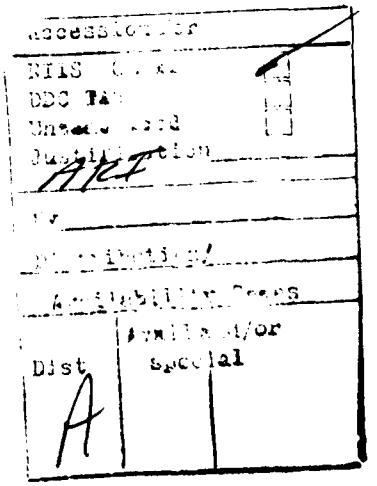
A089251 d. VOL IV - Individualized Instruction Speciality Workshop.

A089252 e. VOL V - Methods and Media Speciality Workshop.

A089253 f. VOL VI - Quality Control Speciality Workshop.

A089254 g. VOL VII - Systems Engineering Speciality Workshop.

4. Separate volumes will be distributed as published. Two copies of each volume will be sent to each addressee to form two complete sets of the report. Requests for additional copies of the separate volumes will be filled after the original distribution to the extent of available supply - a second printing is not planned.



CONARC TRAINING WORKSHOP
5-7 October 1971

1. PURPOSE: The CONARC Training Workshop was conducted at the Southeastern Signal School, Ft Gordon, Georgia, 5-7 October 1971 (Appendix A and B). The purpose of the workshop was to foster an extensive interchange of ideas concerning advances and innovations in training practices and technology relevant to CONARC's training activities in keeping with the requirements established by the Haines Board and CONARC DOI/EA Conference.

2. SUMMARY: GEN Haines, CG, CONARC opened the workshop providing the purpose and direction of the workshop along with his observation in the critical areas of systems engineering and the need for consideration of the individual soldier-student (Appendix C).

Dr. Leon Lessinger, the keynote speaker, followed with the challenge of "A Structural Revolution Through Educational Engineering," emphasizing the need to improve education generally (Appendix D).

Dr. George E. Bair, the dinner speaker, emphasizing the ways in which to achieve "Communication with Youth in Today's World," (Appendix E).

BG Ira A. Hunt, the CONARC DCSIT, concluded the workshop with a presentation entitled, "Ideas to Actions," - which charged the participants with the requirement of utilizing the proven innovations in improving the preparation and conduct of CONARC training (Appendix F).

The major segment of the program consisted of six simultaneously conducted speciality workshops. A summary of each workshop is at Appendix G.

Copies of TV and audio tapes of presentations are available on a loan basis. Written request should be submitted to Headquarters, CONARC, ATIT-SEF (Appendix H).

The US Army, US Navy, US Marines, US Coast Guard, US Air Force, other governmental agencies, along with members of civilian academic communities, were represented at the workshop. There were 265 registered participants, 80 speakers and 35 USASESS workshop staff. Analysis of the comments and suggestions provided by those attending the workshop indicated that the purpose of the workshop was achieved with a strong endorsement to have similar workshops in the future. Fort Gordon and the Southeastern Signal School were highly commended for the support they provided the conference.

This final report along with related papers that may be developed, will serve as a basis for workshops to be conducted in the future.

CONARC TRAINING WORKSHOP

5-7 OCTOBER 1971

WORKSHOP ORGANIZATION

Members at Large

BG Henry C. Newton, USA Ret

Dr. Meredith P. Crawford, President,
Human Resources Research Organization

Chairman:

COL Edward M. Hudak
Spec Asst to DCSIT, CONARC

Assistants:

Mr. Harold A. Schulz
Educational Advisor, CONARC

Mr. Norman B. Carr
Educational Advisor, USASESS

Chairmen of Specialty Workshops:

MAJ William V. Green
Ch, Cur and Eval Div, USAAGS

Mr. Paul O. Crick
Ch, Cur Div, USASESS

MAJ Robert S. Tamer
Sys Eng Div, USATSCH

Mr. Thomas J. Dolan, Jr.
ETV/TF Unit, CONARC

Dr. Vincent P. Cieri
Educ Advisor, USASCS

Mr. Richard S. Kneisel
Educ Advisor, USAIS

Civilian Consultants:

Dr. Harold E. Mitzel
Penn State University

Dr. Leslie J. Briggs
Florida State University

Dr. C. Edward Cavert
Great Plains National
Instructional Library

Dr. Alfred S. Drew
Purdue University

Dr. Robert G. Smith, Jr.
Human Resources Research Orgn

Dr. Robert M. Gagne
Florida State University

Keynote Speaker:

Dr. Leon M. Lessinger
Georgia State University

Dinner Speaker:

Dr. George E. Bair
University of North Carolina

APPENDIX - A

CONARC TRAINING WORKSHOP

AGENDA SUMMARY

Monday, 4 Oct - Arrival and registration -- Richmond Hotel

Tuesday, 5 Oct

Workshop Opening Session in Alexander Hall

Invocation -- LTC (Ch) George E. Fort, USASESS
Opening Remarks -- COL Edward M. Hudak, CONARC
Welcome Remarks -- MG Harley L. Moore, Jr., CG, USAS/TC&FG
COL P. J. McDonnell, Comdt, USASESS
Mission and Purpose -- GEN Ralph E. Haines, Jr., CG, CONARC

Specialty Workshop Orientation -- COL Hudak, CONARC

Introduction to Workshops -- Mr Harold A. Schulz, Educ Adv, CONARC
Computers in Training -- Dr Cieri, USASCS
ETV and Training Films -- Mr Dolan, CONARC
Individualized Instruction -- Mr Carr, USASESS
Methods and Media -- Mr Kneisel, USAIS
Quality Control -- MAJ Wood, USAAGS
Systems Engineering -- LTC Garneau, USATSCH

Keynote: "Accountability: The Case for Educational Engineering" --
Dr Leon M. Lessinger, Georgia State University

Specialty Workshops (See Specialty Workshop Schedules)

Dinner Address: "Communications with Youth in Today's World" --
Dr George E. Bair, University of North Carolina

Wednesday, 6 Oct

Specialty Workshops (See Specialty Workshop Schedules)

Thursday, 7 Oct

Specialty Workshops (See Specialty Workshop Schedules)

Workshop Closing Session in Alexander Hall

Critique -- COL Hudak, CONARC
Workshop Summary -- Mr Schulz, CONARC
Computers in Training -- Dr Cieri
ETV and Training Films -- Mr T. Dolan
Individualized Instruction -- Dr Smith, HumRRO
Methods and Media -- Mr Kneisel, USAIS
Quality Control -- Mr Sherrill, USAAGS
Systems Engineering -- MAJ Tamer, USATSCH

"Ideas to Actions" -- BG Ira A. Hunt, DCSIT, CONARC

Appendix B

CONARC TRAINING WORKSHOP
5-7 October 1971
Fort Gordon, Georgia

MISSION AND PURPOSE

General Ralph E. Haines, Jr.
Commanding General, U.S. Continental Army Command
Fort Monroe, Virginia

Thank you very much, General Moore and Colonel McDonnel, for hosting this workshop. I'd like you to extend my thanks, please, to all of your people who have made the splendid arrangements.

I am happy to be here this morning among CONARC's educators and trainees. I extend a very special welcome, as has already been done, to representatives of the Navy, the Air Force, the Marine Corps and other Governmental agencies - and, of course, our friends from the academic and scientific communities. In particular, I want to welcome two close friends - General Newton, a distinguished Army and civilian educator, who has served without compensation as a consultant to my headquarters, specifically my DCSIT, I think for about eight months now and has done some splendid work surveying various of our educational institutions and making some across-the-board studies in specific areas of interest to us all. And, also Dr. Crawford, President of HUMRRO, an organization which has worked in the Army's behalf for many, many years in which I believe we all agree has contributed in major degree to the advancements of training and education methodology in the Army. I would like the two of you to stand so that the others will recognize you when you visit their workshops. General Newton and Dr. Crawford have both agreed to participate as members-at-large and I'm sure that you are going to find their observations and recommendations will contribute in a major degree to our conference.

I have looked forward to this opportunity. Six years ago, the board with which I was associated recommended that we have this type of meeting to insure a uniformity of excellence throughout our school system. Last April, selected Directors of Instruction and Educational Advisors, as you know, met at Fort Belvoir to discuss improvements to our school system. They covered a wide range of subjects that were of concern to all of us, and I know that a good many of you were present at that meeting. This CONARC workshop is a direct outgrowth of those discussions. As such, it should provide the means of improving the interaction within the military and with the civilian research and academic communities.

Although some change is always inevitable, the next decade, of course, will certainly be a period of ever accelerating change in our modes of operation and in our personal responsibilities. These changes may place us in a situation similar to the story of that duffer who was out on the golf course who took a tremendous slice out in the rough which landed on an ant hill, and he wasn't nonplussed by this at all. He got

out his trusty three iron, lined up on the ball and took a tremendous swipe at it, missed it completely and killed about three thousand ants. He just unbuttoned another button on his shirt, took another couple of waggles and took another swipe at the ball, missed it again and this time killed about two thousand ants. At this point, one of the few remaining ants looked at one of his nervous compadres there and said, "If we want to live, we better get on the ball."

That might be the situation that we all find ourselves in today. Just how are we going to "get on the ball," in terms of being prepared to cope with expected changes? What role must each of us play and how can we help with this workshop? Let me establish a perspective. Education and training have three major components: content, process and product. Our workshop program concentrates most heavily on the process of training. This, of course, includes far more than the conduct of courses. The process must be considered in terms of the product - the new soldier and our deliberations must lead us to discover the ways through which we can exploit technology to fully develop this new soldier into a competent, dedicated fighting man. Proceeding from this premise, we can say the purpose of the workshop is threefold: first, to foster an interchange of experience and knowledge gained in the application of training technology; second, to provide, not only new ideas and expanding horizons, but also a new approach for upgrading the proven techniques of training; and third, to identify needed changes or modifications. Thus, our overall goal is to improve the Army school system.

I view my role this morning primarily as one of provoking thought, though provocation is sometimes accompanied by difference of opinion, in this instance, identification of such differences will hopefully result in a more fruitful conference.

Speaking of differences of opinion reminds me of another story about a pastor of an old, established backwoods parish. This preacher, having grown tired of straining to read his sermons in the semi-darkness of his church, called a meeting of the parish elders to consider a proposal that the church buy a chandelier. Everyone approved of this motion except one elder who refused to be persuaded. The preacher asked this recalcitrant soul to state the reasons for his opposition. "Well, I'm against it for three reasons. First, no one here can spell chandelier. Second, I doubt if there is anyone here that can play one. And, besides what we really need is some light around here." I hope that my remarks will be perhaps a little more illuminating than those of our friend the elder.

The role of CONARC's trainers and educators here can best be described by the shortest and most powerful prayer I know. In his Summa-Theologica, St. Thomas Aquinas says: "Lord - give me the wisdom to speak - and the courage to stop." Put in more mundane terms,perhaps we can say that the

good Lord has given us two ears and one mouth, and we should use them generally in that proportion. I find it equally appropriate to turn it around and say - let your courage guide you not to be hesitant about talking to your associates - but have the wisdom to stop and listen as well. The success of this workshop is dependent upon two necessary forces: first, the sharing of knowledge among the participants; and second, the application of the new knowledge which we gained by the interchange of ideas.

As to the role of our visitors, I look to them to provide the catalytic element that will promote a positive interaction among us. In return for this function, this workshop should provide you who represent the academic and research communities perhaps with greater knowledge of military training. More specifically, we hope that it will give you a greater awareness of the problems we face and our efforts to solve them.

One of our immediate problems, of course, relates to the size and composition of the United States Army. As the strength of the Army is reduced, the demand to improve our training, of course, increases. We must produce not only an effective fighting force but also a nucleus for expansion in the event of an emergency in order to obtain the best possible service from the new soldier. We must communicate with him as an individual. All of these requirements serve to point up the need for emphasis on individualized training and development of the whole man. A concept which we are following to a larger and larger degree, throughout our school system.

Over the past year, we have been engaged in a number of training experiments and evaluations. We have learned that today's soldier is responsive to training methods that provide systematic recognition and reward for individual performance. We know, also, that the young soldier seeks more, rather than less, physical training. Furthermore, he is critical, not of training tasks or missions, but of frequent instances of organizational inefficiency, such as scheduling delays, inappropriately paced instruction, and archaic teaching styles and methods. As one young soldier put it, "We don't want you to make life easier for us, we just want you to make it better organized."

This man is our contemporary challenge - the soldier student of today. Unless we maintain our focus upon him as the product of our system, we are in the same position as those 5,000 very dead ants who never had a chance to get on the ball. Our overall task is clear. We must learn to forecast requirements more accurately and to bring together the right soldier student and the most effective educational process, in an evnironment that assures their successful melding, thereby producing a true professional.

I subscribe to General Westmoreland's definition of professionalism when he said, "Professionalism...involves a strong sense of duty - the willingness to give it all you've got - a firm and unyielding commitment to excellence - doing your job with pride and satisfaction -

unquestioned integrity - being honest with yourself, your superiors, and your subordinates - exhibiting a high degree of intelligence and competence - knowing your job and your men."

All of our organizations must undertake an honest self-appraisal in light of this definition of professionalism. To be realistic, this appraisal must take into account the drastic changes taking place in American society. I would, however, introduce a note of caution. We cannot permit ourselves to be overly preoccupied with transitory problems. While we must face up to the challenges of social change, we must also continue to provide for the security of our Nation. Thus, we have the added responsibility of determining correctly where to direct our efforts and to commit our resources without going through an extended process of successive approximations. We simply can't afford that.

CONARC is required to be both the conscience and the workhorse of the Army with regard to the planning and conduct of training. Thus, we must employ and evaluate training technology within today's limited resources. To that end, we have committed ourselves to design or redesign our courses on the basis of systems engineering. Beyond our detailed efforts at systems engineering, I feel that we must make a parallel assessment of the total effectiveness of our efforts. In this context, questions remain to be answered concerning CONARC's training effort, such as - where are we now and where are we going?

On the basis of my visits to our schools and training centers, I am certain that an assessment of where we are will show that we have made considerable strides in the application of technical innovations. In some instances, we are among the forerunners. For example, some of you may be surprised to find that educational TV and training films, which we have been using routinely for many years, were considered as innovations by the President's Commission on Instructional Technology, as recently as 1969.

Our widespread use of educational technology has resulted from receptiveness to innovation and research findings, and a willingness to exert the effort necessary to minimize the risks involved. People in our school system have a clear commitment to progress but are dependent upon imaginative leadership and intelligent planning.

The progress that we have made does not permit us to become complacent, nor to ignore the need for refinement of our training process. We must explore more fully the specific application of systems engineering to non-technical courses, such as our officer career courses or those involving soft skills or subject material such as leadership. I believe that we must guard against becoming too deeply immersed in a quantitative approach to our problems in our systems engineering efforts.

We certainly can do better in the area of TV where we are under criticism from such people as the Army Audit Agency for not fully capitalizing on the potential of that medium. Similarly, our use of programmed instruction is clearly more limited than its proven value clearly suggests. Though these remain problem areas, they represent the kinds of challenge that produce our best efforts.

This cursory appraisal of where we are today indicates that we have gone a long way in the use of technology in our training efforts - but that the compelling need to improve has certainly not lessened.

In that light, it is even more significant to determine where we should go from here. In terms of the process of training, two major goals must be achieved. First is the extension of our application of systems engineering to cover more of our training effort. And I recognize that Dr. Gagne and others here are pioneers in this whole area of systems engineering and that we have much to be thankful to them for in expanding our systems engineering effort. We must place particular emphasis on the design of the learning exercise. And we must study further the process of conversion of a training objective into a lesson plan.

The second goal is to develop a heightened awareness of the trainee as an individual and to pay particular attention to his unique requirements. To achieve this goal, we must consider the individual in the design of our training. We are approaching the point at which we must give deliberate attention to the entry characteristics of our student and, whenever possible, adjust the training to his individual abilities. How we identify and adjust for these individual differences remains a continuing challenge.

As we look into the future, we need no crystal ball to foretell the impact that the shift in the Nation's attitudes has on the role of the military. This shift in attitude is especially apparent among our youth - the youth who will be the mainstay of what we seek to build in our so called Modern Volunteer Army. We know our new soldier is articulate, individualistic, and extroverted. He does not deny authority - he wants and needs authority - in fact - but with reason. We must evaluate these aspects of the individual soldier and design our training to produce a loyal, dedicated member of the Army team. During the austere days ahead, creative imagination will be essential - and we must look to your leadership at the schools and training centers to evaluate and to support the application of suitable improvements in the training of the young men entrusted to our care.

In so saying I am going to look forward to a very meaningful workshop here. I thank you very much for your attention and I wish you the very best of luck as you begin your deliberations. Thank you.

A STRUCTURAL REVOLUTION THROUGH EDUCATIONAL ENGINEERING

Dr. Leon M. Lessinger
Callaway Professor of Education
Georgia State University
Atlanta, Georgia

Education is perhaps the most important activity of our age; it is certainly one of the most expensive. You may have read recently that our budget for education in this country now exceeds $85 billion, and we have passed the defense costs. It is unhappily also one of the most backward. Critics ranging from the President of the United States to members of state legislatures and school boards. You may recall Mr. Nixon's first sentence in his message on education reform in which he proposed this principle of accountability as the central principle of his administration. But the message starts by saying education is in urgent need of reform and I find nobody who will critize that observation. And you will find this in our states, you will find it in our school boards. And if we can believe public opinion polls, the majority of the American people -- want major educational reforms. Yet the schools seem immune to change.

Benson[1] gives us an interesting perspective on the recent past and suggests a line of activity which I want to pursue this morning. He introduces his paper on "Economic Analysis of Institutional Alternatives for Providing Education," and I think you are aware of a number of developments to provide competitive alternatives to the public schools. He starts with the statement, "The decade of the 1960's was a time for experimenting with technology of educational processes. Some of the pieces of this 'Technological revolution' were (1) ungraded primary programs, (2) instructional television, (3) team teaching, (4) language laboratories, and (5) computer-assisted instruction. I am sure you in the Armed Forces have gone through a similar technological revolution in the 60's, and even before. And he goes on, that technological revolution left American educational institutions largely undisturbed. In contrast, the decade of the 1970's is likely to see a great deal of structural experimentation, i.e. examination and testing of alternative schemes for financing, managing, and controlling schools and various other educational institutions."

Benson adds the statement with which I most heartily concur, "It is possible that the 'structural revolution' will produce fundamental changes in flows of educational and training services and in the distribution of those services among households." Take then as my theme, the notion of a structural change and its possible impact on the use of technology and hopefully to achieve more accountable educational systems.

APPENDIX - D

I would like to examine with you important elements of that "structural revolution" with two objectives in mind: first, to put your own efforts at educational reform in a useful perspective and second, to help us in the civilian sector appreciate the significant contribution your training efforts may make to the betterment of our entire educational system.

Structure refers to the configuration of the elements or parts which make up the entity. For my purpose I will highlight three elements of the educational entity: the belief structure, the reward structure and the management structure. In the process of highlighting these structures I shall attempt to do a "needs assessment" i.e. contrast what is and what ought to be. It is my hope that this contrast will help me achieve my two objectives.

Educations' Belief Structure

Let me begin by talking about education's belief structure. I suspect if what B. F. Skinner says is true, and I think it is, that most of us teach the way we were taught, that this believe structure may also be part of the military's training program, although I think you are making vast strides to overcome it. Education is dominated by a belief in aptitude as a fixed quantity -- an indwelling essence which determines the quickness of learning and the degree of understanding a person may achieve -- and which is largely indifferent to outside influence. This concept of aptitude, which goes back all the way to Aristotle and even before, is not only widespread but it is now universally encoded in the awesome respectability of the Gaussian, bell-shaped, or normal curve. That great mathematical symbol of what the point-maker in the sky has given us.

The whole approach to aptitude, so familiar that it seems part of the natural order, is now being challenged. The critics agree that students differ in their aptitude, but they argue persuasively that we ought to define aptitude not as the degree of mastery a student will attain within a given course or program, but rather as a function of the amount of time and approach he requires to attain a defined mastery of a specified task.[2]

This new definition of aptitude turns our attention away from the weary dangerous routine of sorting out students according to how many questions they can answer after a fixed course, to the more productive quest for more effective technologies of instruction and considerations of benefit-cost economics. One can then arrive at how much one is willing to pay and for what reason rather than arbitrarily invoking the magic of a bell-shaped curve.

What happens when we accept the new definition of aptitude? Instead of a fixed program in which each student learns what he can, we set a goal of basic mastery for everyone and offer whatever programs are necessary to meet that goal. Instead of grades we give diagnostic tests to help us decide which program each student needs; instead of relativistic ranking on normative instruments we use criterion performance tests; and at the end of the process we award competency warranties instead of the increasingly dubious "diploma".

Educations' Reward Structure

Think for a moment about education's reward structure. People tend to do that which is rewarded and to stop doing that which is not rewarded. In education, what are people rewarded for? Even a cursory analysis reveals the following: educators are rewarded for collective bargaining; for length of service, for college courses taken, and for furthering their own disciplines. There are few rewards for producing student accomplishment. The connection between teaching and learning is left to chance and to pious exhortations in annual meetings and publications. Not only do we fail to link teaching and learning but we have virtually no measurement of the student accomplishment that the enterprise yields. This is fantastic.

Our public elementary and secondary schools enroll more than 45 million students, employ close to 2 million teachers and spend more than $40 billion in tax funds annually. We have all kinds of measurements of where the money goes. We can pin down per-capita expenditures in any of the more than 17,894 school districts. We can state how much any of them spent for construction and service on its debt. We know how many teachers there are, we know how old they are, we even know how tall they are. The only thing we don't know is what is produced by all of these teachers, books, space, and all the rest.

We know what it costs to keep a student seated for one year; we don't know what it costs to raise his achievement in a basic skill for one year's growth. We do not know the progress (or lack of it) of a single school or school system in achieving its objectives. We have held our schools fiscally accountable and custodially accountable, but they are not accountable for results. All this is radically changing. There is a widespread accountability movement in operation. A movement so vast that its only counterpart would be in the period 1910 to 1914 in what was then called an "efficiency movement." You may remember the scientific management movement. This, however, accountability is an effectiveness movement, not an efficiency movement. And its ultimate purpose is to find the extent and degree to which an institution meets its objectives. Quite a different notion than efficiency.

Associated with this accountability movement are performance contracting, vouchers, and decentralized learning schemes to name a few, each with significant linking of rewards for educators to the performance of students.

But what happens when we hold schools accountable for results? Or for that matter any program. In the first place, the schools would then define their output no longer as teaching done but as learning proven. Secondly, once the output of schools is measured in proven learning we can relate learning to cost and thus for the first time gain an effective handle on alternative practices to achieve increases in productivity. We have been derelict in education in getting at alternative practices. One of my friends says that one of the problems of education is it lacks a digestive system. It is a great and wonderful primitive organism, but doesn't have the means to take on new ways. We need to get at this productivity. Incidentally, I might define for you what we're using in Florida. Florida is a good example of what many states are doing in pursuing accountability and productivity. Dr. Bob Gagne and I are members of the Board of Governors of Florida's Research and Development program. This is a program sponsored by the State legislature. I chair that group and I assure you that it is quite an exciting task. The legislature has appropriated for this program last year $1,200,000; this year $1,350,000 as development capital. Risk capital, in this case to be invested in universities and school systems to achieve more productivity and a more accountable school system in Florida. And we've taken as our definition of productivity, this: First, that we ought to be able to achieve the same learning that we get now for less cost, or we ought to get more learning for the same cost, or we ought to get significantly greater learning for more cost. We are looking at the social indicators, the impact of the Florida educational system on the significant problems of that state. This is the kind of productivity look that we are taking in Florida. The same thing could be said in many other states.

It might interest you to know why I emphasize this productivity and cost problem. Let me give you some of the dimensions of it, and give you again another reason why I think what you are doing in systems engineering may have tremendous impact, maybe essential impact on all aspects of our schooling. I don't know if you have heard of the famous economist William Baumol, an economist at Princeton. Essentially his argument is this, which I think in part accounts for the spread of accountability. His analysis under the title "The Macro Economics of Unbalanced Growth" goes something like this: If a sub-system of a system grows at a rate that exceeds the rate of growth of the total system, the subsystem becomes the system. If one looks at educational costs, and you could look at the same in health, welfare, and other aspects; but if you go back

and look at educational rates of increase -- cost increases -- you can go back over a hundred years and you will discover that education has increased at roughly two times the increase in the gross national product. Since 1963 it has grown even larger than that. Two figures to bolster this line of thinking. In 1947 we invested as a people in education $6-1/2 billion. This is not considering the educational efforts of the Armed Forces incidentally. By 1969 that was $68-1/2 billion -- over one thousand percent increase at a time when the gross national product increased by four hundred percent in that same period. It is possible to ex-postulate these curves, which go back as I indicated over one hundred years (and this is silly). But just for purposes of discussion this assumes that everything continues as it did in the past. Those two curves cross each other again as Baumol predicts and we will need the entire gross national product to support public education in the year 2084. It is an interesting notion.

I discovered in Canada, in the Province of Alberta, there was the minister of education of that province and I was on a program with him, and I was talking about the Baumol crunch and he got his staff to work on their figures and discovered that their Baumol crunch was 1994. I guess then that in 1994 we can go up there and see how they handled it.

In a serious vein, you can see some of the reasons then for the spread of the movement which says we know what we are investing, but what are we achieving in terms of the fundamental purposes of this enterprise, namely student learning, student growth - performance. And I think that it is kind of exciting that you have been wrestling with this same sort of thing possibly with recognition of the awesome problems out in the civilian sector. I have indicated that we have gone from $68-1/2 billion in 1969 to $85.1 billion for 1971-1972. And there doesn't seem to be a way to get at a relation between these kind of accelerating costs and increases in productivity.

Finally, we can bolster educators' professional credentials. I know some of you are faced with the problem of turnover in your instructors and you don't have for the most part professionals. I think the accountability movement may sharpen our notion of what a professional is. For example, if an attorney loses as many cases as he wins, he will soon have none but the most ignorant or impecunious clients. Neither specialized education nor experience by itself validates his claim to special wisdom. Professionalism, in other words, goes hand-in-hand with accountability, with clear-cut proof of performance. In general, educators so far have rested their claim less on assured results than on their university credits, years of service, and probity in administering public funds. If this is an attack on professionalism, so be it! There can only be one definition of professionalism and that is: proof of results.

Educations' Management Structure

Let's look now at another structural element - educations' management structure. And here I think systems engineering -- what I call educational engineering -- has a powerful impact; that is, to recognize the essential part of management structure in the teaching-learning encounter. In our technological age, what would we ordinarily think of an enterprise that spends only a fraction of one percent of its income on research and development? That often fails effectively to apply the knowledge which it does have? That is so labor-intensive that it spends, on the average, less than four percent of its budget for materials, equipment, and supplies? There are some of our large cities that now put over 91% of their operating dollars into salaries and related benefits and with just a little bit of extrapolation in those areas, they won't be able to afford a pencil for a child. All the money will go for salaries and other benefits.

What future do we predict for an enterprise run by people who lack training in sophisticated management techniques, who exercise little creative control over their personnel, and who seldom know exactly what effect they are having? Unfortunately, our public schools make up such an enterprise. Apart from a relatively small fraction of children whose parents pay double to send them to a private or parochial school, this enterprise has a monopoly on elementary and secondary education. Without the tax revenue it receives, how long would this monopoly survive?

What happens when schools finally join the management revolution that has swept significant portions of American business and industry? First, school leaders will be able to properly plan, organize, implement, and evaluate their efforts. Secondly, they can form new alliances with those outside the schools who can develop, package, test, introduce, manage, and verify new methods. Finally, they can successfully avoid being bogged down at the necessary day-to-day administrative problems level so well described by the housewife's principle: "When you see a mess, clean it up."

We have several management strategies that are being tried out around the country. I see some reflection of them in your program, certainly management by objectives as one of the important strands. The notion of management by option is coming in. That is, to get a set of bench marks in the form of Gagne's cognitive domains and other domains, to get samples of that universe, to establish a set of exercises, and then to array a whole set of alternative strategies and programs against those bench marks. An interesting notion of management by conjecture, which I call it; the notion of trying to look at the future, and along with performance objectives writing stylistic objectives, strikes me as kind of interesting. To look at alternative futures and to array the soft objectives, the stylistic ones, along with the tough behavioral ones so that we don't get locked into the past. This is one of the dangers I think of too eager a pursuit of behavioral objectives.

Management by reflection is one that I personally have been interested in. I use that term, you won't find in the literature, maybe, at least I haven't found it. I use that notion to try to bring to educational engineering, and hopefully you do this in systems engineering, to bring that human quality which is so essential. I used to do this as a school superintendent. Once a month I had my secretary trained to use a table of random numbers, and once a month I became one of the clients, one of the students in that school system. And I went through the full day; I did all the exercises, both physical and mental; I did the homework. The next day I would call the teachers together and the principal and the counselor and we would talk about what had happened to me as a student. I use the term management by reflection to suggest two ideas. One, the notion of thinking about what's happened to you when you walk in somebody's shoes, and second, the notion of giving back as a mirror gives back what it is that the group is doing.

One little incident may be amusing but shows the power of putting into educational engineering this basic dimension of the human concern which I think is terribly important as it matures. I remember one time in the home-making department when my girl friends and I were making biscuits, and I recall when we got the biscuits all made, that is the dough, and we put it in the oven - and then the bell rang. And I remember the next day asking the teachers and the principal why did the bell ring? And, of course, was still taking the role of that girl that I was the previous day. Now the principal just somehow couldn't divorce the fact of how I look from my role playing as a girl. He had great difficulty making that distinction. But, I persisted. He said: "You know why we have to ring the bell," and I said, "No, I don't." And then he resorted after a lot of fumblings, to the age-old answer to problems of this sort -- no doubt you have them in the armed forces -- he invoked the magic of the physiology pronoun "they" and he would say, "But they require that." But there I was, superintendent, and I said, "But they is me." I said: "Furthermore, we have five board members, two of them are ladies. I am sure that Mrs. Cullen and Mrs. Grant, certainly the Superintendent, wanted to see the girls eat the biscuits that they made. That is good learning. It is bad learning -- it is bad psychology to get the dough made, stick it in the oven, and then have the bell ring. That's bad." Well, to make a long story short, through management by reflection, we made changes. We discovered in that school system some things can be twice as long, some experiences, as others.

I think the point I am trying to make is that there is a tendency for the engineer to be linked with the group that would dehumanize. One of the great criticisms may very well be, within your own establishment of systems engineering, that it becomes so impersonal and it loses its essential contribution, in my judgment, to the human spirit. Because a successful human being, a competent human being, to me also has that strong self-image in all the things we would call basic humanity. And I think management by reflection, which incidentally is a very old idea, you'll find it practiced by the Jesuits and even before, should be applied. The point is that the management structure needs to be looked at in education, including the management of instruction itself, which is what you are building into your systems engineering.

But what has this to do then with <u>your</u> concerns? I think a great deal. The structural revolution of which I speak is a natural consequence of applying the principles of educational engineering -- a field which you are pioneering under the name systems engineering.

<u>Engineering for Education</u>

Everybody knows that in engineering we define exactly what we want, then bring together resources and technology in such a way as to assure those results. In applying this process to the design of education, I am not proposing that the schools treat students as if they were unfinished products in a factory but rather that we devote to the fashioning of educational programs at least as much imagination, skill and discipline as we routinely apply to the building of a color TV set.

As you know, when a program is well engineered, it will meet these tests: it will require planners to specify in measurable terms, what they are trying to accomplish; it will provide for an independent audit of results. One of the things that accompanys this accountability movement is a new career in education, called variously Educational Program Auditor or Independent Education Accomplishment Auditor. And I am pleased and rather proud to have been one of those responsible for the development of this new movement in education. To get at the essential quality of any program (which is feedback) without knowledge of results there can not be improvement. And that knowledge must be objective and must be reflective in the sense that I used before. So it will require planners to specify measurable terms -- what it is that the outcomes of that program will be. For an independent audit of results it ought to allow taxpayers and representatives to judge the educational payoff of a given appropriation. It should stimulate a continuing process of innovation not merely a one-shot reform. It should call forth educational ideas, talent, and technology from all sectors of our society and it should allow experimentation with new programs

at limited risk and then allow educators to adopt the best of them promptly. Above all, it should guarantee results in terms of what the student can actually do.

I think the effort successfully to defend America has wrought significant advances for the commonwealth. One thinks quickly of aviation and the harnessing of atomic energy. The next great contribution may well revolve around the efforts to perfect and generalize what you call systems engineering, and what I call educational engineering. Briefly here are some processes that you will find around the country of which you may not be aware in the name of educational engineering. Then try to make some of these cross-ties between what you're working on in this workshop and what is going on in places around the country. There probably is something like 30 or 40 million dollars worth of performance contracting out and this is an educational engineering process, one that we have been pioneering. It goes something like this: the school system, the agency that wants to do something for which it does not have the capability, instead of continuing to work at something in a non-productive way employs an outside group, a management support group, who comes in to help the local group, the group with the problem articulate and define its problems specifically in the form of a RFP, not an unknown term to you in the military. Once this set of specifications is developed, and of course you see how it goes back to defining objectives and all the rest, once you have a set of specifications in terms of what you want, for which you have an amount of money, then that goes to bid. Now who may bid on these? Sometimes its the local teachers association. We have two projects around the country, where in Mesa, Arizona, and Stockton, California, the teachers are competing. Mainly it has been private enterprise who come in on a pretty basic level. The first contract you may have heard about was in Texarkana. The youngsters were three or more years behind in reading and in other skills. The contract read as follows: For each youngster who progresses one grade level in 80 hours, the contractor would get $80; if the youngster gained one grade level in achievement in 60 hours, or less, the contractor would get $106 for that youngster; if the youngster did not gain a grade level and increase in reading in 165 hours, then the contractor would get zero. That is what you call laying it on the line. A lot of problems with it, problems of measurement, all sorts of things, nonetheless, that basic notion has spread and in my judgment will become an important part of American education as we move toward a more productive and more accountable system. Notice that this is effective because it makes a change in structure and, in this case, the reward structure as well as other aspects.

Perhaps it is fitting to end with some lines from the man who first used the term educational engineering to articulate his views. In 1923, the year of my birth, W. W. Charters, I think the father of educational engineering stated.[3] And mark these words, might this not be in part, the credo of what you are trying to do in this workshop. In 1923, here is what he said:

" . . . . . the perfect analysis is one which is carried out to the point where the student can learn without assistance. If it is put into the form of a book, the ideal text is one which teaches itself. In it the material is so expertly presented that the student understands everything, can follow it through to its end, incorporate it into his experience, and use it in his life of action." What a tremendous goal for the educational engineer to carry an analysis out to the point where the student can learn by himself which is after all, the basic way to learn.

In his last work in 1951 entitled "The Era of the Educational Engineer"[4] he said, "I predict a change in emphasis in the next half-century in the field of education. The shift will be from the exploration of ideas and concepts to the development of technique for putting them into practice. An interesting foresight. A shift from discovering ideas to taking what is known and getting it into the main stream. That is after all the major role of the educational engineer. He then describes five methods used by the educational engineer. See if these are not some of the methods that you are proposing and using. Here they are:

. . . . . identify the idea to be worked on

. . . . . analyze it

. . . . . build a structure .. a curricular unit .. an operational technique .. an instructional method

. . . . . operate the tool and try it out in practice

. . . . . test the results to measure the efficiency and practicality of what he has constructed."

Pretty basic advise. It may interest you to know that there is supporting evidence of the power of these concepts so simply and easily read. I was the Associate Commissioner in charge of Elementary and Secondary Education for a two-year period, 1968-1970. And through my Bureau passed about $1-1/2 billion for educational uses, most of which we had no control over. However, in looking through the results of one of the titles, title one of the Elementary and Secondary Act, the one that you all know about -- has to do with educating the children of poverty, and so on.

That program since 1965 has cost roughly $1.2 billion each year. Not a large amount when you consider the needs -- some nine million children involved. Nonetheless, a very large amount because most of that money was suppose to go for new methods, better ways. Now the results are not particularly gratifying; however, within a rather dismal picture of the effect of those monies on raising the achievement level there are some gems that just sparkle, things that work so well as to capture the imagination. In every case, the studies are showing there were certain elements that seem to emerge as the casual elements (now that has yet to be established). They are striking like some of the material in systems engineering and educational engineering. Certainly it was clear that without well-stated objectives, without instructional programs geared to those objectives, etc. you simply didn't get the results.

Well, I think we are on the brink, the edge of something that is extremely valuable. Perhaps my real ending -- maybe there is no ending -- maybe there is a beginning. I think it may be significant in this workshop that many of Charter's views, in fact much of what he stood for, was not widely accepted during his lifetime. He died in 1952. Perhaps the real measure of your success would be the pleasure, I think, that Charter would find if he were amongst you. I think he would be pleased with this conference today. Thank you and good luck.

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COMMUNICATION WITH YOUTH IN TODAY'S WORLD

Dr. George E. Bair
Director of Educational Television
University of North Carolina

"I see no hope for the future of our people if they are dependent on the frivolous youth of today, for certainly all youth are reckless beyond words. ...When I was a boy, we were taught to be discreet and respectful of elders, but the present youth are exceedingly wise and impatient of restraint."

So wrote the Greek Hesiod in the 8th Century B.C.

"There is no greater resource in our society than our young people. It is they who have the energy and the desire to create a better world. They continue to be our best hope."

So spoke the Superintendent of Public Instruction for North Carolina at the dedication of a school in September 1971.

Obviously, from the beginnings of man's records there is abundant evidence that he has regarded youth with considerable ambivalence. The Greek society which produced Hesiod also idolized the olympic athlete and must in its own way, have had its youth cult.

Attitudes toward the young have ranged from such mere idolatry through somewhat amused tolerance to downright dismay and condemnation of the young.

More often than not, however, and particularly in our own time, adult commentators have reacted to the young with dire predictions and sweeping generalizations leveled at the young not as individuals but as a whole generation whose actions and behavior threaten the very fabric of the existing social order.

It seems to me that this ambivalence is especially intense in our own society. Beginning sometime after World War II, the manufacturer and advertiser discovered something called the teenager and created the youth cult as a new market. More specifically, when I was a youngster -- and I am of that generation which never was identified as "teenager" -- I used to hear an advertisement on the radio which sang, "Pepsi Cola hits the spot, twelve full ounces, that's a lot! Twice as much for a nickle, too. Pepsi Cola is the drink for you." Obviously the appeal to me as to my elders was the appeal of economy, an appeal which in the '30's and 40's knew no age boundaries.

But suddenly all that was changed, and Pepsi moulded its own Pepsi Generation - that Generation which would reject the old habits of drinking Coca Cola and do its own thing by drinking Pepsi -- and above all by thinking young.

Now, just when the advertiser discovered the newly affluent youth in this country, the fantastic medium of television began to flourish, and willy-nilly it became both the great exploiter and the great exponent of the young. Beautiful young women sell cars, and beautiful young male athletes sell shaving cream.

Suddenly the young were taken very seriously and identified as a group separate and distinct and important -- particularly as potential consumers. Family drama became standard fare -- usually depicting bright, knowledgeable children and bumbling parents. And, incidentally, I wonder how much longer the adolescence of the Cartwright sons will be prolonged. Only one of them in all these years has left the nest to make his own way in the world!

Whatever the reasons, in our television world all of our heroes have been young -- Jack and Bobby Kennedy, Jim Plunkett, George Jackson, the Beatles, Janice Joplin, and the growing number of men who have walked on the moon.

It should not have been surprising, then, that the young in this country in the last ten years would have "discovered" themselves even as they had been discovered by those who had something to sell them. And, as always, when youth discovers itself the results are both exciting and extremely painful. Exciting because of youth's energy, its vitality, its optimism, and its idealism. Painful because of its directness, its lack of perspective and its lack of organized experience.

Lit by the fuse of television, the youth of the 60's in this country and elsewhere literally went off like a bomb. For me they might be epitomized by the three young people in New York who, striving to remake the world as they saw it, were literally blown up as they shaped the explosives to destroy the old order.

But, they might also be epitomized by the Peace Corps kids who went off to Columbia to start an ETV station or to Turkey to teach English or to Africa to build schools and hospitals. They were builders and creators as well as destroyers.

I would suspect from living with as well as among them that the best way to get to know them is through their music. It has extraordinary range -- not only of volume but range of mood and tempo and quality. And no one can begin to know them until he has faced up to the challenge of their music.

And so our times are haunted by the same ambivalence of all times -- open admiration for all the virtues of youth and open terror that these crazy, unpredictable kids are going to tear the whole fabric of western civilization down. We love them as consumers and fear them as activists, and, as a result both they and we are in a tough spot.

Indeed, a group of experts on adolescence came to the following conclusion not long ago:

> Free communication between adolescent and adult is difficult, so much so that many professional observers doubt that the differences between the generations in a rapidly moving society can be bridged. They feel that perhaps the most that can be hoped for is mutual tolerance, sincere negotiation, and relatively peaceful coexistence. (Normal Adolescence, Committee on Adolescence of the Group for the Advancement of Psychiatry. Charles Scribner's Sons, 1968, p. 102.)

I guess that it is a sign of my own advancing age that I refuse to be disheartened by that conclusion. Indeed, I feel that "mutual tolerance, sincere negotiation, and relatively peaceful coexistence" are a consummation devoutly to be wished whether between husband and wife, father and son, employer and employee, or teacher and student.

Let me explore with you for a moment what those terms mean to me. First "mutual tolerance." This obviously means respect for the special strengths each has and it also means that neither runs roughshod over the other. "Sincere negotiation." It seems to me that the most damning change which youth levels at age in our time is the charge of hypocrisy. On all sides they see us preaching one set of values and following another. It also seems to me that if by sincere negotiation we mean achieving consensus on the goals and then playing by agreed-upon ground rules that we will all be ahead. "Peaceful coexistence" to me implies deriving strength from tension and from competition without letting friction destroy us all. And it means accepting, nay, welcoming differences and individuality.

Be that as it may, given the apparently natural authoritarian thrust of the adult and the equally natural aggressive rebelliousness of youth on its way to adulthood aided and abetted in our times by the identification on both sides of a separate entity called a youth culture, how do we as educators take it from here?

I hope we don't find ourselves in the same situation as the New Jersey tourist in Maine. As one approaches Portland from the North on combined I-95 and US 1, the road forks. I-95 goes to the left and US 1 to the right, but above each road at the fork is a sign pointing to Portland.

The New Jersey tourist in his big flashy car pulled up with a screech at the fork and scratched his head; then he saw a Maine farmer in the field nearby. He rolled down his window and shouted, "Hey, buddy. Does it make any difference which way I go to Portland?" To which the Mainer replied, "Not to me, it don't."

We have about the same choices as adults and youth have had for years ahead of us. We might, for example, like Hesiod, throw up our hands in disgust and write-off the young. But that isn't so simple. One fifth of our population is between ten and twenty years of age. And they <u>are</u> here. We've produced them, and if you will take a good close look, I think you may find that you don't want to write them off. On the whole, they are much more extraordinary creatures at their age than we were when we were that age. They have read more, seen more, been more places, and just plain lived more than we had. They are taller and healthier, and smarter than we were. And, consequently, they have more capacity for greatness or for meanness than we had.

Another choice is to write-off us adults -- just quit and turn the show over to these bright and energetic kids. That won't work either because all of history shows us that the sense of what is good, what is just, and what is wise comes not with birth but with maturity, and maturity comes more slowly in humans than in any other creature.

Maturity in our species has to be nurtured.

A third choice is to seek the accommodation of "mutual tolerance, sincere negotiation, and relatively peaceful coexistence." And believe it or not, I think that may be exactly what you are concerned with in these days here. Externally you seem to be deeply involved in a whole new jargon of "systems," "objectives," "cognitive and affective learning," "taxonomies of learning," and other such phrases and processes.

But what I suspect is really happening is that you are being asked to develop a new perspective about the young people you have been teaching and about yourselves in the role of teachers.

In this context here, then, I would plead with you that you begin to perceive the young you need to communicate with not as adversaries, not as consumers, not as activists, not as students or trainees, and certainly not as crazy mixed-up kids -- but as <u>learners</u>. At one time or another they may well be all of those other things and more but at all times they are consciously or unconsciously <u>learners</u>. And that is the great quality which all young people share in common.

The other side of the coin is that I plead with you that you begin to regard yourselves not as teachers or trainers, or as dispensers of knowledge, or as defenders of high academic standards, or as authorities in a given subject matter, but as <u>facilitators of learning</u>.

All that is very easy to say and terribly hard to bring about. The young bring with them not only the natural rebelliousness of youth but also years of built-in resistance to a conventional teacher-student relationship. It will take some doing for you to convince them that your concern is for their learning.

And you bring with you, as any teacher does, whether civilian or military, years of authoritarism which regards the young as adversaries to be tamed and shaped and judged according to the syllabus or the manual or the normal curve or something.

Through thousands of years we've learned a great deal about teaching. We must have or we wouldn't be where we are today. In the past two decades we've learned a very great deal about learning. As the young of our time would say, "Let's get it all together" right now.

This is what I find so exciting as I review the program that you people are undertaking together. You are not simply gathering together to reaffirm that what all you have been doing is right if only you had had better students! Nor are you here just to dabble in old ways with new audio-visual aids and techniques. As I see it, you are taking the whole process apart to be able to start anew with deeper understandings and fresh perspectives.

Indeed you have yourselves become learners again, perhaps the greatest experience that can happen to one who calls himself a teacher.

Beginning with World War II, the Armed Forces took up the burden and the challenge of being the largest educational establishment the world has ever known. Struggling with that challenge, you have done extraordinary things for us all. In my own field of the judicious use of television in instruction the folks here at the Signal School in Fort Gordon have been pioneers and they continue to set a fast pace.

It is my fondest hope that out of your experience here will come the new design for learning, the new understandings of the process which very well may insure for the learner and for the facilitator for learning everywhere "mutual tolerance, sincere negotiation, and a relatively peaceful coexistence."

CONARC TRAINING WORKSHOP
5-7 October 1971
Fort Gordon, Georgia

IDEAS INTO ACTIONS

BG Ira A. Hunt, Jr.
Deputy Chief of Staff for Individual Training
Fort Monroe, Virginia

General Newton and Dr. Crawford have been with me as members-at-large and it has been our duty to try to find a thread of continuity to summarize this traning workshop, to list ideas for CONARC headquartes of what we might consider in the future.

The Armed Forces of the United States is the largest educational training organization in America, whether you measure it by numbers, or diversity, or by expenditures. During the past four or five years the armed forces have had to meet stringent requirements training our people on an accelerated basis for the combat area. It left us very little time for introspection. However, now that we are pulling out of Southeast Asia and we are entering into a peacetime environment the training of troops assumes an even more important aspect in the scheme of things. As General Haines has stated, our challenge is to improve our educational and training system under austere conditions that always follow a buildup of the type that we just had-to insure that the American fighting man continues to receive the best possible training. It's this challenge to improve our educational and training capability that sets the tone for this conference.

The theme of the conference as we all know has been the systems engineering of training. Our keynote speaker then set the tone for our theme when in his opening sentence he said: "Education is perhaps the most important activity of our age; it is unhappily also one of the most backward." I don't for a minute want to imply that the CONARC educational system in any aspect is backward, but then I think it is a fair assessment to say that we are not optimum. Dr. Lessinger went on to state that "The decade of the 1960's was a time for experimenting with technology and educational processes" and he quoted a few: " Instructional Television, team teaching, language labs and computer assisted instruction." He noted that this technical revolution left the American educational institutions largely undisturbed. He quoted then again: "In contrast the decade of the 1970's is likely to see a great deal of structural experimentation. " I will come back to this thought later.

So you see then, we have our challenge, our conference theme, and our keynote stressing the importance of education, our experimental technology, and the need to integrate this technology into the existing system. It is this need that has led me to call my summarization of this conference "Ideas into Actions." The time for experimenting is past, we have got to get results and to turn them into teaching technology. The means to do this is course design, or as we call it -- systems engineering. It is hoped that this workshop has served the purpose of being catalytic and influencing the translation of ideas into action. In this respect we have indeed been fortunate to have with us outstanding and renowned educators, to have with us our counterparts from sister services and we are pleased to have with us other government agencies - members of the Coast Guard, HEW, and others, and most importantly the working members of the CONARC system. This heterogeneous group of individuals and their free flow of ideas -- their stimulating presentations have indeed been catalytic.

Very important to this conference has been the setting here at the Southeastern Signal School, perhaps the jewel of the CONARC school system with respect to environment. These modern buildings and the enthusiasm of the staff, faculty and students of this institution, accompanied by their thoughtful efficiency and of their effective administrative arrangements, have provided the best possible background. And before I go any further, I want to convey on behalf of all of us here to COL McDonnell, to General Moore, and to your staffs -- our great thanks for a job well done.

What is systems engineering? I think one of the problems of systems engineering is its awesome title, it scares the instructors in a school. And if you go back to your schools, to your training centers, and try to get out of them systems engineering, find out how many really understand it, you will find that before they have even started they have sheered away from it. It is nothing but a systems approach for designing MOS, functional, and career courses. Purely and basically course design, and that's all it is. It consists of the following processes accomplished in sequence: First, job analysis; developing training materials; developing testing materials; conduct of training; and last - quality control.

One of our workshops included the generic entity of systems engineering. It was chaired by the Transportation School. They were thoughtful enough ahead of time to go out to the schools and centers and ask them what problems they were having in the implementation of systems engineering. They identified twenty-seven different topics, four were highly repetitive. These four of high frequency are: What is the criteria for selecting tasks for training; another was, how do we go about the systems engineering of soft skills, the third was,

what is the best sequence for effective learning, and the fourth was, how do you select your methods and media. These four were the prevelant problems. And it is these four things that I would like to discuss this afternoon.

But before I do, I would be remiss if I didn't say that there was one area that overshadowed the others in the comments and this was the administrative area, where people discuss such problems as manpower, the CONARC regulations, organizing themselves in their schools to get systems engineering done. Now as I see it, and I have some experience in a school, that the greatest drawback to systems engineering today has been our self-imposing restrictions - restrictions such as how to use our own people, limiting ourselves to fifty minute periods, what we should do with students in self-paced instruction who graduate early, limiting our ideas to monetary restrictions and not giving free vent. But, lastly I see an inherent institutional problem in our own organization where you get a lot of foot dragging from such people as branch chiefs who are quite unwilling to give up two hours of their instruction for the good of a larger thought of course design. These are all built in and they are administrative, and they are important. And today I would like to brush these aside because although they are important, they are not at the heart of what this conference is about.

Dr. Gagné in his summarization of systems engineering said, it is perhaps time that we considered the optimization of techniques -- techniques of deriving objectives, of identifying learning outcomes, sequencing of skills, etc., and he is absolutely right. I should like to point out however that in optimizing systems engineering, this does not mean the optimization of each of the seven steps -- we have been very prone to do just that. Some schools have spent two years in determining what the tasks were -- the job that needed to be taught. Others have expended extensive effort in trying to figure out the best possible methods of instruction. Discussions still rage in some schools concerning the evaluation of performance and criterion oriented testing. We must settle for the sub-optimization of the parts if we are going to optimize the whole. I guess, put another way around, we have got to get on with the job. We can't fool with two years of determining what the tasks are because everyone sitting here knows better than I that this, and I'll refer to it later on, is a cycle -- you get the second, third, fourth crack at systems engineering, but you will never get the second chance unless we get on with the job and finish it, initially.

First off I would like to say that I think that we have got to get a multi-disciplinary approach to systems engineering. If the schools don't already have it they've got to get to it. You've got to marry

up your curriculum division under the DOI with your educational advisor and with your instructors, as someone just mentioned. And you have got to go into this with a pooling of expertise-with a man who is deciding what tasks will be performed having to interface with a man who is going to decide how to teach these tasks-and not to do it compartmentalized as many of us have done in the past. I think that the criteria.which is one of our major problems that I mentioned before, for deciding what tasks have to be taught is really a function of the subjective opinion of these experts who form your team.

It is not an insurmountable problem. Systems engineering sounds very stylized and formalized, yet in reality it is basic logic -- what to teach, how long to teach, the best way to teach. There are no hard and fast rules. However, when we come to step three of systems engineering -- the training analysis -- I think we are getting to the heart of the matter. I think from my experience that this is where our hangups are, in the third step of systems engineering and training analysis. There are four operations required in this step: First, we must convert our job requirements to training objectives. Included in this training objective, of course, are standards. And when we have the standards we can then develop a course evaluation concept. And this, according to the methodology that we have, should lead us immediately into performance testing and criterion referenced testing, they follow exactly. We shouldn't be arguing over which type of testing -- it's automatic. Last, we must develop a course structure. And it's in this one area of course structure where I believe that CONARC headquarters has not given definitive enough guidance. I think that more definitive guidance from higher headquarters in many areas is required.

It is important to know what we are treating before we start, whether we are talking about a hard skill course or a soft skill course. Where hard skills are defined as those job related skills where we can formulate specific objectives which lend themselves to precise measurement. On the other hand, soft skills are cognitive strategies and attitudes, which are very difficult to analyze precisely. And thus our current methods of systems engineering fall somewhat short.

I have been delighted during this conference to see how many new ideas you have, how many people are thinking of way to systems engineer our soft skill areas. That is a great stride forward that is being made. Dr. Gray presented a thought-provoking matrix when he stated that all courses can be typified by considering the

learning factor, i.e., hard or soft skills. And by considering also student experience, and he listed three levels: Entry level, basic training, basic officers; advanced individual training; and his third level was those who have had advanced individual training as well as unit experience. In this matrix he comes up with six possible types of courses. He went on to say that we can structure these six types of courses, in accordance with certain methods. For example, the hard skill areas could be structured according to hardware, to duty areas, to systems, or to tasks. Whereas in a soft skill area they could be structured according to functions, the environment, tasks, or duty areas.

The main point I want to make thought is that, without a structure, it is extremely difficult to properly sequence a course. The feedback that I get from students, the feedback this summer from ROTC -- what problems do you have? The greatest problem for every student, every feedback that I have seen, without exception, is the sequencing of a course. That ought to tell us educators something that we're not getting across to these people, mainly because we didn't start out from step "a" with our own idea of how to structure our courses. Once we get our course structured, sequencing is no longer a problem. And once we follow training analysis, get our training objectives, it seems to me the how to teach also falls out.

Four of our workshops will involve the areas of how to teach and it is my belief, and it is an over-simplification but fundamental, is that the training objective will tell you how to teach. There is a limited hierarchy of training objectives. I heard two presentations during the conference which discussed just this. Training objectives such as trouble shooting, repair of equipment, operation of equipment.

When we have a clear definition of structure and training objectives, then I think we will be able to get into our courses with more of the computer assisted instruction, more closed circuit television, more even in the soft areas such as case studies and seminars. Now we are very remiss in this area. When CONARC reads through your programs of instruction, you will be aghast to learn that only one, two, three percent of a course is involved in these new areas we have spent so much time discussing.

Unquestionably, our schools are amongst the leaders in the country in methods and media, innovations, and in experimentation. But we have got to marry the researcher and the user. We must do a better job in determining cost effectiveness, and until we get our training objectives and our course structure, this is not possible. But we are getting there. I believe as a result of many of the ideas

that we have heard in these workshops, that we will better differentiate between our hard and soft skills requirements, we will more closely focus on our training objectives and we will be able to translate the objectives into instructional technology.

Our last workshop area had to do with the quality control of instruction. This very important area of training accountability, diagnosing training problems and testing had some of our most heated discussions. I think we are well along the path of criterion referenced testing. We have all heard how HumRRO has made some stimulating progress at our training centers. Some of our schools have applied performance testing to whole courses, thereby enhancing their instruction. Two courses right here at the USASESS are operated on the self-paced principle. So then we complete the cycle of systems engineering which began with defining the tasks and ends up with the feedback.

As I mentioned before, our job is never done. Trainers and educators must continue to search better ways. Our requirements in the field are always changing. We are introducing new equipment constantly. And so the job of systems engineering is a continuing requirement.

I asked a group of workshop leaders to list for me the good and bad aspects of this conference. They all agree that the experts that attended in such great numbers added immeasurably to the discussions; that there was a great opportunity for talk and discussion. The fact that the conferees were from all levels of the establishment brought in-depth expertise, and, of course, the administrative support here at Fort Gordon was truly outstanding. On the other hand, there was an unanimous desire for more time. There was a desire to get into specific situations in depth which would lead us and give us a forum for utilizing our experts with better opportunities. There was also an echo or two concerning the changing role of the instructor, and the desire to know about the person that we are teaching. I think these two things, the changing role of the instructor and the student, might be the grist for our next conference. What is the changing role of the instructor: We hear how he is now becoming a diagnostician, a manager to his students; his former role of lecturer is becoming secondary. Dr. Bair in his outstanding dinner presentation highlighted the challenge of communicating with today's youth. To be effective, we must never forget the human element. The use of live models is so important, particularly in the soft skills area. Instructors and drill sergeants in the last analysis are the key to good teaching; however, it is the students that are the learners and I would like to close my comments today stating that everyone here is in the learning business. The key to

everything we have to do is in the one word - learning.

In closing, on behalf of General Haines, General Moore, Colonel McDonnel, we want to thank you for your attendance and far above all, your participation. We wish you all a safe journey home, and thank you very much.

Computers-in-Training Specialty Workshop

Summary

1. Computers are being extensively used in military training and civilian applications. Applications are diverse and tend to be restricted to small number of trainees at various locations. The number of students being served is increasing and the quality of programs is being improved. This seems to be true of Army efforts as well as the Air Force, Navy and Marine Corps.

2. Incomplete evaluations of comparison with conventional instruction show small but significant superiority in achievement for CAI-taught groups. Time savings of about one-third are realized when compared with conventional instruction. Real potential appears to be in terms of cost-effectiveness. However, much remains to adequately account for all factors in cost-effectiveness assessment of CAI.

3. Need exists for documented evaluation reports on CAI training experience. Reports are necessary to demonstrate the quantitative data which supports the qualitative decisions about the worth of CAI in meeting training needs.

4. A problem with the individualized approach to training which seems inherent in CAI is the profitable utilization or time savings -- involves personnel departments and group personnel assignment policies.

5. A strong plea was made for a common interservice nomenclature. There is much mixed meaning in the terms computer-assisted instruction, computer-administered instruction, and computer-managed instruction. CONARC has published a Glossary of Terms.

6. Staff and faculty must be oriented on the use of computers in education and training. Should include "hands-on" experience with actual programs.

7. Computer based systems should provide uniform quality control in training.

8. Concensus is - there has been greater success in application of available hardware than in capitalizing on the potential of computers in individualizing training maximizing on learning potential. Future conferences should discuss the development and implementation of instructional strategies to meet these needs.

EDUCATIONAL TELEVISION AND TRAINING FILMS SPECIALTY WORKSHOP
SUMMARY

There have been many changing requirements in CONARC training. For television and training films to be effective ETV/TF must get to the trainee wherever he may be training -- be it classroom or field. New, small television and film cassettes are available in portable format. Problem is standardization of equipment to provide interchangeability of video tapes and films. The highlight of the 23" giant presentation was the use of television to give a closeup view of small items of equipment. Major problem in production of training films in CONARC is in scripting. CONARC encourages schools to write their own scripts.

CONARC was charged by DA with FY 71 management of the motion picture/television production program. History of Army-wide Training Films was traced to show support of unit training and the mission of schools.

Army and Air Force approaches are similar in television and training films and conversion of ETV to color by 1975. Sony and AVCO Corporations demonstrated new video cassettes and cartridge machines.

Academic credit by television problems and objectives of instructional design of education and more meaningful use of television and films was stressed.

Cost effective use of television in Army training will save on limited training resources.

Increased utilization of television in Reserves and ROTC training pointed up the appropriateness of television in self-critique of summer ROTC training using portable television units and indicated increased use of video tapes for campus instruction of ROTC cadets.

Changes in the upcoming BCT, ALT training in MVA will influence the use of television at Fort Dix. The Infantry School Individual Learning Centers use a combination of film, slides, and television for individual-paced instruction. A look at the past through use of slides followed by a tape showed the possible future direction of educational television and the integration and use of multi-media in the year 2001. Audio-Visuals must be effectively used to support the type and caliber of soldier that will make up the Modern Volunteer Army.

APPENDIX G2

INDIVIDUALIZED INSTRUCTION SPECIALTY WORKSHOP
SUMMARY

First session expressed how educators and trainers have dealt with individual differences in students, explaining distinctions between five forms that individualization of instruction may take. Three major system problems must be resolved if individualization is to be successful - the administrative-logistics problem, mastery problem, and student motivation problem.

Experiences with a low-cost instructional model suitable for multi-aptitude training populations were described. This model, developed under HumRRO Project "APSTRAT" (Aptitude Strategies), involves individualized, self-paced learning in an operational functional context and utilizes peer instruction. Application is being made in the Field Wireman Course (MOS 36K20) in Army training centers. Utilization of individualized instruction in high density Army courses includes self-paced MOS training as applied in four courses - clerk, clerk-typist, personnel specialist, and key punch operators. Successful use of programed instruction text in those courses was explained along with the advantages in terms of time savings and increased proficiency. Methodology involved and results achieved from evaluation of Project COBET -- Common Basic Electronics Training -- was reviewed. In COBET, programed instruction texts and audio visual devices are used in a carrell configuration to provide individualized instruction.

Air Training Command presented individualized instruction in Air Force technical training. Programed and individualized instruction are used by the Air Force to provide the quality of instruction while reducing training time and cost. Basic format for individualization which permits self-pacing, a variety of learning media, and go-no-go criterion testing was described by the Navy. The Navy's basic electricity and electronics courses are fully individualized. Advantages and disadvantages of Army, Navy and Air Force approaches, as well as cost factors involved were examined.

Management training for heterogeneous groups at the US Army Quartermaster School emphasized the selection of media in conducting individualized instruction programs -- with media selection based upon (1) task to be taught, and (2) suitability of selected media for the individual being trained.

Administration and management of self-paced programs, student motivation, attendance, and progress in a program were discussed and an explanation given of a "progression index" which is used as a student control device. Regulatory controls for students as they relate to courses of various lengths were discussed.

METHODS AND MEDIA SPECIALTY WORKSHOP
SUMMARY

Established theoretical and practical considerations in use and selection of methods and media. Types of considerations in selecting methods and media include: when to make the media selection in designing the instructional system; establishing the context within which the course is to be designed; criteria or rationale for selecting media; type of stimulti or learning mode; design criteria, i.e., minimum performance to be accepted; use of checklist to match media and methods with characteristics of learning; and ease of presentation management (executive decisions) as to comparative effectiveness and trade offs of methods and media.

Role of the course designer in the methods and media solution as opposed to the instruction being involved was discussed. Scheme for selection of media, methods and training aids in the systems engineering process was outlined. Use of a matrix for selecting methods and media was demonstrated. While each training establishment has its own special problems and requirements for specific approaches, the matrices and considerations for media selection are extremely valuable aids for course designers and instructors.

Some theoretical concepts in the development and use of miniaturized systems simulation and simulators were presented. Laser beam rifle and target simulators were discussed. Concept and the developmental actions resulting in a simulation system system for air mobile command and control simulators and for a combined arms tactical training simulator was reviewed.

Learning centers and multimedia centers were discussed from the Army, Navy and Air Force perspective -- the process was extremely valuable since it included practical examples of ongoing systems in the respective services.

Comparative cost-effectiveness of various media and methods is a complex problem and has in the past even been misleading. Possible solutions and alternatives were presented.

Some basic issues addressed were: In selection of methods and media consider the total system and instructional design; there is a tendency by the course designer to ignore the instructor; more research is needed in simulation and requirement for low cost and more simulation at the lower trainee level; more effective use of individual learning centers and multimedia centers; need to bring training to the learner rather than the learner to the training; tendency in the systems approach in the military for the system to be too big and not responsive to the trainer; learning effectiveness is as or more important than cost effectiveness; when is OJT cheaper than school training; Media and Methods "Tails Sometimes Wag Training Dogs."

APPENDIX C4

Quality Control Specialty Workshop

Summary

1. Army service schools should adopt criterion referenced evaluation in all courses conducted to insure that the trainee can do each job for which he is trained. Superior performance on one task could not compensate for inadequate performance on another; in effect courses should be "multiple hurdle". This goal presents problems in group paced courses (time constraints cause problems in handling failures on an individual basis, and obtaining recognition (on manpower surveys) of staffing to support remedial training.

2. A need exists for ADP support of training quality control. Schools without ADP support claim inability to conduct an efficient and/or effective quality control program without ADP support.

3. Detailed feedback to the instructional system is necessary.

4. Standards (absolute, fixed) are required but concern was expressed with how such standards are determined.

5. Concern was expressed that the present requirement to identify the honor graduate, the honor students and the upper half of each class as eligible for promotion, produces inequities. Issues are: failures are promoted (by the company and the field) before successful graduates; and requirements are not compatible with criterion referenced evaluation. Identification of "honor students" in self-paced courses (based on completion times) was recognized as an excellent approach.

6. Evaluation of subjective tasks (briefings, staff studies, etc.) was recognized as highly subjective and while many proposals but no solutions were offered. Post-graduate questionnaire return rates (10 to 80%) continue to be a problem. Also terminology problems again were surfaced.

SYSTEMS ENGINEERING WORKSHOP
SUMMARY

The Army's system engineering program is in step with other services and ahead of the civilian sector in implementation. However, Army progress lags behind the commercial community in the refinement of techniques and procedures. Differences between the Army's program and the Marine Corps are found in the organizational separation of the job analysis phase and the direction of initial efforts towards unit training. The Navy's involvement in systems engineering centers about their modified systems engineering approach. The acronym PILOT -- Performance-centered, Individualized, Learner Oriented Training - identified the Navy approach to, and extension of, the systems engineering process. The Navy's departure from the traditional systems engineering to curriculum development is in the lack of a formalized job analysis and in the emphasis on development of software to individualize instruction. The Air Force's systems engineering problems, philosophy, direction, and current status closely parallels the Army.

Limited implementation of systems engineering within the civilian community, breakdown of the function and the conditions of learning, and the attainment of the hierarchy of objectives were presented.

A display of specialized materials and techniques for systems engineering training focused on step-by-step procedure for the conversion of tasks into objectives and directing this objective in a fixed sequence to facilitate a transfer of learning between objectives.

A concept for solving administrative problems associated with the systems engineering proposed a new command organization which provides for a centralized Systems Engineering Department. Revisions in course scheduling policy and procedures were suggested as a means of further increasing administrative flexibility while also providing for efficient and effective allocation of personnel and resources.

Review of successes achieved and problems remaining in the systems engineering of Soft Skill Courses also identified the need for developing standardized criteria. Subjective evaluation techniques, by necessity, substitute for criterion referenced assessments.

A computerized task inventory technique that employs the concept of Functional Context training was described. The format includes task statements and supporting skills and knowledges, doctrinal references, course and test item location, frequency of performance data, and performance standards. It arranges and communicates information required in curriculum development.

A presentation on course structuring based on learning effectiveness identified that optimum course structuring can be determined and that standardized criteria can be established.

CONARC TRAINING WORKSHOP
Ft Gordon, Georgia
5-7 October 1971

ROSTER OF ETV RECORDINGS

TVR #	TITLE	SPEAKER	RT
1. Opening General Session:			
28-40	Remarks	LTC George E. Fort	1:40
28-41	Welcome Remarks	MG Harley L. Moore,Jr	:55
28-42	Welcome Remarks	COL P.J. McDonnell	1:48
28-43	Workshop Mission & Purpose	GEN Ralph E. Haines	19:10
28-44	Remarks Workshop Orientation	COL Hudak, CONARC Mr. Harold A. Schulz	13:30 1:00
28-45	Orientation to Speciality Workshops: Computers in Trng	Dr. Vincent Cieri	7:30
28-46	Orientation to Speciality Workshops: ETV & Trng Films	Mr. Dolan	8:30
28-47	Orientation to Speciality Workshops: Individualized Instruction	Mr. N.B. Carr	7:15
28-48	Orientation to Speciality Workshops: Methods & Media	Mr. Kneisel	9:30
28-49	Orientation to Speciality Workshop: Quality Control	MAJ Nelson V. Wood	9:50
28-50	Orientation to Speciality Workshop: Systems Engineering	LTC Lucien R. Garneau	7:40
28-51	Keynote Address-Accountability: The Case for Educational Engineering	Dr. Leon M. Lessinger	48:30
2. ETV/TF Speciality Workshop:			
28-52 A & B	Welcome to the ETV/TF Workshop	Mr. Dolan	3:00A 3:50B
28-53 A&B	Help from the 23" Giant	Mr. Carrigy	25:40A 26:40B
28-54 A&B	Script Writing Made Easy	Mr. Dolan	26:47A 44:15B
28-55 A&B	School's Role in Army-Wide Training Films	COL E.D. Weaver	31:02A 22:00B

TVR #	TITLE	SPEAKER	RT
28-56A & B	The Air Force Outlook for ETV	Mr. A. D. Hemphill	43:00A 27:20B
28-57A	Air Force Plans for ETV	Mr. A. D. Hemphill	25:00
28-57B	ETV Discussion Period	Mr. Dolan	25:00
28-58A & B	Demonstration of Video Cartridge Cassette	Mr. Joseph Walsh	35:40A 32:46B
28-59A & B	Academic Credit by Television	Dr. Edward Cavert	36:50A 58:12B
28-60A & B	Cost Effectiveness through the Use of Television	Mr. Joseph Walsh	34:30A 23:00B
28-61A & B	Television in Training - VOLAR	Mr. Douglas Long	11:30A 9:00B
28-62A	Television in Training-Reserves	MAJ Shannon	8:00
28-63A	Television in Training - ROTC	MG Goers	7:00
28-64A & B	Television in Training - Self Paced	MAJ Melvin Russel	6:00A 11:00B
28-65A & B	2001 Television Odyssey	Mr. Murray Tesser	30:52A 29:00B
28-66A & B	Audio Visuals in the Army's Future	Dr. Joseph Kanner	17:00A 15:30B

3. Closing General Session:

28-71	Workshop Summary	COL Hudak	Not rec
28-72	Introduction to Summaries of Speciality Workshops	Mr. Harold Schulz	2:30
28-73	Summary of Speciality Workshop Computers in Training	Dr. Cieri	5:26
28-74	Summary of Speciality Workshop ETV and Trng Films	Mr. Dolan	6:44
28-75	Summary of Speciality Workshop Individualized Instruction	Dr. Robert A. Smith	5:10
28-76	Summary of Speciality Workshop Methods and Media	Mr. Richard Kneisel	7:30

TVR #	TITLE	SPEAKER	RT
28-77	Summary of Speciality Workshop Quality Control	Mr. James L. Sherill	4:10
28-78	Summary of Speciality Workshop Systems Engineering	MAJ Tamer	6:25
28-79	Workshop Critique (Note: This recording also appears seperately in para 5 as TVR 28-100)	BG Ira A. Hunt	22:00

4. Systems Engineering Speciality Workshop:

28-80A & B	A Status Report: Army	MAJ Robert S. Tamer	24:11A 19:00B
28-81A & B	A Status Report: Marine Corps	LTC Edwin J. Godfrey	17:45A 30:00B
28-82A & B	A Status Report: Navy	Dr. Charles Havens	20:53A 19:30B
28-83A & B	A Status Report: Air Force	Mr. William S. Neal	32:36A 28:15B
28-84A & B	Systems Approach to Course Design in the Civilian Community	Dr. Robert M. Gagne	65:45A 65:45B
28-85A & B	Systems Approaches to the Design of Curriculum	Mr. James L. Foster	28:45A 24:40B
28-86A & B	Administrative Innovation	Dr. P.W. Tiemann	20:00A 21:00B
28-87A & B	Soft Skill Courses	Mr. Charles Harvey	19:00A 24:40B
28-88A & B	Computerized Aspects of Systems Engineering	Mr. James E. Henry & Dr. Howard Wagner	22:00A 20:30B
28-89A & B	Course Structure Concept	Dr. Charles O. Gray	15:35A 18:30B
28-90A & B	Commercial Approach to Systems Engineering	Dr. William Hoyt	42:30A 27:30B
28-91A & B	Views from CONARC	Mr. McDowell	10:00A 24:30B
28-92A	Workshop Observations	Dr. Robert M. Gagne	31:00A

TVR #	TITLE	SPEAKER	RT
5. Consolidated Recordings:			
28-97	Opening General Session: Welcoming Address	(TVR 28-40, 28-43)	24:30
28-98	Introduction to Speciality Workshops	(TVR 28-44, 28-49)Reel #1 (TVR 28-50)Reel # 2	59:30 7:40
28-51	Key Note Address (this program also listed in paral)	Dr. Lessinger	48:36
28-99	Summarization of Speciality Workshops	(TVR 28-72, 28-78)	37:50
28-100	Workshop Critique	BG Ira A. Hunt	22:00
6. Recordings Made Subsequent to the Workshop:			
28-93	USASESS Experience in Methods and Media Selection	Mrs. Lakeman	21:55
28-94	USASESS Computer Assisted Simulation Training	MAJ Truehart	10:30
28-95	Management and Control of Students in Self-Paced Courses of Instruction	Mr. Danilovich	30:00
28-96	Go-No-Go Grading	Mr. Carr	14:30

7. Audio (only) Recording:

A fair quality recording has been preserved of Dr. George E. Bair's speech at the workshop banquet - 32 minutes.

Addressees who desire to borrow copies of tapes, should submit request to:

Headquarters, CONARC, ATIT-SEF, Fort Monroe, Virginia 23351.

END

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