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Inglis House Conference
On the Role of Psychology
in Project MICHIGAN

Edward L. Walker, Moderator

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*The University of Michigan
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INTRODUCTION

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The Inglis House Conference on "The Role of Psychology in Project MICHIGAN" was held to obtain guidance with respect to how the area of psychological research growing out of Project MICHIGAN should be developed. The conference was organized at my request by Professor Edward L. Walker of the Psychology Department of The University of Michigan. It was held 16-19 April 1957 at the University's Inglis House. The document which follows is the final report of this conference.

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THE ROLE OF PSYCHOLOGY IN PROJECT MICHIGAN

In considering the role of psychology in Project MICHIGAN it was necessary to deal with some of the larger issues involved in order that detailed recommendations might be made within the framework of the larger setting. Therefore, a summary of the discussions may be organized around three broad problems:

(a) the mutual benefits to be derived and the dangers involved in the association of a large-scale research project like Project MICHIGAN with the institutions and functions of a major university,

(b) the character of psychological problems posed by and pertinent to Project MICHIGAN, and

(c) the desirable relationships between the Psychology Department and the psychologists and psychological research within Project MICHIGAN.

LARGE-SCALE RESEARCH PROJECTS AND THE MAJOR UNIVERSITY

It was the consensus of the group that the presence of large-scale research projects in the setting of the major university can be of considerable mutual benefit to both the university and the contractor involved: e. g., in the case of Project MICHIGAN to The University of Michigan and to the Army. It was also the feeling of the group that in asserting this opinion and most of those which follow, it was merely affirming principles and policies already in existence at The University of Michigan, although not always wholly realized.

Possible Benefits to the University

Large research operations can and should serve to enrich the university community. They make it possible to bring to that community professional personnel in greater numbers and in greater diversity than can be supported within the more traditional framework of the university. Many gaps in existing departments could be filled in this manner. It is also possible that the presence of such projects could serve to help retain existing personnel who might otherwise be attracted to other positions.

The modern university has long since assumed major responsibility for the origination as well as the dissemination of knowledge. Research and development operations such as those to be conducted under Project MICHIGAN offer the possibility of knowledge origination not otherwise available. For example, there is much to be learned about the behavior of large man-machine systems which cannot be learned without having available an actual or a simulated system. Neither the system nor its simulation can be made available without extensive contractual support.

In a less concrete, but no less important manner, the presence of a successfully managed large-scale research organization enhances the reputation of the university with which it is associated and thus provides a number of less tangible benefits, especially in the area of obtaining and keeping good students and staff members.

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Possible Benefits to the Contractor and to Society

A contractor, such as the Army, is often in a position of having available no alternative other than contracting with a university for fulfilling its social responsibilities. It is clear that research is of paramount importance in the preservation of our country and our way of life. Military organizations rarely have the capacity to recruit, assemble, and maintain groups of people with the knowledge and skills required by the dimensions of the problems they must solve. Other than the universities, there is often no repository of high-caliber experts available to them. The military must depend in part upon the universities for aid in fulfilling its responsibilities. The contractor obtains this benefit only if the relevant staff of the university has a substantial association with the research and development activity supported by the contractor.

Possible Detriments to the University

It was the feeling of the group that there were no serious disadvantages intrinsic to the association of a major university and large-scale research projects which could not be eliminated by proper effort. Nevertheless, there are areas in which difficulties have occurred, and the resolution of these difficulties is not an easy task.

Perhaps the most obvious dissatisfaction arises when the association between the large-scale research project and the university is mainly of the nature of physical contiguity rather than functional interaction. In this case neither side receives the expected benefits, and the university's efforts in this regard are wasted. The high likelihood of such nonfunctional association apparently arises out of the very different organizational structures and traditions of the two institutions.

The presence of a large-scale research project in a university represents a substantial increase in the size of the budget and the number of staff personnel. Unless the benefits of the association are large, it may occur that its presence represents a net loss in space, time, and resources which might have been more profitably devoted to other purposes.

Many large-scale research projects, and Project MICHIGAN is an example, involved materials which carry government security classifications. Knowledge which is not communicated is hardly knowledge at all. This barrier to the dissemination of knowledge is a problem which must be dealt with.

Finally, there is the occasionally expressed concern that the wealthy project will raid the university staff of its top men who would otherwise be devoted to more fundamental research.

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Mechanisms Aimed at Assuring Mutual Benefits

It seemed clear to the group that the number of people involved in research of all kinds, the magnitudes of the sums of money to be spent, and the complexity, variety, and continuously changing character of the problems involved required the full-time attention of a capable administrator. It would be his primary task to assure that the university did in fact obtain the benefits which are a potential of the association with large-scale research activities supported by outside agencies. He would be primarily an administrator of policy set by either an advisory or executive group so constituted as to represent the best interests of the university as an educational institution. His titular status would of necessity be commensurate with the responsibilities involved — possibly Vice-President in Charge of Research Administration.

Cooperation between the research staff and the members of the departmental faculties of the university is imperative and should be encouraged in every possible way. There are many ways in which this can be done.

Full-time research workers should be given occasional teaching responsibilities whenever it is possible to do so. This mechanism would help to assure the acquaintance of such persons with the educational goals of the university. It would afford opportunities to the research staff which would add considerably to their professional development.

If the above recommendation is to be implemented, university departments should be consulted in the recruitment of staff for the research activity. It would often be true that of two prospective employees in research, one would be suitable for occasional teaching and the other not. It might be equally true that the needs of the research project could influence an otherwise equal choice of areas to be developed within a department. Therefore, some mutual advisory arrangement must be instituted which assures consultation without hampering the personnel policy of either group.

A variety of mechanisms for involving the college faculties with large-scale research efforts were suggested in discussion. A faculty member might take some of the project research into his own laboratory, more or less on a subcontract basis. A faculty member might serve as a consultant on project research. A group of faculty members might constitute a technical advisory committee to the project as a whole or to some subarea or task. Such a group would be mainly responsible for the long term consequences of the project, in contrast to the project or task

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director who must, of necessity, be more oriented toward the immediate goals of the research and the contractor.

A member of the college faculty might, on occasion, assume directive responsibility for some segment of the project's research efforts within the context of the project.

It is imperative that a place be made for graduate students within the project activities and, wherever possible, students should be permitted to do dissertation research while so employed.

The project should be able to draw on the faculty of the college for full-time service of senior staff members on a loan basis. The circumstances in which this mechanism would be most useful would be those in which the project required someone to initiate an activity or a group. The faculty member on loan could do this while actively engaged in finding his own permanent replacement on the project.

The group was unanimously in favor of the established principle at The University of Michigan of "extra compensation for extra work." It has been their collective experience that in those institutions in which such a principle is in force, the advantages outweigh the problems it occasions. In those institutions in which it is not in force, interaction is held to an absolute minimum or in some instances cut off altogether. The principle, however, should probably not be applied unilaterally. A full-time research person should be granted the same privilege under the same conditions — that consulting and teaching be considered extra work and not a substitute for a portion of his normal responsibilities. He should be permitted to consult with outside agencies and to teach when his services are requested by a department. Such activity should be limited in amount, but extra compensation should be permitted.

The problems of the real and the perceived status of full-time research personnel were extensively considered. It was not considered a necessary concomitant of the association of the university and large-scale research that research personnel be mutually regarded as, in some sense, second-class citizens. The problem has many facets. Steps already suggested will go far toward alleviating the problem. Personal security in a sense equivalent to tenure can be achieved through the establishment of a stable institution. Highly diversified research support, long-term contracts, reserve funds which separate contract termination from employment termination, and additional salary or equivalent fringe benefits are all effective in establishing a stable institution. Not to be completely neglected are the superficial accoutrements of faculty status such as football-ticket priority, parking privileges, and membership in the Faculty Wives Club. In the long run, equivalent

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status will be achieved when full-time research personnel feel they are members of the university, working toward common goals, and when identification with the product of the research effort is a source of pride.

The security classification of much government research poses a real problem, but one which is subject to amelioration. There are often delays in research efforts because clearance procedures require time. A partial solution would involve fairly systematic requests for clearance investigations of certain staff members and students in anticipation of their future participation in classified efforts. Furthermore, it was the experience of most members of the group that it was the details of the situation which defined the problem which required classification. Once the problem is clearly set, the research can be conducted on an unclassified basis and the results broadly disseminated. The staff should be encouraged to extract all possible unclassified findings from classified studies and report them in regular professional media. There should be an active and energetic policy of rapid declassification as the security status of material changes. Finally, of course, the university should try to keep projects with security classifications at a minimum. Many of the disadvantages of classified research can thereby be reduced or eliminated.

Finally, university research is often described as predominantly "basic" research in which the directions taken are entirely determined by the investigator involved. Contract research often emphasizes developmental problems and more "applied" research. One of the unique facets of the university setting for large-scale research, as opposed to the private research organization, is the possibility of developmental work (short-range and long-range research moving along simultaneously). As a matter of principle, the university should probably not involve itself in large-scale research which does not anticipate balanced support for basic research parallel to the easily discernible needs of many contractors for developmental and applied work.

In view of the magnitude of the problems involved, the group wished to make a strong recommendation that administrative procedures be set up to encourage continuous review and revision of the relationships indicated.

AREAS OF PSYCHOLOGICAL RESEARCH AND DEVELOPMENT IN PROJECT MICHIGAN

Time placed limitations on the level of detail in which the conference participants could consider the problem of areas of psychological research. In a short conference period it was not possible to present the highly varied, complex, and numerous problems of Project MICHIGAN except in a very broad way. Furthermore, the recent major reorientation of the direction to be taken by the project left Project MICHIGAN personnel in the position of having, for the most part, plans rather than accomplishments to discuss. (See Appendix A for a description of the project and its current task organization.) The conference participants thus approached the question, "What can psychologists contribute to Project MICHIGAN?" with some temerity, because none of them felt sufficiently informed about the combat surveillance problem of the Army, or the proposed equipment, to identify with assurance the specific research and development products that are required. However, it did seem possible to offer some general guidance with respect to such matters which would be based on the experience of psychologists with analogous man-machine systems generated for the solution of military problems or the satisfaction of military requirements.

This general guidance must necessarily be derived from the role of psychologists in the development and test of complex weapons systems such as the SAGE system, the ATLAS system, and the B-58, C-135, and F-102 aircraft systems. These systems have in common with the Combat Surveillance System the fact that they are man-machine systems and must be conceived and developed as such; further, they are never static in design but are actually in a continuous process of modification, either of equipment functions, human-component functions, or both.

Insofar as the system involves men, and therefore assumptions about the performance of men, psychologists have quite specific roles in the development and test of the system. The research of psychologists on abstractions from the system — research on characteristics of the human component taken alone, or research on man-machine interaction in sub-systems of the total system — must ultimately

derive its justification from the observations or hypotheses formulated in the process of system design, development, and test. These are as follows:

1. A man-machine system design is incomplete unless the characteristics of the required performance of the human operator(s) in the system have been specified. This is frequently overlooked. Even when not overlooked, the descriptions of the expected human functions are too sketchy or too ambiguous for effective use by the psychologist as the basis for inferences about system-design deficiencies, the actions required to produce the necessary knowledge and skills in the human component through selection and training, or identification of critical questions about human performance that can only be answered by new research. The first function of the psychologist should be, therefore, to participate in the complete description of the Combat Surveillance System proposed for 1960, and his subsequent participation in description of system redesigns for 1962 and future years. This is his role in "system engineering."

2. With the propositional statements about the required characteristics of the human (components) as the basic referents for his further work, the psychologist is then able to do the following:

- a) He gives his attention to the adequacy of displays and controls with which the human must interact in order to perform the specified functions. This involves him in the process of component equipment development in the manner customarily described as "human engineering." For this purpose he can usually work with the sub-system simulators.

- b) He identifies and explores special problems associated with (i) the development of operating procedures (either as rules for the action of the crews, or as rules for controlling the abilities and experience of the human operator in order to facilitate the emergence of effective crew-generated operating procedures), (ii) the formulation of tests of the proficiency of the human component or the system as a whole, and (iii) the formulation of training procedures and training equipment requirements and other critical elements of the personnel system required to support the assumption the system designer has made about the human components.

In order that he might have the opportunities that are needed as supports for his analysis of system functioning with emphasis on the men, and in order that he might test his inferences about each of the problems mentioned above, the psychologist needs to be a participant in the design and accomplishment of operational training and of field tests of the system. But of much greater importance is his requirement for a "system simulator" since this must serve him as the "real-time" test of

his inferences about the performance of human components of the system, and also must serve as an experimental situation for the exploration of the efficiency of the human as a function of system modifications. In fact, in the case of Project MICHIGAN, it is the consensus of the group that the major function of a system simulator is to assist the psychologist in studying the human component, while the function of evaluating equipment components and their interactions takes a secondary position. For this reason, the psychologist must play a prominent role in specifying the characteristics and variable capabilities of the system simulator, and must, by the same token, heartily endorse the effort to develop such a system simulator. It is only by this device that "operational experience" with the man-machine system may be had in advance of actual operational experience.

c) Based on the activities outlined in (b), it becomes possible for the psychologist associated with Project MICHIGAN to make confident statements about such factors as selection, training, on-the-job training, job aids, standing operational procedures -- in other words, the personnel system that the Army must institute in order to support the effective operation of a Combat Surveillance System. While this is not an explicit responsibility of Project MICHIGAN, as reflected in its work statement, it is properly included in the development of any new complex system that employs men.

It was agreed that the best interests of the Army, the University, and the Psychology Department would be served in a setting in which developmental work, applied research, and more basic, long-range research were developed simultaneously. Furthermore, the group felt it was important to point out that the "systems concept" forces the psychologist to develop new ideas and techniques, with the result that the probability of payoff for a given approach may be low. On the other hand, there are many urgent problems in Project MICHIGAN, such as the interpretation of infrared records, where immediately applicable results from the use of available standard techniques could be expected.

PSYCHOLOGICAL PERSONNEL IN PROJECT MICHIGAN

It was the belief of the group that there is one essential step toward the effective development and utilization of psychology in Project MICHIGAN and toward the effective coordination of that work with psychology in other parts of the University. This is the employment of a top-level experimental psychologist who would be capable of fulfilling a complex of responsibilities that stem from the direct needs of the project and from the less tangible requirements of the community situation.

The man should have broad experience in relating psychological research to military and engineering problems, a recognized position in the field of psychology, and managerial capability. His responsibilities would include

1. advising the Director of Project MICHIGAN on matters pertaining to psychology and human factors;
2. supervising psychological research in Project MICHIGAN;
3. assuring cohesion and professional identification among the psychologists on the Project MICHIGAN staff; and
4. effecting liaison between Project MICHIGAN, other psychological activities within the Engineering Research Institute, and the Department of Psychology and the psychological groups associated with it.

Although his basic position would presumably be in the Engineering Research Institute, fulfillment of his several responsibilities would, we believe, be facilitated by appointments

1. to the group advising the Director of Project MICHIGAN
2. to a position of administrative responsibility for a psychology group of Project MICHIGAN,
3. to the Graduate Committee of the Department of Psychology, and
4. to a tenured Professorship in the Department of Psychology.

It was felt that the requirements called for a truly outstanding man; one capable of assuring effective contributions from psychology to the work of Project MICHIGAN and, at the same time, mutually constructive interaction between

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Project MICHIGAN and psychologists in the other parts of the university. Such a man would begin to contribute almost at once in a substantive way toward the solution of Project MICHIGAN's combat surveillance problems, and it was thought appropriate that those problems be of direct and primary concern to him. There will be need, however, for a number of full-time research men and also several advisors and consultants in the area of psychology. The most vital contributions of the key psychologist should therefore be expected in the zones of planning and organization and in the attraction to Project MICHIGAN of outstanding research talent for the study of man-machine interrelationships. This man was envisioned as participating in the top-level thinking and planning of Project MICHIGAN and, in the human-factors area, as fulfilling the responsibility of transforming the plans into action.

Though psychology will prove to be of great value to Project MICHIGAN, the number of psychologists on the project will probably always be small relative to the number of engineers and physicists. This circumstance may raise for the psychologists a somewhat special problem which, in the experience of the group, is well worth attention: the problem of professional identification. The problem would be almost sure to arise if the psychologists were scattered among diverse groups. On the other hand, it is less likely to appear if all the psychologists are associated in a psychology group, within which they may reinforce one-another's professional aims and motivations. Membership in such a psychology group is, of course, consistent with assignment, on a task basis, to other groups in the project. The leadership of the psychology group, if one be created, is one of the responsibilities we consider appropriate for the key man we are suggesting.

Responsibilities extending outward from Project MICHIGAN would also be important. These will involve relations with human-factors groups of the military and other organizations with which Project MICHIGAN must cooperate, and also with other psychologists working within the university community. An important aspect of the senior psychologist's task would be to encourage and facilitate participation in Project MICHIGAN by psychologists on the college faculty. An understanding by the academic psychologists of the problems and opportunities provided by Project MICHIGAN may, of course, have an influence on the direction of certain parts of graduate education and research in psychology, and thus the senior psychologist's responsibilities would extend indirectly into that area.

Thus, to summarize the recommendations of the group regarding the key initial

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administrative step towards the realization of these various potentialities, the following can be said. It will be necessary to find and appoint a top-level senior psychologist and to make it his primary responsibility to see that these potentialities are realized. He must be acceptable to both the Department of Psychology and the Engineering Research Institute. It is believed imperative to introduce such a man into the situation as soon as possible. To attract a man of the stature we feel is required, it will be necessary to provide a situation in which there is considerable assurance of continuity, and genuine expression of moral and practical support for his efforts.

It also appears likely that as psychologists of the academic community become acquainted with the work of Project MICHIGAN, some will discover problems of special interest to them. It appears also that the success of the Project, insofar as it is looked upon as a large-scale research effort, depends in large part upon its attracting the participation of academic scientists. Among the possible modes of participation which should be encouraged with respect to psychology and other areas as well are:

1. Full-time service of a member of a college department to organize the relevant work, and at the same time to find his own replacement.
2. Consulting service on a limited basis, conceivably at any level from top-level planning to concern for specific limited problems.
3. Supervision of a project task group on a part-time basis on a problem or problems which fall within the domain of his research interests.
4. Actual conduct of research on a project problem within the setting of the project.
5. Conduct of research supported by the project but carried out in a college laboratory on a subcontract basis.
6. Appropriate selection of faculty members, as well as persons from other institutions within the university, who might serve as a technical committee responsible for the long-range efforts of some segments of Project MICHIGAN, while the task leaders might be responsible for shorter-range objectives and goals along with the details of day-to-day responsibility. For example, if a senior psychologist is appointed within Project MICHIGAN, he might have as a semipermanent technical committee one person from Group Dynamics in the Institute of Social Research, one member from the Mental Health Research Institute, and one to three persons from the Psychology Department.

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7. Supervision of graduate students who would work as research assistants in either setting, and who might, when conditions permit, carry out their doctoral dissertation on the project.

APPENDIX A

OUTLINE OF PROJECT MICHIGAN

Project MICHIGAN is a joint service supported project at the Engineering Research Institute of The University of Michigan. Its general mission is the conduct of research and development of systems and components for combat surveillance.

Originally let in 1953, the contract under which the project operates is a Department of the Army contract (DA-36-039 SC-52654) administered by the Signal Corps. Most of the work under the project is carried on by the Engineering Research Institute at its Willow Run Laboratories, but other departments of the University make contributions to the project. The Project is under the direction of M. M. Flood, Associate Director of the Engineering Research Institute. R. G. Folsom is Director of the Institute.

The aims of Project MICHIGAN are: to supplement the functions of the Technical Services in the research and development of equipment for surveillance, target location, and data transmission; to make maximum use of the techniques and equipment developed by the Technical Services and to emphasize their ultimate use in the combat surveillance system; and to engage in such research and development as may be found necessary to fill gaps in the existing programs leading to combat surveillance.

A.1 Charter for the Operation of Project MICHIGAN.

The charter for the operation of Project MICHIGAN, as promulgated in 1953, reads as follows:

"CHARTER FOR THE OPERATION OF PROJECT MICHIGAN

"The three Departments of the National Military Establishment propose to establish, under the management of the University of Michigan, a program of research and development to be known as Project MICHIGAN. The project will be under prime contract with the Department of the Army.

"The primary mission of the project will be Battlefield Surveillance. This is defined as the all-weather surveillance,

by any technical means, of the ground area extending 200 miles from the main line of resistance, and the over-all system required to correlate and apply rapidly and effectively the information derived from this surveillance.

"It is agreed that the most effective way to accomplish this mission is to include within the project consideration all problems pertinent to Battlefield Surveillance.

"It is expected, in view of the magnitude and scope of this project, as well as its long-range aspects, that it will continue over an extended period of time. The Department of the Army will budget for the fiscal support of the basic project on that basis.

"It is agreed that this project will serve the Army, Navy and Air Force; and it is anticipated that each of these services will allocate funds or provide logistic or other support to this project to the extent of their respective individual interest as may be indicated by specific projects or tasks. By agreement between the contractor and the service involved, tasks falling within the scope of the project defined above may be initiated by the contractor within the funds made available. When requested, the project will serve as a consultant to the services in its field of experience.

"To give the project the fullest possible tripartite character, a Joint Services Advisory Committee will be appointed, on which the Army, Navy and Air Force will be equally represented, with the representative of the Army serving as Chairman."

Since the conception of this charter, developments within the military services have raised questions relating to the 200-mile range stipulation of the second paragraph. This range aspect is under review at the present time. Also, the "battlefield" surveillance of the charter has come to be "combat" surveillance.

A.2 Statement of Work of Project MICHIGAN.

The current formal statement of the work to be done by Project MICHIGAN, as specified in Contract DA-36-039 SC-52654, calls for the following:

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"(a) Investigate and perform necessary research to determine the manner in which the physical sciences may be employed in the accomplishment of battlefield surveillance.

"(b) Conduct a study to determine in more specific detail the over-all problem facing the field forces as regards the battlefield surveillance and evaluate the various surveillance means with respect to their comparative capabilities against various enemy dispositions.

"(c) Review existing research programs with the view toward recommending implementation and modification of such programs to develop a comprehensive program of research to meet the needs of the services.

"(d) Produce or have produced initial test quantities of experimental equipment for field trial by special test trials or appropriate agencies where such trials are considered necessary to evaluate a technique or system.

"(e) Develop or have developed components, which may be necessary to implement the over-all program, including a study of the subcontracting possibilities for such components.

"(f) Furnish technical and procurement information and consultation services as necessary to appropriate military services to permit procurement of service test or production items as appropriate.

"(g) Such other services and tasks (which services and tasks may or may not increase the scope of this contract) as may be mutually agreed upon."

This work statement has proved to be sufficiently inclusive so that no formal changes have been required in it since the initiation of the project, apart from the "battlefield" versus "combat" aspect.

A.3 Combat Surveillance.

Combat surveillance is the gathering, processing, displaying or communicating of information useful to tactical commanders at all tactical echelons. Tactical echelons considered include the "Army" echelon and lower in the U. S. Army. Corresponding to this are the "numbered Air Force," "numbered fleets," and lower echelons in the Air Force and Navy, respectively. Active work on the project is primarily for use by the Army, but Air Force and Navy applications are by no means excluded.

Information is gathered by units employing any technological means such as binoculars, photography, radar and infrared techniques and by any nontechnological means such as interrogation of prisoners

Processing of the information is by units employing any manual grease-pencil display, maps and filing card techniques and by any punched card or mechanical or electronic processing means.

Communications is by units employing wire, radio, messenger or any other means.

The terminology employed in surveillance distinguishes the following levels of complexity:

- surveillance materials (metals, glass, plastics),
- surveillance components (resistors, condensers, and such items),
- surveillance devices or subsystem elements (men, navigation devices, instruments, vehicles, detection devices, or communication sets),
- surveillance subsystems (smallest-sized units that can, in principle, perform a military mission; example: a patrol),
- surveillance system (combinations of subsystems units that can perform a military mission; example: observation battalion), and
- over-all surveillance system (the totality of all surveillance units in the field).

A.4 Orientation of the Project Within the Bounds of the Charter and Contract

The charter and the contract provide broad and rather flexible boundaries on the project effort. Within this broad framework, more definitive requirements on the project effort have been developed jointly – in varying degrees of formality – by the project and the military services. The areas in which the project might best contribute to the over-all attack of the services on the surveillance problem have been singled out for particular emphasis. Certain specific tasks have been imposed within these areas. This is in accordance with the charter: "By agreement between the contractor and the service involved, tasks falling within the scope of the Project

defined above may be initiated by the contractor within the funds made available."

It is rather generally accepted by the military and the project that the greatest potential for contribution to the surveillance field by Project MICHIGAN lies in study and consideration of the Combat Surveillance System as a whole, the integration of new devices and equipments into the subsystems, and integration of these into systems and into the over-all surveillance system in a manner consistent with improvement of the system as a whole. It is in this aspect that the project differs from (for example) the many and varied research and development projects being undertaken throughout the country on components and devices which have potential for the surveillance system of the future.

It should be noted that the project, in its considerations of the over-all system in accordance with the above, necessarily must engage in all of the areas of activity of items (a) through (c) of the work statement of the contract, and in so doing will increase its potential for contribution in items (f) and (g).

A.5 Organization and Work of the Project

The technical work of the project is carried out as follows:

(a) Management.

Technical management is the responsibility of the Associate Director, Dr. M. M. Flood, assisted by planning and operations staffs.

(b) Project MICHIGAN Tasks

There are six task groups. These groups execute the tasks themselves or see that they are executed by subcontract assignment or other means.

(1) System Design Task (Mr. James Wolf)

The objective of this group is to design integrated surveillance systems using the surveillance subsystems developed by Project MICHIGAN and others, and to subject these to engineering test. The job of developing new subsystems is also in this task and work is proceeding under subcontract to design and contract an experimental airborne radar subsystem.

(2) System Simulator Task (Dr. S. Veniar)

The activity of this group is to simulate the action of surveillance systems and subsystems in the laboratory using model man-machine systems and subsystems, computers, or other means as simulators. The outputs are measurements of system performance, operating procedures, and suggested system design changes and improvements. Present emphasis is on the simulation of the action of a combat observation battalion for a specific situation. This work is in a planning stage.

(3) System Field Experiment Task (Mr. E. Smith)

The activity of this group is to test surveillance systems and subsystems in the field under operating conditions that are as realistic as possible, and to measure and evaluate the system performance. Present emphasis is on the design of tests of a combat observation battalion. This work is in a planning phase.

(4) Equipment Engineering Task (Mr. R. E. Miller)

The activity of this group is to design and construct equipment useful in surveillance and subject these to engineering test. Present emphasis is on the construction of equipment for surveillance subsystems. This work has produced two experimental subsystems, one using radar and one using infrared detection, both of which can be operated in the field.

(5) Surveillance Research Task (Mr. P. N. Metzelaar)

This task is to do basic and applied research leading to greater knowledge and understanding of surveillance. Much of the surveillance research task is carried out by the teaching faculty. The Research Planning Staff also makes use of the increased understanding obtained to plan needed work in other areas such as equipment, subsystem and systems development. This work is in the planning stage.

(6) Applied Research Task (Mr. D. Wilson)

This task is to do research and development leading to improved surveillance equipment and procedures. Much of the research is being carried out by the Infrared, Vision Research, and Acoustic Laboratories of the University. Present activities include such items as research and development of infrared thermal imaging and scanning devices, and studies of infrared background; studies of the acoustics of motor vehicles, acoustic detector systems, acoustic background, and propagation; the development of optical devices for surveillance, and studies of the operating characteristics of the eye, the optimum scale of photographs for interpretation, and the properties of the atmosphere in propagating optical frequencies. In the radar portion of this task, the main emphasis is on the development of an experimental ultra high-resolution radar. This work has been carried out over a considerable period of time.