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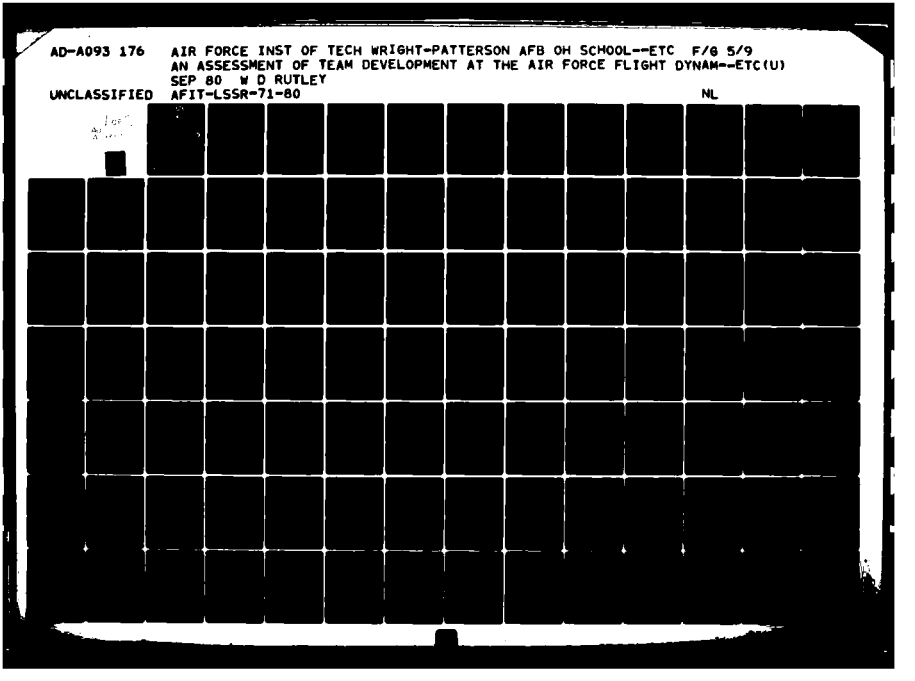

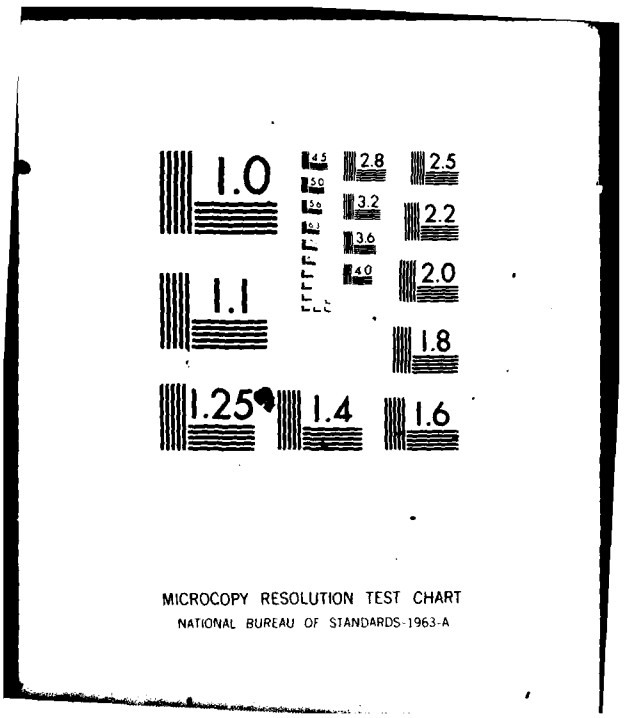
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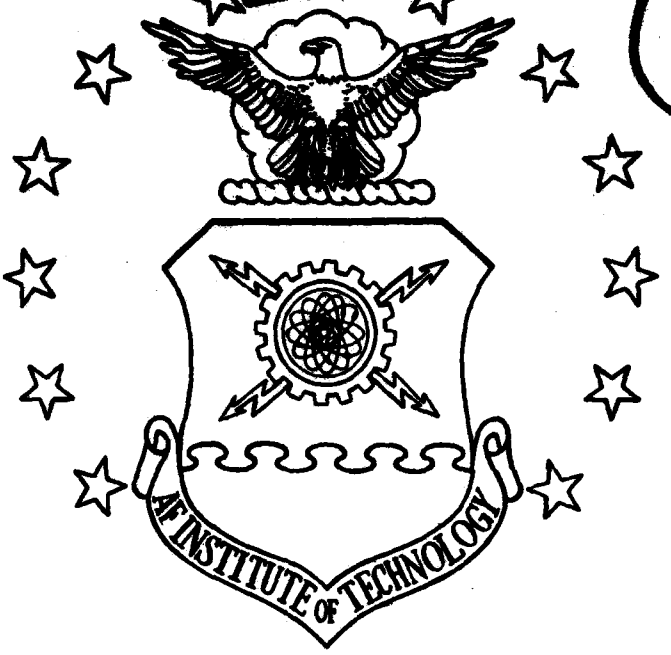

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AN ASSESSMENT OF TEAM DEVELOPMENT AT THE AIR FORCE FLIGHT DYNAMICS LABORATORY

William D. Rutley, Captain, USAF

LSSR 71-80

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The basic question answered by this research was: Has the team building organizational development (OD) intervention at the Air Force Flight Dynamics Laboratory (AFFDL) had any measurable effect on the various organizational goals that were stated for the program? Effectiveness was determined via a longitudinal analysis of the change from 1978 to 1980 on eleven criterion variables: employee job satisfaction, job motivation and absenteeism; five organizational climate factors; and three productivity factors (scientists and engineers only). A questionnaire was utilized in 1978, 1979, and 1980 to obtain data on all variables except absenteeism. Absenteeism data were obtained from AFFDL internal records. The four main product divisions of AFFDL served as subjects for this research. Since the OD program was voluntary, two divisions elected to participate while two did not. This created the natural control group--treatment group situation utilized in this research. The results of the data analysis showed that OD treatment divisions failed to exhibit any statistically significant change on any of the eleven criterion variables from 1978 to 1980. Despite having been underway for over four years, the AFFDL program has had no lasting measurable positive effect on the stated program goals.

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In Partial Fulfillment of the Requirements for the

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By

(10) William D. Rutley
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This thesis, written by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I Introduction

> The accelerating and almost unbelievable rate of change in our society has had a profound effect on our social institutions. They are faced not only with innovations in science and technology, but also with changing values and concepts concerning the nature of man [Margulies and Raia, 1972:1].

The basic result of this rapidly changing environment has been considerable changes in how organizations function and in what "types" of organizations are most successful. A study of early human history shows us that changes in social, economic and technological areas came slowly in discrete steps. Since the early 1900's, however, a type of "time" compression has taken place. Changes now come much closer together and tend to have large impacts on the way our world operates. A major factor in this time compression has been the advent of rapid, world-wide communications. No longer are people and organizations widely separated. Truly our world has become "smaller".

In early human history organizations were mechanistic in nature having been founded on military style organizations. The environment, by today's standard, was predictable, stable and very slow to change in either social, economic, or technological areas. As communications improved and technology advanced, mechanistic organizations found themselves faced with increasingly dynamic environments.

The lack of flexibility often found in mechanistic organizations began to erode their capability to cope and survive.

Margulies and Raia state:

> Older mechanistic organization structures are gradually giving way to newer and more organic temporary systems and matrix forms . . . . The concept of man as an inert instrument to be manipulated and controlled by the organization has become obsolete. The depersonalized values of bureaucratic systems are gradually being replaced by organizational values based upon humanistic and democratic ideals [Margulies and Raia, 1972:1].

Basically organizations are now recognizing the importance of the human aspects in how they function. This recognition, in addition to the rapid technology changes has forced managers to consider changing their organization. Change in itself is another characteristic of organizations. Albanese states:

> The fact of change needs no proof because it is immediately and continuously evident to the senses. We may not like change. We may not know exactly what is changing. The meaning of changes may not be clear. We may not know how to respond to the changes. However, one thing is clear. Change is a fact. Response to change is an essential requirement of organizational effectiveness [Albanese, 1978:555-556].

A medical analogy can be used to describe the current organizational dilemma. Organizations are born, they grow, and tragically they sometimes die. In the commercial world the death can be, and usually is, quick. Marginal commercial organizations that fail to change to improve effectiveness do not survive long. In non-commercial areas, such as the federal government, the actual organizational

death may never come. Instead a "lingering" illness may be the rule. This non-commercial problem is even more dangerous and costly than the commercial problem due to the far reaching economic consequences of ineffective government organizations.

Organizational effectiveness itself, as a concept, presents a problem in terms of definition. Generally organizational effectiveness is stated in terms of goals/objectives accomplishment. Criteria are developed from the stated goals of the organization to provide measures of effectiveness. With commercial organizations criteria such as profit, production rates, cost, et cetera provide easily measurable criteria by which effectiveness can be judged. Commercial organizations have the "market test" which provides judgment on performance. People vote in the market by buying or not buying goods and services. In the case of public goods, i.e. defense, the market test fails. Government organizations, particularly those engaged in Research and Development (R&D) have problems with criteria selection since they lack a definitive product or products. Multiple criteria are required because no one criteria is likely to cover all aspects of an organization. Criteria for R&D type organizations as well as other "public" organizations tend to be vague and difficult to measure. Criteria such as efficiency of budget use and schedule accomplishment are often utilized by government organizations in lieu of criteria which are

more closely aligned with goals. Budget use and schedules are easily measured while the quality of a technology is difficult to quantify.

Due to Congressional action in terms of laws used to establish government organizations, it is nearly impossible to terminate such organizations for failing to be effective. In fact, it may be undesirable to terminate a government organization which, by some criteria, is failing to perform some vital functions. If a commercial store goes out of business, there are generally many others which not only fill the gap but may have been responsible for the demise of the competitor. This is not usually the case with government organizations. The only solution available, for government organizations, to the problem of improving effectiveness is changing the organization and even then the methods are often limited by law or regulation.

An important question arises here. Must an organization make changes just for the sake of change? No! Random and unneeded changes can cause as many problems as not changing when needed. The key is for an organization to recognize when change is required, what changes are needed, and what tools are to be used. This is a problem of considerable magnitude. The increased concern over the humanistic aspects of organization has only enlarged the problem. As Dekok puts it in his thesis, "Organizations quickly realized that concomitant with capital investment in new

processes, materials, and equipment came a new type of investment -- in human capital [Dekok, 1979:1-2]."

Human labor accounts for large percentages of organizational costs. In the Department of Defense (DOD), the percentage exceeds 50%. These facts have led to increased emphasis on how to alter the humanistic processes in organizations in order to improve effectiveness. Changes in how society views the nature of man have led to many changes in the composition of our workforce and in what that workforce expects from participation in organizations. This has also been a powerful force in changing our organizations. As stated by Dekok, "Increasingly top management was faced with unrest in this new workforce -- a situation which manifested itself in turnovers, absenteeism, and low productivity [Dekok, 1979:2]."

Organizations have found themselves faced with massive and complex structural and human organizational problems. Most organizations and their managers were not equipped to cope with the changes required or even to know which tools to utilize. Out of this environment has come a multitude of behavioral science approaches and management consultants designed to help an organization cope with change and to improve, hopefully, its effectiveness. For as stated by Albanese: "Presumably the reason for changing or developing organizations is to make them more effective. Organizational effectiveness is the 'bottom line' [Albanese, 1978:570]."

The Nature of Organizational Development

In the mid 1940's a new field arose in response to the rapidly changing environment which provided tools aimed at the humanistic side of organizations. At that time Kurt Lewin and his associates began looking at the use of small discussion groups to change behavior. They were innovators in the field that was to become known as organizational development (OD) (Albanese, 1978:567).

There are three basic approaches for initiating change in organizations:

> (1) changing the individuals who work in the organization,
> (2) changing specific organizational structures and systems, and
> (3) changing directly the overall climate and interpersonal style which characterize an organization [Porter et al., 1975:439].

OD initially tended to involve techniques which utilized approach three (3) above, a basically humanistic approach. Modern OD also includes approaches one (1) and two (2) thereby including human processual as well as technostructural methods (Porras and Berg, 1978). This has caused considerable confusion as to exactly what OD encompasses. OD started out under the human process approach; however, in recent years, practitioners using structural approaches such as job enrichment, job redesign and organizational redesign have used the OD banner with the resultant confusion (Dekok, 1979:11).

For the most part, OD views an organization in a humanistic/organic sense. OD's management approach is along the lines of McGregor's Theory Y and Likert's System Four. OD's philosophy, thus, involves a humanism approach to changing organizations. In this trait lies its basic popularity. People want to be treated as people and individuals rather than interchangeable subunits. This is the basic reason for revolts against the "Scientific Management" approach.

OD Definition. Defining OD is a considerable problem due to the wide variety of development/change techniques referred to as OD. Albanese defines OD as:

> . . . a management-supported, systems approach to planned organization change that utilizes behavioral science knowledge as a major means of achieving the goal of greater organizational effectiveness [Albanese, 1978:566].

French and Bell define OD slightly differently:

> Organizational development is a long range effort to improve an organization's problem-solving and renewal processes, particularly through a more effective and collaborative management of organization culture-with special emphasis on the culture of formal work terms -- with the assistance of a change agent, or catalyst, and the use of the theory and technology of applied behavioral science, including action research [French and Bell, 1973:15].

Campbell excludes technostructural interventions from his definition of OD (Campbell, 1977:31).

The definition first proposed by Bechard and later used by Porter, et al. and Dekok is used in this paper:

> Organization development is an effort (1) planned, (2) organization-wide and (3) managed from the top to (4) increase organizational effectiveness and health through (5) planned interventions in the organization's "processes" using behavioral science knowledge [Beckhard, 1969, Ch 2:9].

Organization Change Model. Time is an important variable in the organizational change model. Only French and Bell, in the above definitions, refer to time. They use the words "long range effort". Likert also realized the importance of time in modelling organizational change. He defined three types of variables: causal, intervening, and end-result. Causal variables were defined as those which could be altered or changed by the organization. Intervening variables included attitudes, motivations, perceptions, et cetera and end result variables were along the lines of productivity, costs, and so on (Likert, 1967:26-29; Dekok, 1979:7).

Likert's model as adapted by Dekok is shown in Figure 1.

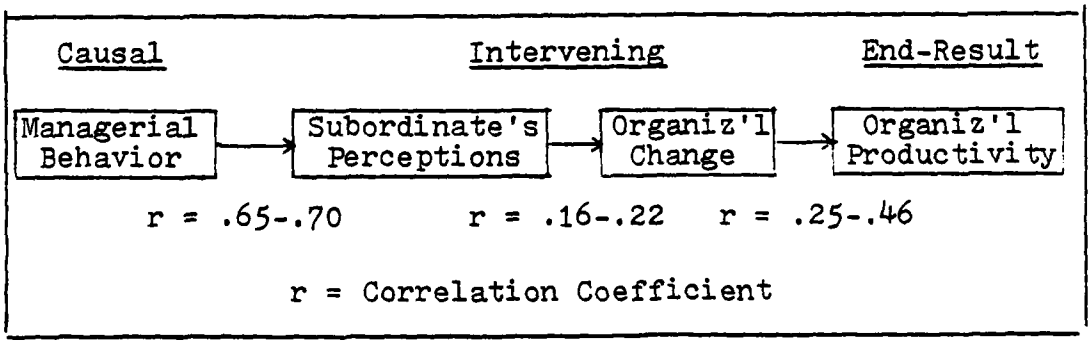


Figure 1. Organizational Change Model (Dekok, 1979:7)

What this figure illustrates is that Likert's model suggests that changes in managerial behavior, caused by OD, will affect subordinates perceptions about the organization and result in a changed organization. This will hopefully lead to positive changes in productivity. This model is important because the evaluation of the Air Force Flight Dynamics Laboratory (AFFDL) OD program has been done partially from this viewpoint. It should also be noted, at this point, that intensity or strength of a change causing process such as OD is an important factor in determining how rapidly changes in the organization and productivity are seen. Clearly, time is an important element. As stated by Likert:

> The available evidence indicates that there are consistent and dependent relationships among the causal, intervening, and end-result variables. When all of the relevant factors are taken into consideration, especially time and the proper analyses made, consistent, positive relationships can be expected among the causal, intervening, and end-result variables in every organization . . . the closer two variables are in causal-intervening-end result sequence . . . the more marked the relationships tend to be. The farther apart the variables are in the sequence and the greater the probable time interval between changes in the other, the lower the correlations tend to be [Likert, 1967:98-99, 81].

The OD effort underway at AFFDL has been in progress for over four years and, therefore, provided an opportunity to check the above model via a longitudinal analysis which is described in Chapter II, Research Methodology. The remainder of this section briefly reviews OD's processes,

assumptions, values, and objectives and then looks at one particular OD intervention, team building, and finally presents a short look at the importance and role of the professional OD change agent.

OD Characteristics. In terms of OD characteristics Albanese states:

> Additional insight into OD is gained by noting several of its characteristics. OD change efforts often use the services of a third-party change agent or OD consultant. OD implies a relatively long-term and on-going process. It emphasizes the importance of goal-setting and planning activities. OD is associated with skills and techniques aimed at developing more effective work groups or teams [Albanese, 1978:566].

Even though the above is not the definition Albanese uses for OD it contains most of the key elements from the OD definition used in this report.

OD Assumptions. As with any program, OD contains several key assumptions. Beckhard lists six (6) assumptions which are representative of lists used by other authors:

> 1. The basic building blocks of an organization are groups (teams). Therefore, the basic units of change are groups, not individuals.
> 2. An always relevant change goal is the reduction of inappropriate competition between parts of an organization and the development of a more collaborative condition.
> 3. Decision-making in a healthy organization is located where the information sources are, rather than in a particular role or level of hierarchy.
> 4. Organizations, subunits of organizations, and individuals continuously manage their affairs against goals. Controls are interim measurements, not the basis of managerial strategy.

5. One goal of a healthy organization is to develop generally open communication, mutual trust, and confidence between and across levels.

6. "People support what they help create". People affected by a change must be allowed active participation and a sense of ownership in the planning and conduct of change [Beckhard, 1969:9].

The above assumptions are critical in that they set the stage for what type of techniques are used and how they are applied to the problem of organizational change and effectiveness. Many basic assumptions about OD lie along the lines of McGregor's "Theory Y" assumptions. Beckhard's list is certainly not all inclusive but is representative. Examples of other assumptions listed by Wendell French include:

. Most people desire to make, and are capable of making higher contributions to organization goals

. Most people wish to be accepted and to work cooperatively with at least one small group

. The work group is a vitally important reference group

. The level of interpersonal trust is much lower than it should be in most organizations [French, 1969:34].

OD Objectives. The question of what OD is supposed to accomplish is contained within the wide variety of objective lists contained in the literature. A list which contains the basic elements of most other authors is provided by French:

1) To increase the level of trust and support among organizational members.

2) To increase the incidence of confrontation of organizational problems, both within groups and among groups, in contrast to "sweeping problems under the rug".

3) To create an environment in which authority of assigned role is augmented by authority based on knowledge and skill.
4) To increase the openness of communication laterally, vertically and diagonally.
5) To increase the level of personal enthusiasm and satisfaction in the organization.
6) To find synergistic solutions to problems with greater frequency.
7) To increase the level of self and group responsibility in planning and implementation [French, 1969:32].

The above list of objectives helps to define the intent of OD in the most general terms. More specific objectives often develop following discussions with specific organizations.

OD Values. Beneath the sets of assumptions and objectives for OD lie certain values. As stated by French and Bell, "While scientific inquiry, ideally, is value free, the applications of science are not value free [French and Bell, 1973:71]." A set of values for change agents widely quoted in literature also comes from French and Bell:

1) The needs and aspirations of human beings are the reasons for organized effort in society.
2) Life can become richer and more meaningful, and organized effort more effective and enjoyable, if feelings and sentiments are permitted to be a more legitimate part of the culture of organizations.
3) Commitment to an action role, along with a commitment to research, in an effort to improve the effectiveness of organizations.
4) Democratization of organizations or one power equalization [French and Bell, 1972:72].

The above sets of values, assumptions, and objectives for OD are certainly not all inclusive but they are representative of what is generally found in OD literature.

They are also vitally important because they form the foundation for the entire OD area of knowledge and application and from them comes the multitude of techniques for interventions. The values, assumptions and objectives of OD must be made explicit to clients of change agents to ensure a meaningful OD process can take place.

The OD Process. As explained by French and Bell, "OD as an operational process was seen to possess three basic components: the diagnostic, the action (or intervention), and the process-maintenance components. . . [French and Bell, 1973:62]." A large number of sources use diagnosis and action intervention as phases of the OD process. The major differences among authors concerning the OD process is the number of steps or phases involved. Most, however, lie along the lines proposed by Lewin:

> A change toward a higher level of group performance is frequently short-lived; after a "shot in the arm", group life returns to the previous level. This indicates that it does not suffice to define the objectives of planned change in a group's performance as the reaching of a different level. Permanency of the new level, or permanency for a desired period, should be included in the objective. A successful change includes, therefore, three aspects: unfreezing (if necessary) the present level, moving to the new level, and the freezing of group life to the new level [French, Bell, and Zawacki, 1978:70].

Note that while diagnosis is not explicitly a part of the above process definition action intervention is roughly equal to the moving phase and process-maintenance is

basically equivalent to the freezing phase. As pointed out, other authors include more steps but the general approach remains close to the above concepts.

OD Techniques. There are a large number of intervention (action) techniques available to the OD practitioner (ODP) for use in the "moving" or "action" phase of the OD process once the critical "diagnostic" stage has been completed. In looking at Table I, the reader should remember that structural as well as humanistic approaches are currently included under the OD banner as previously discussed.

Table I
OD Intervention Techniques

. T-groups
. Laboratory Training
. Job enrichment
. Managerial Grid
. Conflict Training
. Rate Analysis
. Transactional Analysis (TA)
. Team Building
. Sensitivity Analysis
. Management by Objectives (MBO)

Table I is meant only to illustrate examples of the wide range of tools the ODP has available to him. There are many more techniques (interventions) than those included in Table I. There is also the rather complex problem of classifying OD interventions. One of the most successful classification schemes is found in a work by Miles and Schmuck (1976) called the "OD Cube" which use three (3) classification axes called: Diagnosed Problems, Focus of Attention

(i.e. person, group, etc.), and Mode of Intervention (i.e. training, goalsetting, etc.). The reader is referred to his article for further information.

Team Building. As stated by McGill, "Team building is the single most popular approach to OD used today [McGill, 1977:77]." Part of the definition of team building is contained in its name. By its very nature team building works with natural work groups. As defined by Franch and Bell, team building activities are:

> Activities designed to enhance the effective operation of system teams. They may relate to task issues, such as the way things are done, the needed skills to accomplish tasks, the resource allocations necessary for task accomplishment; or they may relate to the nature and quality of the relationships between the team members or between members and the leader [French and Bell, 1973:102-103].

The reason for expanding on this particular intervention is twofold: (1) It is the most popular intervention; (2) It is the intervention being used in the OD program at AFFDL. The goals/objectives of team building are similar in nature to those found for OD in general:

> 1. Understanding, mutual agreement and identification regarding goals to the group.
> 2. Open communication
> 3. Mutual trust
> 4. Mutual support
> 5. Effective management of conflict
> 6. Developing a selective and appropriate use of team concept [McGregor, 1967].

French and Bell state that team building interventions are basically aimed at four major areas: diagnosis, task accomplishment, team relationships, and team and

organization processes. French and Bell set these four areas within family groups and special groups as separate considerations. Family groups are basically on-going, intact and somewhat permanent work groups while special groups may be newly formed or transient in nature (French and Bell, 1973: 112-113).

Porter et al. provided three general approaches to accomplishing team building:

1) Survey - Feedback - discussion - action planning techniques which involve a consultant's helping the group collect information about the way the group operates, feeding this data back to the group, discussing the information and making action plans to improve the group.

2) Process consultation technique which involves a flexible and, many times, ad hoc set of consultative interventions designed to help a group understand and do something positive concerning its problems.

3) The interpersonal approach utilizes the T-group or laboratory education method (Porter, et al., 1975).

The OD Practitioner (ODP). Concerning team building activities Porter et al. state, "Almost all team building activities take place with the active assistance of a consultant skilled in working with groups [Porter et al., 1975: 459]." Dekok in his thesis work on the AFFDL OD program states:

> In OD theory organizational change is induced by an OD practitioner (ODP) who is also referred to as a "consultant", "change agent", or "interventionist". His role is one of diagnosis, prescription, and facilitation. The tools he possesses to accomplish these tasks are many and varied, ranging from "sensitivity training" on one extreme to "job redesign" on the other hand [Dekok, 1979:57].

The ODP's role in OD interventions is vital to success. A good ODP is, however, a necessary but not sufficient condition for a successful OD program. It has been shown in previous sections of this report that the ODP has a multitude of tools to choose from when considering how to improve an organization. The ODP is usually external to the organization (i.e. not a member) and is a professional behavioral science expert and management consultant. The ODP's first task, and perhaps the most critical, is to "diagnose" the organization via any of a variety of analysis techniques including interviews, surveys, et cetera. The ODP must determine first if a problem really exists and if one does exist, the ODP must define its characteristics and causes.

The results of the above process will lead the ODP to select from his "tools" the proper intervention(s) to accomplish the desired goals. However, as stated by Dekok,

> The nature of the treatment(s) are ODP-dependent. Some practitioners have developed confidence in a few methods (or perhaps even a single one) which they have found appropriate for a wide variety of organizational problems [Dekok, 1979:35].

Once an appropriate intervention(s) is selected the ODP now provides the "catalyst" to begin the "moving",

"action", or "unfreezing" stage. The ODP also provides a control function to ensure the intervention is kept on track. Finally the ODP must work to make the results, hopefully good of course, self-sustaining. This is then entering the "process maintenance", or "re-freezing" stage.

For the above process to have any chance of success, the ODP must establish a strong "trust" relationship with the client organization. OD can be viewed, by organizational members, in a negative fashion as an unwelcome intrusion on their lives and "kingdoms". Although a manager may call in an ODP, he/she may be reluctant to be completely open about problems in the organization. In short, the potential for conflict is present which may limit the ODP in how useful an OD program can be established. Walton (cited in Bowen, 1977:546-73) indicated that such conflict can arise from five basic types of inconsistencies:

1. An inconsistency may exist between the goals and strategies of the client and the values of the consultant.

2. The client's actions in implementing the OD program may be inconsistent with the goals and values of the consultant.

3. There may be a difference between the consequences of the intervention and the consultant's personal values.

4. There may be a difference between the consultant's behavior and accepted professional standards.

5. The consequences of an intervention may be inconsistent with the values generally identified with OD.

Dekok summarizes the ODP's problem well in the following statement:

> In summary, the ODP is in an unenviable position within his own profession. Even though his tool kit contains an assortment of potent instruments, his profession has often not provided him with the training necessary to diagnose or treat the assortment of maladies, he is likely to encounter. Worse yet, his patient is unlikely to be of much assistance in the diagnosis or the course of treatment, and the treatment (once chosen) is unlikely to produce measurable effects (if any) for several years after it was started [Dekok, 1979:43-44].

OD Effectiveness. Measuring the effectiveness of OD intervention is a problem of considerable magnitude. While several past attempts have indicated positive changes in organizations due to an OD program (Bowers, 1973; Porras and Berg, 1978), nearly all such analysis efforts, have suffered from the same research problems: small sample sizes, poor research designs, lack of statistical control and the inpreciseness inherent in measuring organizational change (Dekok, 1979:58).

As stated previously in this thesis the bottom line in OD is improving organizational effectiveness. Measuring the change in organizational effectiveness and, therefore, the effectiveness of an OD intervention(s) is a problem of immense magnitude. The foundation of OD established earlier in this thesis indicates that measures in at least two areas are vital to judging the effectiveness of OD in changing

organizational effectiveness: (1) intervening variables such as organizational climate and (2) end-result variables such as productivity measures. Measurement of changes in organizational climate (OC) and productivity presents extremely complex problems. These measurement problems are compounded in a military Research and Development (R&D) laboratory such as the Air Force Flight Dynamics Laboratory (AFFDL) due to a lack of a definitive product on the order that commercial firms produce. OC creates a measurement problem in that it is a "warm fuzzy" area that is not clearly defined and can, depending on the author, be viewed either as an organizational characteristic or as an attribute of the perceiving individual (Dekok, 1979:203-204). The questionnaire used in the research effort on AFFDL's OD program is discussed in Chapter II, Research Methodology. Using Likert's model of the organizational change process presented earlier, one should agree that most OD interventions are aimed at altering OC via individual perception changes which hopefully result in increased productivity and, therefore, a more effective organization. The problems of measurement stated above only serve to complicate the goal of determining if OD has any lasting value. In view of the dollars being spent on OD, 53 million in 1977 by DoD (Dekok, 1979), some methods must be found to ensure that organizations truly benefit by this process and expenditure.

Summary. The discussion in this section on the nature of organizational development (OD) was not intended to be exhaustive. It was meant only to orient the reader to the general subject area. For a far more complete discussion of OD, organizational climate, and organizational effectiveness, the reader is urged to consult Dekok's thesis, Chapter II and Appendix B, or any of the other sources listed in the bibliography of this thesis. A brief review of Dekok's thesis on the AFFDL OD program is presented later in this Chapter.

OD can, properly implemented, provide a powerful tool for improving an organization in today's rapidly changing environment. Its emphasis on humanistic values with a mixture of structural considerations offers a wide range of techniques to choose from to accomplish the goals of any OD program. The role of an OD practitioner (ODP) is vital in the entire OD process and a positive, trusting link between the organization and the ODP is critical to success. Measuring OD intervention effectiveness is hampered by many factors including the problems inherent in measuring organizational climate and productivity.

Background on OD at AFFDL

As mentioned in the preceeding discussion on OD and today's environment, OD represents a wide range of tools for dealing with the wide variety of organizational problems

faced today. The military as well as the business and academic worlds have used and continue to use OD and the ODP to improve organizational effectiveness. Within the Air Force Wright Aeronautical Laboratories (AFWAL) complex at Wright-Patterson Air Force Base, Ohio, several laboratories including the Air Force Materials Laboratory (AFML) and the Air Force Aero Propulsion Laboratory (AFAPL) have used OD programs in the 1971-1975 time period. The popularity of those OD interventions led AFFDL, in 1976, to contract with Dr. George Lehner, a nationally known ODP, to set up an OD program for AFFDL.

Dr. Lehner began the diagnostic stage of OD by interviewing personnel in the laboratory for individual perceptions of organizational problems. Following discussions with AFFDL management concerning the above interviews as well as about AFFDL's goals for the OD program, it was decided that team building would accomplish their goals. Concerning the goals (objectives) of the AFFDL OD program Dekok points out that:

> Although the goals of the team development effort were not formally documented, "goals of people working harder, or better, or feeling better about the laboratory were verbalized (Stahl, et. al, 1978:2)" subsequently in discussions with researchers [Dekok, 1979:4].

The approach selected by the ODP, Dr. Lehner, involves visitations by him to the laboratory, usually two days at a time, for a total of 16 days per year. The AFFDL

team building intervention is rather flexible and unstructured in nature utilizing meetings between Dr. Lehner and selected groups and committees within the laboratory. Some of the groups involved in the program include:

1. Branch Chief's Council
2. Corporate Board
3. Professional Advisory Group
4. Woman's Seminar (Now the Women's Action Board)
5. Division and Branch level training (Dekok, 1979:5)

The AFFDL program is conducted as a completely voluntary program. AFFDL management and Dr. Lehner took great care to ensure that no pressure was placed on personnel to attend OD sessions. Two divisions out of the four main AFFDL product divisions elected not to participate in the OD program. It was this particular arrangement at AFFDL--two divisions participating and two not--that offered an unusual opportunity to use a research design which would aid in eliminating many of the problems faced by previous researchers. This research design is discussed in Chapter II, Research Methodology.

As stated in the previous discussion on the nature of OD and team building, Dr. Lehner's techniques involve aspects of the humanistic side of organizations rather than structural considerations which are very difficult to alter in government areas. As a result of his approach and the values and objectives inherent in the team building techniques,

Dr. Lehner seeks to improve the interpersonal part of the AFFDL organizational environment which involves improving group communication and relationships.

The team building intervention at AFFDL is still underway in 1980. There has been increased interest in OD at the AFWAL level with a staff member established to look at OD programs for all the laboratories.

History of the Current Research Effort

Do OD interventions actually provide any measurable benefit for the investment made in time and money? This question lead Dr. Lehner and the AFFDL OD staff officer, Mr. Max Davis, to ask three AFIT researchers (Drs. Stahl, McNichols, and Manley), in the summer of 1977, to conduct an assessment of the program. The next step as stated by Dekok:

> After discussion with the principals, the AFIT researchers formulated a multivariate model of organizational effectiveness based on a model by Kilman and Herden for evaluating the impact of interventions on organizational effectiveness [Dekok, 1979:6].

The AFIT researchers prepared a survey instrument, based on the above model, which was designed to measure job satisfaction, job motivation, organizational climate, and productivity in addition to providing demographics. The baseline measurement was taken, via the survey instrument, between Christmas 1977 and mid-January 1978 by the original AFIT researchers. The second measurement was conducted from

Christmas, 1978 to mid-January, 1979 by Major Roger Dekok who conducted the first longitudinal analysis of the data. A complete discussion of the research design and survey instrument is contained in Chapter II. The next section of this chapter provides a brief review of Dekok's results.

Summary of Results from 1979 AFFDL Research Effort

Following collection of the second set of measurement data in early 1979, Dekok evaluated the effectiveness of the AFFDL team building program using one primary and one secondary hypothesis:

Primary Hypothesis

> Divisions which are involved in the team development effort showed more positive change on criterion variables than divisions which are not involved in the OD program.

Secondary Hypothesis

> Intervening variables (primarily those associated with organizational climate) exhibited less positive change than end-result variables (productivity and absenteeism) [Dekok, 1979:9].

A longitudinal analysis was conducted by examining the change from 1978 to 1979 on eleven criterion variables: employee job satisfaction, job motivation, and absenteeism; five factor dimensions of organizational climate; and for scientists and engineers (S&E's), three productivity factors (Dekok, 1979). Selection of the criterion variables was based on the goals stated for the OD program at AFFDL and on a factor analysis (principal component) of the

combined 1978 and 1979 data. Dekok concluded, as a result of his analysis of the measurements, that the OD program at AFFDL could be having a measurable positive effect in some areas, particularly communication and absenteeism. However, he stated that due to the weakness of the OD intervention, i.e. lack of intensity, effects were slow in evolving and an additional measurement and analysis would be required to accomplish the following objectives:

> 1. Confirm or deny that the process of OD induced organizational change is still occurring within the laboratory.
> 2. Observe if more of the perceptual measures exhibit statistically significant changes over a two year period (3 measurements).
> 3. Resolve the absenteeism issue for FE and FG (the two divisions using OD out of four AFFDL divisions). Confirm or deny that this is an effect that can be unequivocally attributed to the OD program.
> 4. Observe if the fall in the scores of FX (non-OD division) on the immediate work group dimension of organizational climate is a continuing event, and ascertain its probable causes.
> 5. Resolve the productivity issues for FE and FG (productivity scores decreased from 1978 to 1979 for these two OD divisions). Investigate whether productivity is a state cyclical variable within AFFDL, and if cyclical, define the period [Dekok, 1979].

The above conclusions and results led to the initiation of the current 1980 research effort. Additional information concerning the previous measurements and analysis can be found in Major Dekok's thesis of the same title (Dekok, 1979) and in AFIT Technical Report TR-78-3 (Stahl, McNichols, and Manley, 1978).

Statement of the Problem

This research effort is designed to answer one basic question: Has the team building organizational development (OD) intervention at the Air Force Flight Dynamics Laboratory (AFFDL) had any measurable effect on the various organizational goals that were stated for the program? In addition this research effort has the five sub-objectives stated in the previous section of this chapter.

Scope and Limitations

This research effort is to be confined to AFFDL and its particular OD intervention. No attempt will be made to generalize any results to any other OD program in any other organization.

Hypotheses

A primary and secondary hypothesis were tested in this research effort. The primary hypothesis was:

Divisions which are involved in the team development effort showed more positive change on criterion variables than divisions which are not involved in the OD program. The secondary hypothesis was:

Intervening variables (primarily those associated with organizational climate) exhibited less positive change than end-result variables (productivity and absenteeism).

II Research Methodology

Introduction

The previous chapter mentioned that many research efforts on the effectiveness of OD have faced significant problems such as small sample size, poor research design, and lack of statistical control. These problems, as well as others, severely limited the usefulness of most other studies on OD. The research efforts on the team building intervention at AFFDL have attempted to avoid or minimize these problems. Major Dekok in his research effort during 1979 described the general approach as:

> . . . a longitudinal, quasi-experimental research design employing control groups was used to eliminate many of the alternative causes for any observed change; standard, validated measures of organizational performance and process variables were used whenever possible; and, statistical control was employed to ensure that any observed changes were significant and not due to sampling error [Dekok, 1979:59].

This chapter reviews and discusses the research design, questionnaire, measures of organizational change, and the statistical and analytic techniques used in support of the hypotheses and objectives of this research.

Research Design

As discussed in Chapter I, the OD program at AFFDL was voluntary in nature. Two of the four product divisions

(FE, Vehicle Equipment and FG, Flight Control) decided to participate in the OD program which has been underway since 1976 and is conducted by Dr. Lehner. The remaining two divisions (FX, Aeromechanics and FB, Structural Mechanics) elected to not participate in the team building intervention. This situation created a natural treatment group-control group experimental set-up. The personnel of the four AFFDL product divisions are the subjects for this research effort. The main thrust of this research project was to use the treatment group-control group arrangement to conduct a longitudinal comparison of data derived from the survey instruments and AFFDL records.

Figure 2, below, utilizes the symbology of Campbell and Stanley (1963) to illustrate the quasi-experimental design that was used in this, and the previous, research efforts on the AFFDL program.

Division	Jan 78	Jan 79	Jan 80
FE	X O_1	X O_2	X O_3
FG	X	X O_2	X O_3
FX	O_1	O_2	O_3
FB	O_1	O_2	O_3

X = treatment

O = observation

Figure 2. Quasi-Experimental Research Design.

The Sample.

> The Air Force Flight Dynamics Laboratory is one of ten expertly staffed Laboratories established to conduct the exploratory and advanced development programs of the Director of Science and Technology, AFSC [AFFDL Brochure, 1976].

Nearly 1000 personnel work in this multimillion dollar facility located at Wright-Patterson Air Force Base in Dayton, Ohio. AFFDL functions as the focal point for all aspects of flight vehicle technology with the exception of avionics and propulsion. Included in their area of responsibility is the vital work of flight system integration. Scientists and engineers (S&E's) make up almost half of the assigned personnel. The four product divisions are as follows:

> Structural Mechanics (FB): The approximately 280 military and civilian personnel of this division are primarily concerned with the safety, reliability, cost, and performance associated with new aerospace vehicle structures.
>
> Vehicle Equipment (FE): This division is responsible for advancing technology on flight vehicle equipment and subsystems including such items as landing gears, windshields, crew survivability, and environmental control. Approximately 150 personnel work in FE.
>
> Aeromechanics (FX): The approximately 270 personnel of FX are involved in formulating and directing development programs in aerodynamics, thermodynamics, performance analysis, and technology integration for advanced military aircraft and missiles.
>
> Flight Control (FG): This division acquires and employs advanced technology to analyze, design, and support the flight control needs of present and future military aircraft. Approximately 200 personnel work in FG [Dekok, 1979:61].

Table II
Demographic Data for AFFDL (1980 Sample)

Question	Description	AFFDL Total	FX	FB	FE	FG
1	Age category[a]	4.53	4.87	4.83	4.33	3.94
2	Grade category					
	Military[b]	8.60	8.24	7.72	9.00	9.05
	Civilian[c]	4.11	4.44	4.00	3.96	4.05
3	Years in Division[d]	6.02	6.02	6.27	6.10	5.67
4	Length Assigned Lab[e]	3.61	3.79	4.00	3.65	2.93
5	Education Level[f]	4.90	4.87	4.75	4.83	5.15
7	Position					
	S&E's	192	50	58	32	52
	Technicians	57	18	22	11	6
	Clerk/Steno	29	4	11	6	8
	Group Leaders	34	10	7	7	10
	Branch Chiefs	15	2	4	3	6
	Others	15	5	4	1	5
	Total	342	89	106	60	87

a An average of 3.0 represents 30-34 years; 4.0 represents 35-39 years; 5.0 represents 40-44 years.

b An average of 8.0 represents T Sgt - CMS; 9.0 represents 1st or 2nd Lt.; 10.0 represents Capt.

c An average of 3.0 represents GS 8-11; 4.0, GS-12; 5.0, GS-13.

d An average of 4.0 represents 2 years but less than 3; 5.0 represents 3 years but less than 4; 6.0 represents 4 years but less than 5.

e An average of 2.0 represents 2-5 years; 3.0 represents 6-10 years; 4.0 represents 11-15 years.

f An average of 4.0 represents BS degree; 5.0 some graduate work (no degree).

As is true with most of the Air Force's laboratories AFFDL's workforce is largely civilian (80%). Military personnel do occupy positions at all levels including S&E's, managers, and administrators. Table II contains the demographic data for the 1980 data sample.

Data Collection. To date three measurements concerning the effectiveness of the OD program at AFFDL have been made using the questionnaire described later in this chapter. The questionnaire was designed to measure factors such as job satisfaction, job motivation, organizational climate and productivity. In each case the questionnaires were distributed in the last week of December and collected in mid-January of the next year. Table III below contains the relevant data for each of the three measurements.

Table III
Data Collection (1978, 1979, 1980)

Collection Date	Number Distr.	Number Returned	Return Rate	Number Usable
Jan 1978	583	380	65%	364
Jan 1979	663	426	64%	413
Jan 1980	581	360	62%	342

In the January, 1978 measurement only FX, FB, and FE were surveyed. FG was added in the January, 1979 and January, 1980 measurements so that all four product divisions were surveyed. The return rates in Table III are considered

to be good for a voluntary survey. The rate is dropping off somewhat, quite possibly because lab personnel have grown tired of repeatedly filling out the same survey. A lack of feedback of the survey results to the general work force may also be a problem. As one respondent put it: "I have been responding to these questionnaires for almost four years without seeing any feedback. Is anybody using this survey for anything?"

Care was taken both in the 1979 measurements and in the 1980 measurement to ensure that only the employees who remained in their respective divisions during the year between measurements were provided an opportunity to complete the survey instrument. Questionnaires were not distributed to new employees or to employees who transferred divisions during the year. Completion of the instrument was voluntary with complete anonymity guaranteed. Therefore the longitudinal nature of this methodology was applied only in the sense of division membership.

Assumptions. As stated by Dekok, there was only one assumption necessary for the use of this research design and the statistical techniques described in this chapter, ". . . the responses to the survey instrument are valid and devoid of any systematic biases [Dekok, 1979:64]."

Limitations. The same four limitations which applied to Dekok's analysis (1979) using this research design also apply to this research effort. They are as follows:

1. The design of this research is quasi-experimental rather than true experimental. The reason for this down-grading is that random selection and assignment of personnel to each of the four divisions is not possible. The research design proposed by Campbell and Stanley (1963) and used in this research was intended to control most of the sources on internal validity. There are, however, two remaining sources of potential problems. As stated by Dekok,

> a. The first of these is the interaction of selection with maturation of the subjects which occurs when one group has a higher rate of maturation or autonomous change than another.
> b. The second potential source of internal invalidity for this research design is regression toward the mean. This would be a potentially serious source of experimental error if any of the comparison divisions were chosen on the basis of extreme behavior on correlated effectiveness measures [Dekok, 1979:64].

The first problem is considered unlikely due to the demographic similarity of the four divisions and AFFDL managers have assured the researchers that the condition for the second problem is not the case.

2. Paired Sample Follow-ups for individual responses was not possible due to the guarantee of anonymity in the survey. This limited somewhat the statistical power of some of the tests of organizational change but did not cause any real difficulties in terms of the results and conclusions.

3. Even though FX and FB have not been a formal part of the OD program at AFFDL, it was possible that some of the personnel from FX or FB received some exposure to the

program. Due to the infrequency and shortness of these possible exposures, this was not considered a problem.

4. The OD program at AFFDL has been in effect since mid 1976, almost two years prior to the first (1978) measurement. Therefore no pre-OD baseline measurement was obtained.

Questionnaire

The survey instrument included as Appendix A of this thesis was utilized in taking all three measurements used in this analysis effort. The questionnaire was developed, following the discussion with AFFDL personnel on the goals of the OD intervention, by Stahl, McNichols, and Manley (1978) using a multivariate model proposed by Kilman and Herden (1976). The instrument contains three basic sections described as follows:

Part A contained seven questions designed to provide demographic information.

Part B contained 38 questions designed to collect information on job satisfaction, job motivation, and organization climate.

Part C contained 13 questions concerning productivity and was to be filled out by scientist and engineers (S&E's), Group Leaders, and Branch Chiefs only. The first five questions required information on how an S&E spends his/her time (% time in each area). The last eight questions were

intended to measure various types of technical output or products that are tracked within the laboratory.

Measurement Scales

Before an analysis of the effectiveness of the AFFDL team building intervention could begin, the question of whether to analyze changes in specific questions or composite measures had to be resolved. Two standard measures were contained in the instrument, Job Satisfaction (Hoppock) and Job Motivation (Patchen) which are described in the next section of this chapter. These standard measures avoided the dual problems of validity and reliability. Factor analytic techniques were used to construct composite measures from the remainder of the organizational climate questions and from the productivity questions. The factors produced were then utilized in the remainder of the analysis. A limited validity and reliability check was conducted for the constructed factors. The following discussion deals first with the standard measures and then with the constructed measures. In addition to utilizing the standard and composite measures (factors) in the analysis, a decision was made to look at the overall change in AFFDL from the first measurement in 1978 to the third measurement in 1980 via an examination of the responses (laboratory) to all 58 items in the survey.

Job Satisfaction. The instrument utilized in this research contained Hoppock's (1935) job satisfaction measure.

The measure is comprised of four questions (questions 8-11 in section B of the instrument) and has been validated as a measure of a respondent's overall job satisfaction by data taken in both military and industrial situations (McNichols, Stahl, and Manley, 1978). The four questions are combined linearly giving each question equal weight which yielded a scale score between four and 28.

Dekok (1979) performed a principal component factor analysis (SPSS Procedure PA1) [Nie et. al. 1975] on the four Hoppock questions using the combined data from the first two AFFDL measurements to confirm the validity of the measure. The factor loadings obtained in addition to the strong zero order intercorrelations for the four questions confirmed the validity of Hoppock's measure for those data.

For this thesis an additional PA1 analysis on the four Hoppock questions was accomplished utilizing all three data sets to confirm the validity of the Hoppock measure for this data base. The first principal component explained 70.2 percent of the total variance in the combined sample and was the only factor with an eigenvalue greater than 1.0. Table IV contains the loadings of the four Hoppock questions on the retained factor and the inter-correlations for those questions. As shown, the factor loadings are quite high, .77 to .90, and of nearly equal magnitude. This supported the equal weighting scheme used by Hoppock and other researchers for this method. The high zero-order

intercorrelations provide another indication of the validity of this measure for the AFFDL sample (Cronbach and Meehl, 1955).

Table IV
Factor Loadings and Intercorrelations of the Four Questions Comprising the Hoppock Measure

Question	Factor Loading	Intercorrelations (N = 1061) 8	9	10	11
8	.87	1.0	.73	.58	.59
9	.90		1.0	.59	.67
10	.77			1.0	.45
11	.80				1.0

Job Motivation. In a similar fashion to Hoppock's measure, Patchen's (1965) job motivation index is formed by combining, linearly, the responses to four questions (questions 12-15) after reversing the polarity of questions 14 and 15. The result is a scale score which yields a range of four to 20.

A PA1 analysis was also conducted for the four questions comprising the Patchen index using the combined three measurement data base. The analysis yielded only one factor with an eigenvalue greater than 1.0 and it accounted for 56.4 percent of the total variance in the combined sample. Table V contains the loadings for the four questions on the retained factor and the zero order intercorrelations among the questions.

Table V
Factor Loadings and Intercorrelations of the Four Questions Comprising the Patchen Measure

Question	Factor Loadings	Intercorrelations (N = 1061) 12	13	14	15
12	.75	1.0	.53	.37	.34
13	.78		1.0	.42	.36
14	.75			1.0	.48
15	.72				1.0

The loadings are high and of nearly equal magnitude which supports, as did Dekok (1979), the use of equal weighting of these questions in the linear relationship for the Patchen index. The zero-order intercorrelations are reasonably high and consistent although lower than those for Hoppock. As stated by Dekok,

> A comparison with Patchen's data (1965), though revealed that the intercorrelations obtained in this sample are higher than those he obtained with the sample he used to develop his measure [Dekok, 1979:69].

This same statement is true for the intercorrelations shown in Table V.

Organizational Climate Factor Analysis. The measurement of organizational climate (OC) is a difficult task at best due mostly to a lack of agreement as to exactly what comprises OC. This difficulty was mentioned in Chapter I and is covered in Dekok's thesis (1979), Appendix B.

As described in the previous section on the questionnaire, section B of the survey contained the questions on OC as well as the Hoppock and Job Satisfaction questions. Questions 16 through 45 in the survey instrument were designed to collect information on individual perceptions concerning the organization's goals/objectives, reward structures, supervisor-employee relationships and communications.

A PA1 analysis was conducted of Questions 16 to 45 to examine first the 1980 data alone and then the combined data base for factors underlying the manifestation variables. The primary objective for this analysis was to ensure that the factor structure discovered and used by Dekok (1979) in his analysis had not changed in its basic form. Dekok, in performing his factor analysis, stated four basic questions:

> 1. Identify the true dimensionality of the responses to the 30 questions.
> 2. If the dimensionality was less than 30, provide a reasonable interpretation for the retained factors.
> 3. Analyze the stability of AFFDL's OC structure over time, particularly the manifestation variables associated with each retained factor.
> 4. Examine the validity and reliability of the obtained OC factors as reasonable criterion variables for the OD effectiveness research [Dekok, 1979:70-71].

The above four steps were accomplished in this analysis with the objective of examining the effects of adding the 1980 data base to the existing AFFDL (1978, 1979) sample.

OC Dimensionality. Dekok's 1978 factor analysis produced five factors with eigenvalues greater than 1.0,

accounting for 56.1 percent of the variance. His 1979 factor analysis produced six factors with eigenvalues greater than 1.0, accounting for 59.2 percent of the variance. The sixth factor retained from the 1979 analysis provided no real interpretive power to the factor structure and had an eigenvalue only slightly greater than 1.0 (1.07). In view of this, Dekok decided to drop the sixth factor and retain only the first five factors which introduced no ambiguities into the factor interpretations (Dekok, 1979:71). A factor analysis of the 1980 data yielded six factors with eigenvalues greater than 1.0, accounting for 60.6 percent of the total variance in the 30 questions. As with Dekok's analysis, the sixth retained factor provided little added interpretive power and only barely exceeded an eigenvalue of 1.0 (1.002). The 1980 analysis confirms the dimensionality yielded by Dekok's previous analysis.

OC Factor Interpretation. Utilizing the dimensionality results from the above analysis, a PA1 factor analysis was then performed on the combined data sample which forced retention of five factors accounting for 55.4 percent of the total variance in the OC questions (16-45). The solution generated was rotated using Varimax orthogonal rotation with Kaiser normalization. Appendix B contains the resultant factor structure with loadings of .4 or greater underlined. Table VI contains the results of using a 0.4 cutoff to determine which variables to use in explaining a

factor. The names provided for each factor were suggested by Dekok (1979) and reflect the nature of the questions which loaded on each factor. The results shown in Table VI are virtually identical to those produced by Dekok (1979, Table XI) with one minor exception. Q 39 (Influence Decision) which loaded at 0.45 on Factor One (Immediate Work Group) for the combined (1978, 79, 80) three measurement analysis in the current research, loaded at 0.43 on Factor Two (Employee/Supervisor Interaction) in Dekok's (1979) analysis. This switch is not surprising. The ability of an employee to influence decisions could be perceived by one employee to be part of his immediate work group while another employee may view it as an element of his/her interaction with the supervisor. The above perception may depend on how decisions are arrived at within the group (i.e. the process itself). Other than the above difference, the factor interpretation and structure remained the same as Dekok's (1979).

Four manifestation variables exhibited complexities greater than one. Questions 29, 33, 41, and 43 had loadings greater than 0.4 on two factors. As with the switch of Q 39 discussed above, this could indicate an interpretation problem with these questions. Individuals responding to the survey may have viewed these questions in different ways (i.e. perceived them differently). These four questions did not, however, cause any problems with interpretation of the

involved factors. Two questions, Q 17 and Q 27, had enough ambiguity involved to prevent them from loading greater than 0.4 on any factor so they were removed from the analysis.

OC Stability. As discussed in the section on Dimensionality, the organizational climate factor structure has remained remarkably stable from measurement to measurement. Appendix B contains the factor structure and associated loadings for the PA1 analysis of the 1980 data sample with five factors retained. The similarity of this dimensionality with the 1978 and 1979 analyses accomplished by Dekok (1979, Appendix C) leads to the conclusion that the OC is very stable and the reliability of the survey instrument is quite acceptable.

Factor Scores vs. Scale Scores (OC). Once the OC factors were identified, there were two possible approaches to calculating "scores" on each factor for further analysis. Standardized factor scores (mean equals zero, variance equal one) could be calculated for each respondent using the FACSCORE capability of SPSS (Nie et al., 1975). The other alternative is to create scale scores by linearly combining the variables in each factor using equal weights for each variable (i.e. in the same fashion as the Hoppock and Patchen measures). From an interpretability viewpoint, scale scores were preferred for this analysis. It is difficult to attach meaning to a factor score even though factor scores are simple to handle statistically.

Table VI
Organizational Climate Factor Analysis Summary (N = 1061)*

Factor One Immediate Work Group	Factor Two Employee/Supervisor Interaction	Factor Three Organizational Warmth	Factor Four Organizational Communication	Factor Five Supervisory Support
Q 22 (.56) Group Friendly	Q 18 (.60) Credit for Work	Q 20 (.51) Orgn'l Loyalty	Q 16 (.71) Info-Group	Q 24 (.64) Sup Hi Stds.
Q 26 (.58) Group Help	Q 19 (.69) Sup Pays Attn.	Q 23 (.68) Promotion Sys. Effective	Q 41 (.41) Info Sharing	Q 37 (.73) Sup Encourages Best Effort
Q 28 (.47) Group Plan	Q 21 (.59) Make Decisions w/o sup.	Q 29 (.44) Rewards greater than criticism	Q 42 (.75) Info-Branch	Q 40 (.64) Pressure to Improve
Q 31 (.73) Group Pays Attention	Q 25 (.50) Supervisor Esteem	Q 33 (.44) Organizational Pride	Q 45 (.74) Info-Division	Q 43 (.59) Sup Encourages Ideas
Q 32 (.75) Group Excg Ideas	Q 29 (.59) Rewards greater than Criticism	Q 34 (.68) Rewards		
Q 33 (.53) Organ'l loyalty	Q 30 (.67) Sup Friendly	Q 36 (.68) Decisions		
Q 35 (.70) Group Trust	Q 43 (.43) Sup Encourg Ideas	Q 41 (.59) Info Sharing		
Q 38 (.74) Group Sharing		Q 44 (.41) People asked for ideas		
Q 39 (.45) Influ Decisions				

* Numbers in parentheses are the variable loadings.

Note: Q 17 and Q 27 do not load at 0.4 or greater on any factor.

The first step in determining if scale scores could be utilized was to examine the loadings of the variables comprising a factor on that factor. Using the 0.4 selection rule ensured that all loadings were reasonably high. As far as equality of variable loadings within a particular factor is concerned they are reasonably close to the same magnitude although some of the "spreads" are larger than would be considered ideal.

To resolve the issue a second test proposed by Jum Nunnally (1967) was utilized. To calculate the reliability of a measure, Nunnally proposed use of a formula for coefficient alpha developed by Cronbach (1951):

$$r_{kk} = \frac{k}{k-1} \left(1 - \frac{\Sigma \sigma_i^2}{\sigma_y^2} \right)$$

[Nunnally, 1967:196]

Where:

r_{kk} = Coefficient alpha

k = Number of items in measure

$\Sigma \sigma_i^2$ = Sum of the variances of individual items

σ_y^2 = Variance of the sum of the items (measure)

As stated by Nunnally,

> It represents the expected correlation of one test with an alternative form containing the same number of items . . . . It is so pregnant with meaning that it should be routinely applied to all new tests [Nunnally, 1967:196].

Basically coefficient alpha provides an indication of whether or not a combination of variables are measuring the same underlying factor, for example: Organizational Warmth. Values for coefficient alpha can range from zero to one with higher values indicating higher reliability. Coefficient alphas were calculated for each of the five OC factors as scale scores with the results shown in Table VII.

Table VII
Coefficient Alphas for OC Factors

Factor	Coefficient Alpha
Immediate Work Group (F1)	0.85
Employee/Supervisor Interaction (F2)	0.84
Organizational Warmth (F3)	0.69
Organizational Communication (F4)	0.81
Supervisory Support (F5)	0.78

The coefficient alphas shown in Table VII are quite high indicating good reliability for the scale score approach to the five OC factors. These results in addition to the analysis of the loadings lead to the decision to use scale scores for the five OC factors in the analysis of AFFDL organizational change. The scale scores were formed as linear combinations of the variables comprising a factor with equal weighting on each variable. The equations are shown below:

F1 = Q22 + Q26 + Q28 + Q31 + Q32 + Q33 + Q35 + Q38 + Q39

F2 = Q18 + Q19 + Q21 + Q25 + Q29 + Q30 + Q43

F3 = Q20 + Q23 + Q29 + Q33 + Q34 + Q36 + Q41 + Q44

F4 = Q16 + Q41 + Q42 + Q45

F5 = Q24 + Q37 + Q40 + Q43

The above formulas yield scale scores which can vary as shown below:

F1: 9 to 45

F2: 7 to 35

F3: 8 to 40

F4: 4 to 20

F5: 4 to 20

OC Factor Item Intercorrelation. To obtain an indication of construct validity, the zero-order correlations among factor items were examined via Pearson Produce Moment Correlations (Nie et al., 1975). The results for each of the five factors are contained in Appendix C. As would be expected the intercorrelations among items comprising each factor are reasonably high verifying, to a limited degree, the validity of the construct.

Productivity Factor Analysis. As described under the section on the questionnaire, Questions 51 through 58 provide data on an individual S&E's productivity. These questions which asked for each S&E to indicate how many of each output an individual either authored or took part in over the past year are listed in Table VIII.

Table VIII
Productivity Categories

Question	Output
51	Published papers in professional or technical journals
52	Technical Reports
53	Technical memorandums or test data reports
54	Presentations at symposia, meetings of professional organizations, and technical conferences
55	Hardware/software specifications, statements of work, requests for proposals
56	In-house studies, technical and/or managerial assessments
57	Presentations to general officer-level audiences
58	Professional or technical committee participation (external to laboratory)

The above questions were developed after a discussion with Mr. Max Davis of AFFDL and a review of laboratory products.

Productivity Dimensionality. Dekok's (1979) PA1 factor analysis of the combined (1978, 79) sample yielded three factors with eigenvalues greater than 1.0, accounting for 60.1 percent of the variance (Dekok, 1979:76). One variable exhibited a complexity greater than one. Q 58 loaded nearly equally on Factor One and Factor Two causing some

factor interpretation problems. All factor loadings were higher than 0.75 with the exception of Q 58 (0.52, 0.51 respectively) and Q 55 (0.53).

A PA1 factor analysis, using Varimax orthogonal rotation with Kaiser normalization, was accomplished using the combined (1978, 79, 80) data sample to investigate the productivity factor structure. The initial analysis yielded three factors with eigenvalues greater than 1.0, accounting for 57.2 percent of the variance. The analysis also yielded some confusion. Q 58 again loaded on both Factor One and Factor Two. Q 55 switched from Factor One to Factor Three. Neither Q 58 nor Q 55 loaded as strongly on any factor as did the other questions. Following discussions with other Air Force Institute of Technology (AFIT) researchers, it was decided to conduct another PA1 analysis eliminating Q55 and Q 58 from consideration to see if a cleaner factor structure could be obtained.

The second PA1 analysis yielded three factors with eigenvalues greater than 1.0, accounting for 68.6 percent of the variance. Table IX contains the resultant factor structure from the second PA1 analysis of the combined (1978, 79, 80) sample.

The factor titles used for the productivity factors were suggested by Dekok (1979) and are retained for use in this analysis. The factor structure in Table IX is extremely "clean", that is, no variables exhibit complexities

Table IX
Productivity Factor Analysis -
Combined Data (N = 685)

Question	Factor One External Professional Development	Factor Two Technical Data	Factor Three Management Studies
51	0.87	-0.01	-0.08
52	0.17	0.77	0.11
53	0.03	0.83	-0.01
54	0.80	0.23	0.09
56	-0.08	0.16	0.77
57	0.08	-0.06	0.82
Eigenvalue	1.77	1.31	1.04
Percent Variance Explained	29.5	21.9	17.2

greater than one. The variables which do load at greater than 0.4 on a factor, as underlined in the Table, have quite high loadings with 0.77 as the lowest loading obtained. The factor structure and loadings obtained in the second PA1 analysis shown in Table IX is a significant improvement over the previous analysis.

Factor Scores versus Scale Scores. As with the OC analysis a decision had to be made concerning the use of Factor Scores, via SPSS FACSCORE, or Scale Scores via an equal weighting scheme of the variables compressing each factor. A scale score would be far easier to attach meaning to than a factor score. The same two step process used in deciding the OC factor question as to scale versus factor scores was used here.

An examination of the loadings in Table IX shows that all the loadings were quite high, 0.77 to 0.87, and the "spread" between high and low loadings was small (for those loadings greater than 0.4 as underlined). This result would support an equal weighting of the variables in a linear combination for each factor.

The second step was to calculate coefficient alpha for each productivity factor (Nunnally, 1967:196). The results are shown in Table X for each productivity factor.

Table X
Coefficient Alphas for Productivity Factors

Factors	Coefficient Alpha
External Professional Development (P1)	0.55
Technical Data (P2)	0.50
Management Studies (P3)	0.48

The coefficient alphas shown in Table X are not as good as those obtained in the OC factor calculations. The coefficient alphas obtained for the productivity factors, however, are considered adequate for this research. As Nunnally stated:

> In the early stages of research on predictor tests or hypothesized measures of a construct, one saves time and energy by working with instruments that have only modest reliability, for which purpose reliabilities of .60 or .50 will suffice . . . . For basic research, it can be argued that increasing reliabilities beyond .80 is often wasteful [Nunnally, 1967:226].

In view of the above information and the strong and nearly equal in magnitude loadings obtained for variables comprising a productivity factor, it was decided to use scale scores for the productivity factors in the analysis of organizational change at AFFDL. The scale scores were formed as linear combinations of the variables comprising a factor with equal weighting on each variable. The equations are shown below:

$$P1 = Q51 + Q54$$

$$P2 = Q52 + Q53$$

$$P3 = Q56 + Q57$$

The range of values which the productivity scale scores can yield depends upon the number of reports, briefings, etc., accomplished by an individual respondent.

Productivity Factor Item Intercorrelation. As stated by Dekok,

> Unlike organizational climate, there is no basis for assuming that productivity levels of an R&D organization are relatively stable, so a comparison of the stability of the factor structure between each year's measurement was not made [Dekok, 1979: 77].

The intercorrelation of items comprising a factor were examined to obtain an indication of construct validity. The results of the Pearson Product Moment Correlation Analysis (Nie et. al., 1975) are contained in Appendix D. The intercorrelations among items comprising a factor are fairly high and consistent verifying, to a limited degree, the validity of the construct.

Absenteeism Data. Absenteeism was the final measure and was not part of the survey. The data were obtained from the AFFDL manhour accounting system which categorizes absences from work into annual leave, sick leave, administrative "other leave", and military-related duties (for military). The data on sick leave were utilized to construct this measure because sick leave corresponds the closest to absenteeism in the private sector. The measure was constructed by dividing a division's total monthly hours charged to sick leave by the total manhours available for the month (Dekok, 1979:78). A four month period, October through January, was used for each year's (1978, 79, 80) sample. The validity of the absenteeism measure is inherent in the records system.

Research Methodology

The analysis of the effect of the team development program on AFFDL proceeded according to the data analysis flow shown in Figure 3. The first step was to examine and confirm the integrity of the 1978 and 1979 data samples. Next, the 1980 data sample was examined and edited for bad data via the SPSS routine FREQUENCIES. The eleven criterion measures were then formed via the formulas and procedures described previously in this chapter.

Survey Item and Criterion Measure Differences. Once the criterion measures were formed, the next analytic step

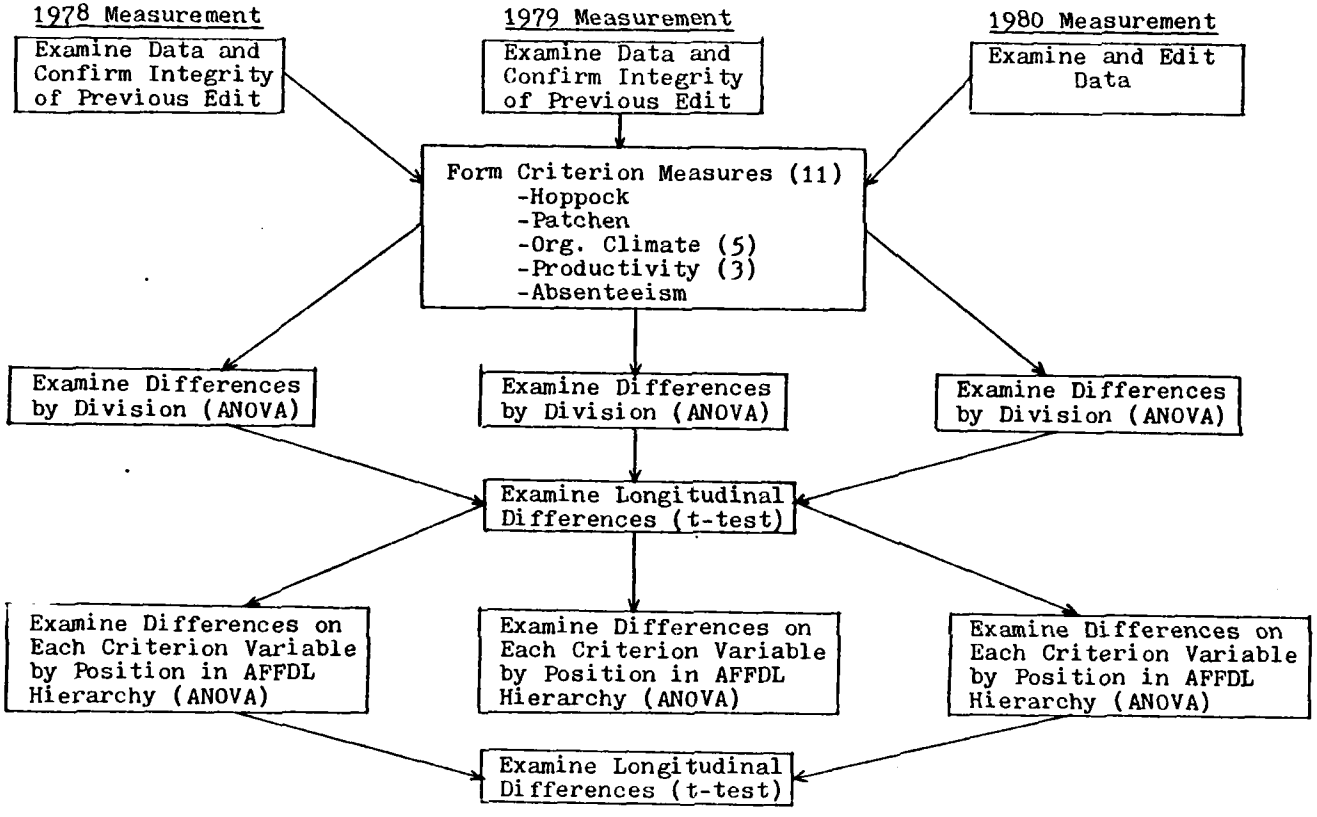


Figure 3. Data Analysis Flow

was the examination of univariate differences in overall laboratory responses to the 58 questions in the survey instrument between the 1978 and 1980 measurements. The criterion measures were then examined for division differences, using one-way Analysis of Variance (ANOVA), in each year's sample. Longitudinal differences in criterion scores for each division were computed for FE, FX, and FB for the two year time period (1978 - 1980) and computed for FG for the one year time period (1979 - 1980). As was previously mentioned, no measurement was made of FG in 1978 so a longitudinal calculation for 1978 to 1980 could not be made, but could be calculated for 1979 to 1980. The computed differences were tested at the p = .05 level (two tailed test).

Differences by Division: Hierarchical Groups. Longitudinal differences in criterion scores for the hierarchical groups, defined by Question 7, were selected for analysis for two reasons stated by Dekok,

> 1. Hierarchical groups have more intuitive appeal as subjects for analysis, particularly when results are communicated back to the organization.
> 2. The effect of the intensity of the team building intervention could be tested, at least indirectly, with hierarchical groups [Dekok, 1979: 83].

A one-way ANOVA was used, with division membership controlled, in each year's sample to obtain the means for each factor. The longitudinal test of the differences was calculated based on the two year period from the 1978 measurement to the 1980 measurement.

Factor Trends. As a final graphic examination of the effects of the OD program on AFFDL, the values for the criterion measures are plotted, by division, for each of the three measurements. While three data points are not sufficient for a good solid trend indication, the plots provide a graphic view of the process being measured.

Summary

The research design and methodology presented in this chapter were designed to answer the questions and hypotheses stated in Chapter I. The basic question was: Has the team building organizational development (OD) intervention at the Air Force Flight Dynamics Laboratory (AFFDL) had any measurable effect on the various organizational goals that were stated for the program?

The main thrust of this analysis was the longitudinal differences in the eleven criterion measures exhibited by the four main product divisions of AFFDL. The voluntary nature of the AFFDL OD program provided a natural experimental set-up with two divisions (FE and FG) participating in the OD program and the other two divisions (FX and FB) not participating.

With the exception of the absenteeism measure, the other measures, job satisfaction, job motivation, five measures of organizational climate, and three measures of productivity (S&E's) were formed as scale scores using a

linear combination of the equally weighted variables comprising each measure. The examination of the longitudinal changes in the criterion variables exhibited by the treatment groups (FE and FG) and control groups (FX and FB) allowed an assessment of the effectiveness of the team building intervention at AFFDL.

III Results and Discussion

Introduction

The presentation of the analysis results in this chapter follows the data analysis flow diagram provided in Chapter II, Figure 3. Following the numerical results of each section of the analysis is a brief discussion relating these results to the AFFDL OD program and other facets of the AFFDL organization.

Examination of the Data

The first step in the analysis of the AFFDL data was to examine the overall change in laboratory responses to the 58 items in the survey instrument from 1978 to 1980. Dekok, in his analysis of the overall change from 1978 to 1979, found remarkable stability in the data with only three items exhibiting statistically significant changes. Those items included one organizational climate (positive change), one productivity (negative change) and one nature of work item (negative change). The same stability observed by Dekok for the one year period (1978-1979) is evident in the results shown in Table XI for the two year (1978-1980) period. As depicted in Table XI, three items changed significantly from 1978 to 1980. Q3, Years in Division, is an expected demographic consequence of a longitudinal study. Q16, Info:

Table XI
Survey Item Comparison*
(1978, 1980)

Question	Short Name	Mean/Std Deviation 1978	1980
1	Age	4.46/2.10	4.53/2.08
2	Grade	3.82/1.51	3.88/1.50
3**	Years in Division	5.39/2.00	6.02/1.49
4	Years in Lab	3.40/1.72	3.61/1.62
5	Education Level	4.78/1.81	4.90/1.65
6	Division	a	a
7	Position	3.04/1.19	2.98/1.09
8	Hoppock-1	4.71/1.37	4.70/1.24
9	Hoppock-2	4.88/1.04	4.91/ .95
10	Hoppock-3	4.66/1.07	4.16/1.04
11	Hoppock-4	4.51/ .94	4.47/ .84
12	Patchen-1	3.94/1.28	3.82/1.30
13	Patchen-2	3.23/ .82	3.14/ .81
14	Patchen-3	3.36/1.31	3.24/1.30
15	Patchen-4	3.69/ .85	3.70/ .82
16***	Info: Group	3.03/1.29	3.22/1.26
17	Objectives	3.81/ .89	3.84/ .87
18	Credit for Work	3.36/1.24	3.51/1.19
19	Supv Pays Attn	3.71/ .95	3.66/ .98
20	Organ'l Loyalty	3.13/1.17	3.12/1.19
21	Autonomy	4.14/ .99	4.05/1.12
22	Group Friendly	4.19/1.02	4.17/ .93
23	Promot Sys Effectv	2.28/1.14	2.37/1.16
24	Supv Hi Standards	3.59/ .95	3.59/ .99
25	Supv Esteem	3.20/ .97	3.33/ .95
26	Group Help	2.87/1.08	2.80/1.08
27	Know What's Exptd	3.78/1.04	3.75/1.06
28	Group Plan	3.10/1.08	3.06/1.16

*N_1 (1978) = 364
N_2 (1980) = 342

a = N/A

**$p \leq .01$
***$p \leq .05$

Table XI (Cont'd) #

Question	Short Name	Mean/Std Deviation 1978	1980
29	Rewards GT Criticism	3.24/1.26	3.30/1.29
30	Supv Friendly	4.14/1.12	4.07/1.09
31	Group Pays Attn	3.71/ .77	3.67/ .79
32	Group Exchg Ideas	3.53/8.7	3.41/ .88
33	Organizational Pride	3.66/1.03	3.60/1.03
34	Rewards	2.74/1.14	2.76/1.12
35	Group Trust	3.75/ .91	3.71/ .84
36	Decisions	2.65/1.11	2.68/1.10
37	Supv Encourage Best Effort	3.49/ .98	3.45/ .96
38	Group Sharing	3.70/ .92	3.70/ .83
39	Influence Decisions	3.30/1.25	3.40/1.26
40	Pressure to Improve	2.88/1.05	2.90/1.08
41	Info Sharing	2.46/1.04	2.50/1.01
42	Info: Branch	3.17/1.18	3.28/1.17
43	Supv Encourages Ideas	3.31/ .99	3.31/1.04
44	People Asked Ideas	2.82/1.09	2.84/1.03
45	Info: Division	2.68/1.21	2.83/1.14
46	R & D (In-House)	27.15/26.56	28.77/25.68
47	Contract Guidance	18.50/20.74	20.81/20.61
48	Technical Support	20.57/21.99	17.75/19.54
49	Program Admin.	23.55/20.05	22.94/18.44
50	Supervision	9.03/14.79	9.17/14.85
51	Published Papers	.34/ .72	.41/ .87
52	Technical Reports	.56/1.27	.40/ .76
53	Technical Memos	.94/1.95	.89/1.82
54	Presentations	.91/1.49	.81/1.55
55**	Specifications	2.55/3.73	1.77/2.1
56	In-House Studies	2.06/3.61	1.82/2.79
57	Gen Officer Briefings	1.38/2.84	1.62/3.85
58	Committee Partic	.89/1.77	.98/1.99

For Questions 46-58 N_2 (1980) = 234
N_1 (1978) = 206 **$p \leq .01$

Group, is the same climate item which exhibited significant change in Dekok's study. From 1979 to 1980 Q16, Info: Group, actually declined from a value of 3.27 in 1979 to 3.22 in 1980. Means and Standard Deviations for the 1979 responses are contained in Appendix F. The final item which changed significantly was Q55, Specifications, a productivity item. This item declined from 1978 to 1980 ($p = .01$) also.

Discussion. As discussed by Dekok, there are three basic reasons for the stability illustrated by the results in Table XI:

1. Organizational climate may change slowly over time as individual perceptions alter. This may be particularly true if the humanistic process type changes are not backed up or coupled with structural changes. As stated by Woodman, organizational climate ". . . has an air of permanency or at least some continuity over time [Woodman, 1978: 818]." Dekok observed that one year, 1978 to 1979, may have been too short a time for the OD changes to manifest themselves. With a two year period more change might have been expected in the climate questions or the productivity responses unless either OD is not having any effect or one of the following reasons is the case.

2. The OD program at AFFDL has been underway since 1976. It is possible that most of the change resulting from the team building intervention occurred prior to the beginning of the measurement process in late 1977. If Likert's

model of organizational change, discussed in Chapter I, is accurate the AFFDL process would be at the end of the chain of events and further changes in the perceptual variables (Q16-Q45) would not be expected. Changes in end result variables, i.e. productivity, would be expected but it is possible that some divisions went up while others went down thereby negating the change over time: Reason three addresses this issue.

3. It is possible that between the time of the first measurement (1978) and the last measurement (1980) that the treatment divisions (FE and FG) gained on some variables while the control divisions (FX and FB) declined on those variables and, therefore, negated any change for the laboratory as a whole (Dekok, 1979:87-88).

In view of the above alternatives for the stability in the AFFDL data, it is not possible to draw any firm conclusions concerning the effectiveness of the AFFDL OD program. Divisional differences must be examined to see if the OD program succeeded in providing statistically significant separation between OD and non-OD divisions.

Analysis of Division Differences

The next step in the analytic process was to examine the scores of the divisions for the various criterion measures developed in Chapter II. First divisional differences

were examined within each year (1978, 1979, 1980) and finally a longitudinal analysis was conducted on the scores from 1978 to 1980.

Tests of Differences Among Divisions (ANOVA). The SPSS procedure BREAKDOWN (Nie et al., 1975) was utilized to generate means and standard deviations for each of the criterion measures by division and to perform one-way analyses of variance (ANOVA) on the data. The results of those analyses are shown in Tables XII (1978), XIII (1979), and XIV (1980). Note that FG was not part of the 1978 measurement and therefore not contained in Table XII (1978).

The results from Table XII (1978) show that little statistical difference exists among the three divisions. Only one of the ten criterion measures indicated that a statistical ($p = .05$) difference existed between the divisions. Climate Factor Five, Supervisory Support, indicated a difference at the $p = .03$ level. This was due to a high value for FE (OD treatment division) and a low value for FB (control division). The ANOVA result does lend some support to alternative one discussed in the previous section and denied alternatives two and three. If all or most of the OD induced change had occurred prior to 1978 (first measurement) then the ANOVA for 1978 should have revealed more statistically significant differences in Organizational Climate (OC) and productivity measures. Along the same lines if FE and FG (treatment) divisions had gained on measures while FX and

Table XII
Differences Among Divisions
on Criterion Scores (1978) #

Measure	Short Name	Means and (S.D.) FX	FB	FE	F Value
Hoppock	Job Satisfaction	18.62 (3.86)	19.09 (3.45)	18.55 (3.90)	.58
Patchen	Job Motivation	14.22 (3.01)	13.90 (3.41)	14.62 (3.33)	.95
Climate Factor 1	Immediate Work Group	31.92 (5.96)	31.74 (6.22)	31.74 (6.55)	.27
Climate Factor 2	Employee/Supv Interaction	24.90 (5.5)	25.03 (5.37)	25.33 (5.17)	.13
Climate Factor 3	Organizational Warmth	22.37 (4.54)	22.99 (4.88)	23.31 (5.40)	.76
Climate Factor 4	Organizational Communication	11.00 (3.73)	11.48 (3.51)	11.38 (4.03)	.60
Climate Factor 5	Supervisory Support	13.17 (3.28)	12.85 (2.91)	14.05 (2.85)	3.25**
Productvy Factor 1	Ext Professional Development	.95 (1.36)	1.36 (2.11)	1.41 (2.05)	1.13
Productvy Factor 2	Technical Data	1.02 (1.39)	1.77 (3.98)	1.63 (2.17)	1.31
Productvy Factor 3	Management Studies	3.43 (5.81)	3.31 (5.28)	3.72 (4.32)	.10

**$p \leq .03$

#N's for all measures except Productivity Factors	109	141	95
N's for Productivity Factors	65	86	54

Table XIII
Differences Among Divisions
on Criterion Scores (1979) #

Measure	Short Name	Means and (S.D.) FX	FB	FE	FG	F Value
Hoppock	Job Satisfaction	18.98 (3.23)	19.00 (3.63)	18.99 (3.62)	19.06 (3.57)	.01
Patchen	Job Motivation	14.06 (3.01)	14.19 (3.22)	14.76 (2.99)	14.16 (3.05)	.79
Climate Factor 1	Immediate Work Group	30.37 (5.98)	31.56 (5.81)	32.39 (5.58)	31.63 (5.51)	1.49
Climate Factor 2	Employee/Supv Interaction	25.06 (5.20)	25.56 (5.30)	25.43 (5.23)	26.24 (4.83)	.94
Climate Factor 3	Organizational Warmth	21.62 (4.90)	23.67 (4.81)	23.41 (4.90)	23.82 (4.99)	3.29*
Climate Factor 4	Organizational Communication	10.83 (3.75)	11.96 (3.53)	12.72 (3.43)	12.18 (3.72)	3.51*
Climate Factor 5	Supervisory Support	13.30 (3.10)	13.24 (3.18)	14.13 (2.79)	13.73 (2.72)	1.62
Productvy Factor 1	Ext Professional Development	1.11 (1.44)	1.72 (2.36)	0.96 (1.26)	0.76 (1.37)	2.94**
Productvy Factor 2	Technical Data	1.06 (1.25)	2.02 (2.69)	1.02 (1.10)	0.47 (.95)	7.34***
Productvy Factor 3	Management Studies	2.14 (2.57)	3.24 (7.97)	3.18 (4.07)	(3.74)	.60

*p≤ .01 **p≤ .02 ***p = .0000

#N's for all measures except Productivity Factors	99	107	83	116
N's for Productivity Factors	64	58	49	72

Table XIV
Differences Among Divisions
on Criterion Scores (1980) #

Measure	Short Name	Means and (S.D.) FX	FB	FE	FG	F Value
Hoppock	Job Satisfaction	18.83 (3.23)	18.36 (3.78)	18.67 (2.97)	18.93 (3.40)	.53
Patchen	Job Motivation	14.02 (3.03)	13.78 (3.20)	13.82 (3.19)	13.92 (2.96)	.11
Climate Factor 1	Immediate Work Group	31.42 (5.96)	30.99 (6.14)	32.41 (6.35)	31.77 (6.43)	.71
Climate Factor 2	Employee/Supv Interaction	24.85 (5.28)	24.65 (6.01)	25.65 (5.13)	26.13 (5.72)	1.36
Climate Factor 3	Organizational Warmth	22.91 (5.17)	22.72 (5.15)	25.37 (5.26)	23.75 (4.66)	.86
Climate Factor 4	Organizational Communication	11.40 (3.47)	11.60 (3.86)	12.38 (3.42)	12.21 (3.85)	1.28
Climate Factor 5	Supervisory Support	13.26 (2.99)	12.91 (3.23)	14.25 (2.63)	12.94 (3.48)	2.73*
Productvy Factor 1	Ext Professional Development	1.48 (2.74)	1.60 (2.54)	1.14 (1.67)	0.69 (1.03)	2.38
Productvy Factor 2	Technical Data	1.38 (1.77)	1.66 (3.11)	1.00 (1.12)	0.85 (1.35)	1.31
Productvy Factor 3	Management Studies	2.72 (3.48)	3.44 (6.60)	4.37 (5.52)	3.49 (3.63)	.95

*$p \leq .05$

#N's for all measures except Productivity Factors	89	106	60	87
N's for Productivity Factors	61	62	43	68

FB (control) divisions declined then the 1978 ANOVA should have revealed more separation. At this point in the analysis, the lack of a pre-OD baseline makes it difficult to state conclusions with any firmness. The OD process may be changing the AFFDL treatment divisions so slowly that as of 1978 no real effect had been observed.

The 1979 ANOVA results revealed more statistically significant differences among the divisions. Four criterion measures exhibited significant differences: two OC and two productivity. Dekok offered two reasons for the increased separation of the divisions in 1979:

1. Division FG's inclusion in the data for the first time induced sufficient changes in the ANOVA to account for the increased number of significant differences.

2. The divisions exhibited different rates of change from 1978 to 1979 in the measures (Dekok, 1979:92).

Dekok's analysis showed that FG's inclusion was not responsible for the change in the 1979 ANOVA. Reason Two was examined via the longitudinal analysis technique, which is discussed in this chapter.

If the AFFDL OD program was having any effect, however slowly, one would have expected to see increased positive significant differences in the 1979 ANOVA from the 1978 ANOVA. The results for Climate Factors Three and Four, Organizational Warmth and Communication respectfully, are due to FE and FG having relatively high scores compared to FX's

relatively low score. This was in the direction expected, if OD worked, since FE and FG are treatment divisions. The productivity results are disturbing, however, since the significant differences were due to low values for FE and FG (treatment) and higher values for FX and FB (control). This is basically opposite to what would be expected if OD was having a positive effect. At this point the OD program at AFFDL had been underway for over three years. Forras and Berg (1978) indicated that involvement by an OD consultant for 13-24 months tends to produce the best results. Either the AFFDL OD process is very slow or OD is not meeting with full success since, as stated before, the only basic reason for organizational change is to improve effectiveness/productivity. The above paradox of results could only be answered by the third, 1980, measurement and ANOVA.

The 1980 ANOVA results in Table XIV showed that with only one exception the four divisions were not statistically separable on the ten criterion measures. Only Climate Factor Five, Supervisory Support, statistically separated the divisions ($p = .05$). This was due to a relatively high value for FE (treatment) and a low value for FB (control) in relation to FE. The differences seen in 1979 on Climate Factors Three and Four evaporated in 1980 as the divisions moved closer together. Even OC Factor Five was barely significant at $p = .05$ when in 1978 it was significant at $p = .03$. In terms of productivity the treatment divisions (FE and FG)

made modest gains from 1979 on several measures but FX and FB (control) made larger gains, generally.

At the time of the 1980 measurement the OD program at AFFDL had been underway for over four years. If it had been effective, there should have been more significant differences between the treatment and control divisions. The 1980 ANOVA's revealed little, if any, significant differences among the four divisions at a point where one would have expected to see differences if OD was having a positive effect.

Tests of Longitudinal Change. The next step in the analysis was to examine the rate of changes in criterion scores from 1978 to 1980 for divisions FX, FB, and FE. In Dekok's analysis of the change from 1978 to 1979 only two criterion measures exhibited significant change using the two tailed t-test ($p = .05$). Climate Factor One, Immediate Work Group, showed a significant ($p = .03$) decrease in FX (control). Climate Factor Four, Organizational Communication, showed a significant ($p = .01$) increase for FE (treatment). In terms of the FE increase on communication (1978-1979), Dekok stated:

> In the absence of any evidence supporting another causal agent, it is difficult to reach any conclusion other than the OD program was responsible for this change [Dekok, 1979:96].

The results of the 1978 to 1980 longitudinal analysis are provided in Table XV. None of the differences shown in that Table are statistically significant. Organizational

Table XV
Divisional Change (Longitudinal)
on Criterion Measures #*

Measure	Short Name	Means: 1980 - 1978 (t-value) FX	FB	FE
Hoppock	Job Satisfaction	.21 (.41)	-.73 (.41)	.12 (.20)
Patchen	Job Motivation	-.20 (-.47)	-.12 (-.28)	-.80 (-1.48)
Climate Factor 1	Immediate Work Group	-.50 (-.59)	-.75 (-.94)	.67 (.63)
Climate Factor 2	Employee/Supv Interaction	-.05 (-.06)	-.38 (-.56)	.32 (.38)
Climate Factor 3	Organizational Warmth	.54 (.78)	-.27 (-.42)	.26 (.29)
Climate Factor 4	Organizational Communication	.40 (.77)	.12 (.20)	1.00 (1.59)
Climate Factor 5	Supervisory Support	.09 (.20)	.06 (.12)	.20 (.44)
Productvy Factor 1	Ext Professional Development	.53 (1.39)	.24 (.62)	-.27 (-.70)
Productvy Factor 2	Technical Data	.36 (1.28)	-.11 (-.18)	-.63 (-1.73)
Productvy Factor 3	Management Studies	-.71 (-.83)	.13 (.13)	.65 (.65)

* None of these differences are statistically significant

Numbers are rounded to two decimal places; Values shown in this and similar tables are 1980 mean scores minus 1978 mean scores.

Communication, Climate Factor Four, declined from 1979 (12.72) to 1980 (12.38) for FE, which accounted for its loss of significance. Also disturbing, in terms of OD effectiveness, were the results of the productivity tests. For FE (treatment) two out of three measures continued to exhibit negative trends. Although they failed to reach statistical significance. The remaining productivity factor, Management Studies, made a modest gain from 1978 to 1980. The situation was reversed for the Control (FX and FB) divisions where two out of three productivity factors exhibited modest positive changes while the third had a negative change.

Discussion. The results of the ANOVAs and longitudinal analysis presented in the previous section, coupled with the fact that FG exhibited no significant changes on its criterion scores from 1979 to 1980, supported the conclusion that if OD had any effect it was temporary and had largely disappeared by the time of the 1980 measurement. The AFFDL OD program was apparently responsible for the temporary significant gain by FE on the quality of communication within that division from 1978 to 1979, which led to the significance of the ANOVA for 1979. This conclusion was reached due to a lack of any other plausible reason for such a significant gain by FE. In addition both FE and FG had consistently higher scores in 1979 and 1980 for the communication factor than FX or FB, even though this difference was not statistically significant. The downturn in FE's

communication factor score from 1979 to 1980 coupled with modest gains by both FX and FB led to the divisions becoming statistically inseparable on the quality of communication factor in 1980. Even more to the point concerning AFFDL's team building technique of intervention, the lack of statistically significant positive change for Climate Factor One, Immediate Work Group, from 1978 to 1980 raised some serious problems. As stated by Dekok:

> Since team building has as its focus the creation of a supportive, cohesive work group, the lack of significant results indicated by the data casts some doubt on the efficacy of this OD intervention [Dekok, 1979:96].

Divisional Differences by Hierarchical Groups

As previously stated in Chapter II, there were two reasons for examining the hierarchical groups (secretaries, technicians, etc.) in terms of the criterion measures. First, there was an intuitive appeal to using the natural groups for analysis and in communicating results to AFFDL. Second, the use of those groups allowed a look at the effects of the intensity of the OD intervention. The Hoppock, Patchen, and five OC factors were used in this analysis. The productivity factors were not used in this analysis. The productivity factors were not used because the previous analysis essentially measured productivity in one group: S&E's. Group Leaders and Branch Chiefs are S&E's in management positions.

Job Satisfaction. The ANOVA results for the Hoppock measure are contained in Table E-1 (1978), Table E-8 (1979), and Table E-15 (1980) in Appendix E. With the exception of S&E's in 1978 and Branch Chiefs in 1979, none of the other natural groups exhibited statistical differences for job satisfaction. In both cases FB (control) had the high scores.

The longitudinal results shown in Table XVI contain no statistically significant results for the two year period 1978 to 1980 at the p = .05 level.

Table XVI
Longitudinal Change for Hierarchical Groups:
Job Satisfaction (Hoppock) #

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	0.25 (.18)	-1.26 (-.88)	1.63 (.74)
2	Technicians	-0.14 (-.12)	-1.12 (-.77	-0.84 (.52)
3	S&E's	0.07 (.01)	-0.53 (-.98)	0.73 (.93)
4	Group Leaders	-0.76 (-.52)	-0.56 (-.62)	-0.78 (-.51
5	Branch Chiefs	0.00 (0)	0.54 (.17)	1.33 (1.29)

None of the above differences are statistically significant.

Note: N's for the tests in this section on Hierarchical groups are found in Appendix E.

Discussion. These results confirm the previous division wide analysis. No positive effect by OD on job satisfaction can be seen in these data. Many groups across the three divisions had negative trends, including Group Leaders from all three divisions in this analysis. This was opposite from what would be expected since Group Leaders had, along with Branch Chiefs, more frequent contact with the OD program.

Job Motivation. The ANOVA results for the Patchen measure are contained in Table E-2 (1978), Table E-9 (1979), and Table E-16 (1980) in Appendix E. None of the results were statistically significant.

The longitudinal results shown in Table XVII likewise produced no significant results in terms of differences from 1978 to 1980.

Table XVII
Longitudinal Change for Hierarchical Groups:
Job Motivation (Patchen) #

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	0.25 (.19)	0.49 (.40)	0.07 (.04)
2	Technicians	-1.41 (-1.44)	-0.58 (-.49)	-1.06 (-.75)
3	S&E's	0.26 (.46)	0.23 (.42)	-0.97 (-1.34)
4	Group Leaders	0.01 (.01)	-1.04 (-.68)	-1.01 (-1.19)
5	Branch Chiefs	0.00 (0)	-1.07 (-.59)	-1.09 (-.94)

None of the above differences are statistically significant.

Discussion. These results indicated that the team building intervention had failed to provide a significant effect on job motivation. Dekok discovered a negative trend for Branch Chiefs and Group Leaders across all three divisions from 1978 to 1979. The 1978 to 1980 analysis confirmed this trend although FX appeared to have arrested their trend. As stated by Dekok,

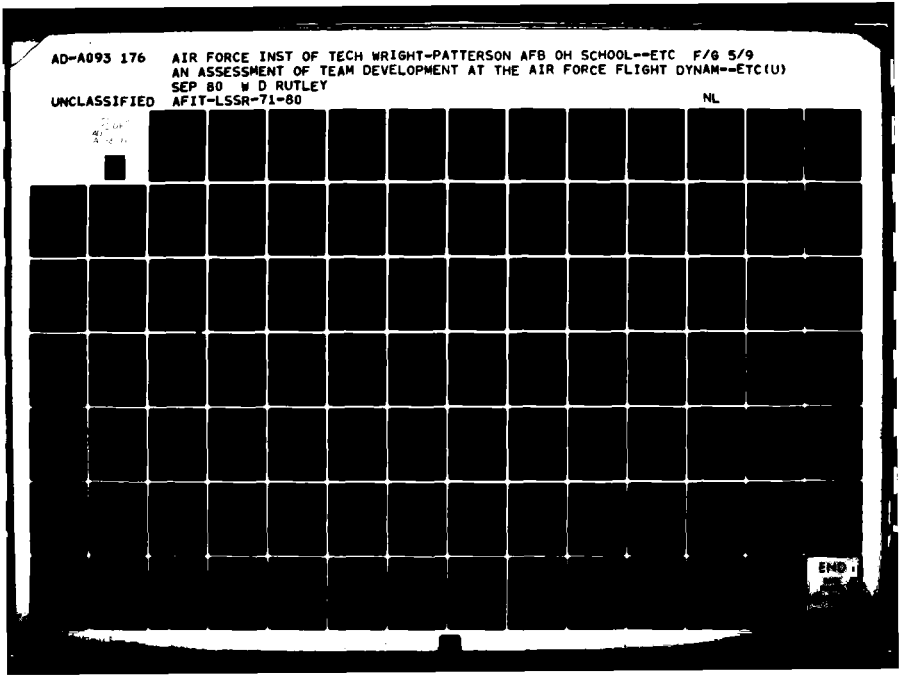
> This implies that the intensity of the intervention does not have a positive effect on organizational change for this factor. This is contrary to the finding of Porras and Berg (1978) [Dekok, 1979:143].

Immediate Work Group. The ANOVA results for F1 are contained in Table E-3 (1978), Table E-10 (1979), and Table E-17 (1980) in Appendix E. There was one statistically significant result in each year: Branch Chiefs (1978), S&E's (1979), and Technicians (1980). None of the ANOVA results indicated any clearly positive OD effect.

The longitudinal results contained in Table XVIII showed no statistically significant results for the two year period.

Discussion. In terms of the team building intervention utilized at AFFDL, this was a disappointing result. As stated previously, team building is directed at the work group: the failure to produce any clear positive improvement has reflected problems for the AFFDL OD program.

Employee/Supervisor Interaction. The ANOVA results for F2 are contained in Table E-4 (1978), Table E-11 (1979),


AD-A093 176
AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL--ETC F/G 5/9
AN ASSESSMENT OF TEAM DEVELOPMENT AT THE AIR FORCE FLIGHT DYNAM--ETC(U)
SEP 80 W D RUTLEY
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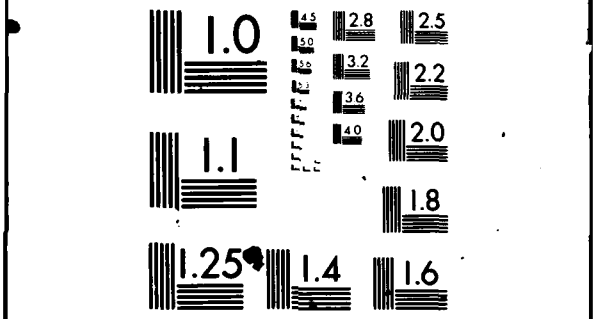

Table XVIII
Longitudinal Change for Hierarchical Groups:
Immediate Work Group (F1) #

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	-2.00 (-.55)	0.45 (.19)	3.23 (.84)
2	Technicians	-0.81 (-.41)	-1.72 (-.82)	-1.01 (-.32
3	S&E's	-0.54 (-.48)	-0.37 (-.40)	-1.01 (.84)
4	Group Leaders	0.62 (.31)	-0.21 (-.13)	-0.42 (-.20)
5	Branch Chiefs	4.50 (0.9)	-0.14 (-.08)	3.33 (1.27)

None of the above differences are statistically significant.

and Table E-18 (1980) in Appendix E. The 1978 results showed no statistical differences. The 1979 ANOVA results contained only one significant difference: Technicians. The Technicians in the two treatment divisions, FE and FG, had higher scores than FX or FB. FB Technicians had a very low score compared to the other three divisions. In the 1980 ANOVA results, the Technicians had the only significant test result, primarily due to a sharp drop by FB Technicians rather than gains by the treatment divisions. In fact, FE Technicians dropped in F2 score from 1979 to 1980 while FG had a modest gain. A brief comment concerning FB Technicians is made at the end of the hierarchical group analysis section.

The longitudinal results for this factor are contained in Table XIX. Only one test yielded a statistically significant result. Group Leaders in FB sustained a significant ($p = .05$) increase in F2.

Table XIX
Longitudinal Change for Hierarchical Groups: Employee/Supervisor Interaction (F2)

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	-2.25 (-.85)	-0.33 (-.14)	2.17 (.68)
2	Technicians	-0.50 (-.24)	-2.94 (-1.55)	0.16 (.08)
3	S&E's	-0.59 (-.58)	0.59 (.71)	0.76 (.64)
4	Group Leaders	1.55 (.73)	3.53 (2.18)*	-0.86 (-.36)
5	Branch Chiefs	4.00 (1.89)	0.43 (.16)	0.83 (.55)

*$p \leq .05$

Discussion. It at first appeared that OD may have had some effect, particularly on treatment group Technicians, over the two year period. Examination of these results revealed that while modest positive gains were made by treatment groups, the statistical differences rated by the ANOVAs were driven by drops in scores sustained by FB Technicians.

Organizational Warmth. The ANOVA results for F3 are contained in Table E-5 (1978), Table E-12 (1979) and Table

E-19 (1980) in Appendix E. The results contained in those Tables paralleled, somewhat, the results discussed above for F2. In the 1978 ANOVA no statistically significant results were revealed. In 1979 the ANOVA depicted significant differences for Technicians, S&E's, and Group Leaders. For Group Leaders the significance was due to a relatively high value for FB (control); and for the S&E's relatively high values for FB and FB (treatment) as opposed to a lower value for FX (control). For the Technicians, a drop in FB's score from 1978 to 1979, in addition to gains made by FE, plus a high value for FG, provided the significant difference in the 1979 ANOVA. Examination of Table E-19 for the results of the 1980 ANOVA showed that the Group Leaders and S&E's differences shown in the 1979 ANOVA have not carried over to 1980. FE Technicians gain on F3 score from 1978 to 1979 evaporated in a downturn from 1979 to 1980. FG maintained a modest positive gain in score from 1979 to 1980 and this coupled with the continued negative trend for FB Technicians led to the significance of the 1980 ANOVA for Technicians.

Table XX contains the results of the longitudinal test for F3 from 1978 to 1980. Only one test achieved statistical significance and that was for Group Leaders in FB, a control group.

Discussion. These results suggested that the OD program, at best, had a temporary effect for FE and FG

Table XX
Longitudinal Change for Hierarchical Groups:
Organizational Warmth (F3)

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	-4.75 (-1.75)	0.37 (.20)	0.63 (.17)
2	Technicians	1.83 (1.11)	-2.44 (-1.61)	-0.96 (-.41
3	S&E's	-0.34 (-.37)	0.12 (.01)	0.99 (.88)
4	Group Leaders	2.05 (1.16)	4.48 (2.57)*	0.73 (.39)
5	Branch Chiefs	-1.00 (-.63)	1.21 (.46)	2.08 (.56)

*$p \leq .02$

Technicians on this factor. This effect was not lasting and had basically faded by the time of the 1980 measurement. The longitudinal analysis results showed that FE hierarchical groups failed to make any significant positive gains on this factor from 1978 to 1980.

Organizational Communication. The ANOVA results for F4 are contained in Table E-6 (1978), Table E-13 (1979), and Table E-20 (1980) in Appendix E. The ANOVA for 1978 revealed only one significant difference. Secretaries in FE (treatment) had a low score compared to either FB or FX (both control). This was opposite to the expected effect from the OD process. As discussed previously in this chapter, this could have been due to the changes being slower than

anticipated. The results for 1979 and 1980 ANOVAs showed no significant differences among the groups on F4.

The results of the longitudinal tests are contained in Table XXI. FE S&E's were almost significant at p = .05 with FE secretaries not far behind. Only Group Leaders in FE had a significant gain, but four out of five groups had positive gains. Technicians had negative trends, although not significantly, for all three divisions. The most significant result was a gain by FB Group Leaders (p = .01).

Table XXI
Longitudinal Change for Hierarchical Groups: Organizational Communication (F4)

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	-2.00 (1.32)	0.48 (.35)	2.43 (1.15)
2	Technicians	-0.08 (.06)	-0.86 (-.79	-0.42 (.29)
3	S&E's	0.26 (.41)	0.03 (.05)	1.62 (1.90)
4	Group Leaders	1.78 (1.28)	4.05 (3.59)**	2.23 (2.13)*
5	Branch Chiefs	-1.00 (-.24)	-0.21 (-.10)	1.50 (.46)

*p ≤ .05 **p ≤ .01

Discussion. The results of the hierarchical group tests generally confirmed the conclusions reached from the division wide data for this factor. OD appeared to have

been responsible for a temporary positive effect on the treatment divisions. Between 1979 and 1980 this effect had begun to evaporate with S&E's failing, just barely, to achieve a significant gain for the two year test and Group Leaders in FE just achieving significance at the $p = .05$ level. Group Leaders in FB, a control group, achieved the highest positive change with a significance level of $p = .01$.

Supervisory Support. The ANOVA results for F5 are contained in Table E-7 (1978), Table E-14 (1979), and Table E-21 (1980) in Appendix E. One test in the 1978 ANOVA reached statistical significance: the very low score by FX Branch Chiefs in comparison to the nearly equal scores of FB and FE accounted for this result. In 1979 FX Branch Chiefs had gained sufficiently on this factor so that no statistically significant differences existed among the groups. In the 1980 ANOVA, FB Technicians continued negative trend for this factor led to a statistically significant result ($p = .007$) for the Technicians' ANOVA.

The longitudinal test results are contained in Table XXII. Only the Group Leaders in FB (control) achieved a statistically significant change (positive) on F5 for the two year period. None of the treatment division groups sustained either a significant positive or negative change and in fact FE Group Leaders achieved no change from 1978 to 1980.

Table XXII
Longitudinal Change for Hierarchical Groups:
Supervisory Support (F5)

Group	Name	Means: 1980 - 1978 (t-value) FX	FB	FE
1	Secretaries	0.20 (.12)	0.00 (0)	1.06 (.61)
2	Technicians	0.93 (.76)	-1.78 (-1.74)	-0.32 (-.27)
3	S&E's	-0.56 (-.96)	0.48 (.98)	0.61 (.99)
4	Group Leaders	1.01 (1.05)	2.60 (1.97)*	0.00 (0)
5	Branch Chiefs	3.50 (1.40)	-0.39 (-.25)	-0.08 (-.13)

*p < .05

Discussion. The results indicated that the team building intervention at AFFDL has had negligible effect on this factor, Supervisory Support. The only statistically significant change from 1978 to 1980 was Group Leaders in FB, a non treatment group.

One disturbing result from the hierarchical group analysis should be noted at this point even though it is not involved as a part of the analysis concerning OD effects. FB Technicians had negative trends for all seven of the criterion measures. Although none of the tests (1978-1980) reached statistical significance, this is a possible problem area for AFFDL which could warrant further investigation by AFFDL management.

Divisional Differences:
Absenteeism

As discussed in Chapter II, AFFDL's manhour accounting system was used as the source for the data on sick leave. Data were available monthly and by division. For each measurement (1978, 1979, 1980), the same four month period, from October to January, was used. The results of a one-way ANOVA for each year are contained in Table XXIII (1978) Table XXIV (1979), and Table XXV (1980). The means shown in those tables are the four-month monthly averages of sick leave (total number of hours charged to sick leave divided by the total manhours available for that division in the particular month) for each of the four AFFDL product divisions (Dekok, 1979:150).

Divisional Differences. As shown in Table XXII the low rate for FX (control) was responsible for the significance of the ANOVA. No OD induced effect can be seen in the 1978 data, somewhat due to the lack of a non-OD baseline. The 1979 ANOVA, Table XXIV, showed that significant drops in the Absenteeism rates for FE and FG (both treatment divisions) were responsible for the significance of the ANOVA. The 1980 ANOVA showed that the 1979 differences had evaporated resulting in no statistically significant differences among the divisions for Absenteeism.

Longitudinal Change. Table XXVI, below, shows the results of the t-tests for change from 1978 to 1980. Dekok's results for the 1978 to 1979 longitudinal analysis showed

Table XXIII
Differences Among Divisions on Absenteeism (1978)

Division	Mean and (Std. Dev) FX	FB	FE	FG	F Value
Absenteeism	.0252 (.0039)	.0395 (.0075)	.0371 (.0027)	.0332 (.0076)	4.52*

*p ≤ .05

Table XXIV
Differences Among Divisions on Absenteeism (1979)

Division	Mean and (Std. Dev) FX	FB	FE	FG	F Value
Absenteeism	.0320 (.0041)	.0337 (.0062)	.0280 (.0035)	.0219 (.0043)	4.96*

*p ≤ .05

Table XXV
Differences Among Divisions on Absenteeism (1980) #

Division	Mean and (Std. Dev) FX	FB	FE	FG	F Value
Absenteeism	.0307 (.0047)	.0229 (.0037)	.0333 (.0082)	.0279 (.0037)	2.12

None of the above results are statistically significant.

Table XXVI
Longitudinal Change for Divisions:
Absenteeism (1978-1980)

(t-value) FX	FB	FE	FG
.0055 (1.77)	-.0166 (-3.98)*	-.0038 (-.88)	-.0053 (-1.25)

*p ≤ .01

that both treatment divisions, FE and FG, has statistically significant drops in Absenteeism rates while neither of the control divisions, FX and FB, achieved significant results. The longitudinal analysis for 1978 to 1980 confirmed the ANOVA results discussed above in that the significant decrease in rates by FE and FG from 1978 to 1979 disappeared in the analysis shown in Table XXVI. Only FB, a control division, achieved statistical significance from 1978 to 1980 with a decrease in Absenteeism rate.

Discussion. Based on Dekok's results for Absenteeism from 1978 to 1979, one could have concluded that OD was responsible for the significant improvement in the rates by the treatment divisions. If this improvement had been sustained over the two year period from 1978 to 1980, this conclusion would have been the logical one to make. However both FE and FG sustained increased rates from 1979 to 1980 thereby wiping out the significance of the decreased rates from 1978 to 1979. Overall both FE and FG still had negative trends for the two year period but a continued upswing in those rates for another year could negate that trend over a three year period. Based on the above results for Absenteeism, it was concluded that if OD had a positive effect and was responsible for the decreases in treatment group rates it was a temporary effect similar to the situation discussed previously in the section of OC Factor Four, Organizational Communication.

Factor Trend Plots

As a means of graphically displaying the results from the division wide ANOVAs and longitudinal changes from 1978 to 1980 for the ten criterion measures discussed earlier in this chapter, plots of the mean division values for each criterion versus time (1978, 1979, 1980) are contained in Appendix G. These plots confirmed visually the discussion provided earlier in this chapter and made it easier to visualize the process being examined.

IV Summary of Results and Recommendations

Summary of Research

The manner in which the AFFDL OD program was conducted gave rise to a unique opportunity for evaluation of the effectiveness of the OD program. With two, of four, divisions participating in the team development program and the remaining two divisions electing not to participate, a naturally occurring treatment group-control group setup was available. Previous examinations of OD program in other organizations suffered from the problems discussed in Chapter I. As stated in a recent article reviewing OD in the military:

> This review has made it clear that the perception of success is based largely on anecdotal reports, testimonials, and personal involvement of the decision makers. Since hard data and rigorous empirical research are lacking, the success could be illusionary or an artifact of a compliant system [Umstot, 1980:198].

Umstot went on to state,

> Thus, the challenge is to develop an empirical research program that will produce measurable results without adverse side effects (e.g., breach of confidentiality, feeling of being manipulated, distorted reporting, and false expectations) [Umstot, 1980:199].

The quasi-experimental design of this research, as explained in Chapter I, was intended to correct the above

problems and control for most sources of experimental error. In addition, statistical control was applied to all quantitative analysis.

This research was intended to answer one basic question, as stated in Chapter I:

> Has the team building organizational development (OD) intervention at the Air Force Flight Dynamics Laboratory (AFFDL) had any measurable effect on the various organizational goals that were stated for the program? Out of this basic problem statement evolved the primary and secondary hypothesis as well as the five sub-objectives stated in Chapter I.

The goals that were articulated for the AFFDL OD program included: "goals of people working harder, or better, or feeling better about the laboratory [Stahl, et al, 1978: 2]." It was against these goals that the effectiveness of the OD program at AFFDL was to be measured. Towards that end the survey instrument described in Chapter II was designed and utilized to measure an individual's productivity, perceptions concerning organizational climate at AFFDL, job satisfaction, and job motivation. Division-wide data on absenteeism was obtained from AFFDL internal records.

Dekok's analysis of the 1978 and 1979 data produced results which were both contradictory and puzzling with respect to providing an unequivocal answer to the basic question and hypotheses (Dekok, 1979:167-8).

The results of this research, which included the 1978, 1979, and 1980 data, are unequivocal and conclusive. Those results, presented in Chapter III, are summarized in the next section in relationship to the hypotheses, sub-objectives, and problem statement provided in Chapter I. Possible reasons for the results of this research and recommendations concerning the AFFDL OD program, are provided in the concluding sections.

Summary of Results

The AFFDL team building intervention has been underway for over four years. While it is generally agreed that humanistic process type interventions are slow to change an organization, lasting positive effects should have been detected in the eleven criterion measures used in this research by the time of the 1980 measurement. The objective of this section is to review the results presented in Chapter III in relationship to the basic problem statement, hypotheses, and sub-objectives stated in Chapter I.

Primary Hypothesis. The primary hypothesis of this thesis was stated in Chapter I as:

> Divisions which are involved in the team development effort showed more positive change on criterion variables than divisions which are not involved in the OD program [Dekok, 1979:9].

Based on the analysis of data from three measurements from 1978 to 1980, this hypothesis cannot be supported. None of the significantly positive changes in the

criterion variables which were revealed by Dekok's 1978-1979 analysis were sustained to the 1980 analysis. OD treatment divisions failed to exhibit any statistically significant change on any of the eleven criterion variables used in this analysis from 1978 to 1980. Most disturbing was the negative trends, although not statistically significant, for two of the productivity measures for FE, a treatment division. Finally, after more than four years of OD work at AFFDL, the four product divisions were virtually unseparable statistically.

The only bright spot in this analysis for OD was its apparent effect, from 1978 to 1979, on Organization Communication, F4. This effect essentially disappeared by the time of the 1980 measurement. This OD induced effect, as well as any others, was temporary and could have been a "Hawthorne effect". Possible reasons for this lack of permanent effect by OD on the AFFDL treatment divisions are discussed in the next section.

Secondary Hypothesis. As stated by Dekok, "the secondary hypothesis of this research emanated directly from the organizational change model (originally proposed by Likert) used in this study [Dekok, 1979:165]." It was stated as:

> Intervening variables (primarily those associated with organizational climate) exhibited less positive change than end-result variables (productivity and absenteeism)[Dekok, 1979:9].

The results of the analysis of the AFFDL data do not support this hypothesis. Although failing to achieve statistical significance, more climate variables showed positive change than productivity where two out of three showed negative trends for treatment divisions. The final end result variable, Absenteeism, failed to sustain its positive effect (lower rates) for the treatment divisions over the two year period. Based on Likert's model and the fact that the OD program has been underway at AFFDL for over four years, positive changes should have been seen in the treatment divisions for the end-result variables.

Sub-Objectives. In Dekok's thesis he proposed five objectives requiring further study following a third measurement of AFFDL personnel. Those objectives, as stated in Chapter I, are listed below with the general results for each objective.

1. Confirm or deny that the process of OD-induced organizational change is still occurring within the laboratory.

Result: The analysis results presented in Chapter III tend to deny that OD induced change is still occurring within the AFFDL organization.

2. Observe if more of the perceptual measures exhibit statistically significant change over a two year period.

Result: As shown in Chapter III, none of the perceptual (climate) measures exhibited statistically significant change over the two year period.

3. Resolve the absenteeism issue for FE and FG. Confirm or deny that this is an effect that can be unequivocally attributed to the OD program.

Result: Based on the results in the absenteeism section of Chapter III, changes seen in absenteeism rates in FE and FG, for 1978-1979, cannot be unequivocally attributed to the OD program. FE and FG sustained increased rates from 1979 to 1980 thereby wiping out any statistical significance for 1978 to 1980 longitudinal analysis. If OD was responsible for the initial positive effect (1978 to 1979), it was temporary.

4. Observe if the fall in the scores of FX employees on the immediate work group dimension of organizational climate is a continuing event, and ascertain its probable causes.

Result: In the analysis presented earlier in Chapter III, FX did have a drop in score for Climate Factor One from 1978 to 1979 but gained from 1979 to 1980 which led to no statistically significant changes from 1978 to 1980.

5. Resolve the productivity issues for FE and FG. Investigate whether productivity is a static or cyclical variable within AFFDL, and if cyclical, determine its period.

Result: There is no evidence to support a claim that productivity is cyclical in nature with AFFDL. FE and FG generally increased productivity slightly from 1979 to 1980 but had an overall negative trend for 1978 to 1980

although none of the results were statistically significant. The productivity items used in the survey, as listed in Chapter II are highly dependent on U.S. R&D policy, and the resultant decisions from Congress down to the laboratory level. This could have had a large effect on the productivity measures used in this study.

The data and results presented in Chapter III, and discussed above, show that despite having been underway for over four years, the AFFDL OD program has had no lasting measurable positive effect on the goals stated for the program. This was the same situation perceived by several treatment group members. As one wrote on the comment page of the survey:

> I must say that since this time last year when the 2nd step in the "continuing assessment of the effectiveness of the team development program" was conducted, I have witnessed no difference whatsoever in any facet of AFFDL's usual way of doing things. It would be interesting to know if any discernable results are ever expected by FDL's top management, and what, indeed, they might be [GS-12, S&E in FG].

Potential reasons for this lack of permanent, discernable effect by the OD program at AFFDL are discussed in the next section of this chapter.

Potential Reasons for Results

Many alternative reasons could be found to explain the lack of any positive, significant, measurable effect by the AFFDL program on its stated goals. Four basic potential

explanations/reasons are discussed in this section of Chapter IV. They are by no means the only possible reasons nor are the discussions intended to be exhaustive.

1. It is apparent from discussions with AFFDL personnel and previous AFIT researchers that the vital diagnostic stage discussed in Chapter I was not complete as necessary for success. A complete and accurate diagnostic stage is critical in finding out what, if anything, is wrong with an organization and if problems are discovered what techniques or combination of techniques may be most effective. An incomplete or inaccurate diagnostic stage can, as in the medical world, lead to the incorrect treatment of the "disease". At best this problem can cause the situation to get no worse, with perhaps a temporary or placebo effect improvement. At worst it can complicate a situation, perhaps delay treatment of the correct problem. A more complete diagnostic stage might have aided AFFDL management in both goal formation and treatment selection. Several AFFDL personnel also stated the above sentiment in written comments. One S&E's comment was typical concerning the OD program at AFFDL:

> . . . is concerned primarily with facilitating dialogue, and only secondarily with achieving any results relevant to the solution of existing problems [GS-12, S&E, in FG].

2. Possibly as a result of an inadequate diagnostic phase, the stated goals for the AFFDL OD program are vague. As discussed in Chapter I, these goals were not formalized

and written down. This created considerable difficulty in defining precisely what the laboratory expected to accomplish and how to measure that accomplishment. Poor goal formulation is often cited as a major contributor to program failure. More definitive and measurable goals could have provided a more solid basis from which to measure goal accomplishment and to guide program implementation.

3. The AFFDL OD program lacked sufficient intensity and visibility to produce and maintain positive results. As previously discussed, where positive results did occur, they basically disappeared by the time of the 1980 measurement. The AFFDL OD program is a low-key approach, with most sessions being informal, voluntary and not always well publicized. Also as stated by Dekok:

> What separates the OD effort at AFFDL from those at other organizations on the base (AFML and AFAPL) is that AFFDL has no internal OD facilitator to work with divisions during Dr. Lehner's absences [Dekok, 1979:169].

The lack of an internal facilitator was particularly a problem for the AFFDL OD program. A low key program, such as used at AFFDL, could have benefited greatly from a trained internal facilitator to maintain both program intensity and visibility between Dr. Lehner's visits. Without such a focal point within the laboratory, the OD program experienced peaks and valleys of interest and therefore, lacked continuity.

4. The final possible reason/explanation for the results of the AFFDL OD program was stated by Dekok as:

> . . . neither a pure "human" or "technological" approach is possible in practice. In fact, there is considerable evidence to suggest that interventions aimed at one element, to the exclusion of the other, produce particularly disappointing results [Dekok, 1979:23].

The AFFDL OD program concentrated totally on team development, a humanistic approach. The lack of permanent change in the perceived way AFFDL conducted business was partly responsible for the lack of permanent effect by the OD program. Two comments by AFFDL personnel serve to highlight this problem:

> . . . unless something discernible happens as a result of the various surveys, self-help inspections, team development programs, etc., etc., it would be far better for FDL management to do nothing at all [GS-12, S&E in FG].

> . . . There are no job enriching experiences, or responsible challenging engineering assignments [GS-12, S&E in FG].

Although government organizations are severaly limited in the structural alternatives available, the complete lack of any such techniques to add strength and permanence to the overall program led to problems for the AFFDL OD effort.

Recommendations

The recommendations which follow evolved out of the results of this research as well as other research work on this topic and others in the organizational development area. These recommendations concern the team development OD program at AFFDL.

1. Terminate the <u>current</u> AFFDL OD program. Note the emphasis on the word current. This recommendation

refers only to the team building intervention that has been underway at AFFDL for over four years and its particular characteristics and implementation. As discussed in Chapter I in the section on Scope and Limitations, no attempt should be made to generalize these results to other OD programs. This recommendation is based on the results presented in Chapter III and also discussed in this chapter. The current program, simply stated, did not accomplish its stated goals.

2. If AFFDL management wishes to continue utilizing programs of organizational change to improve organizational effectiveness the following steps are recommended:

a. Perform a complete and accurate diagnostic stage prior to selecting any technique or group of techniques for use. This is a critical step for success.

b. Set clear and definitive goals for any program to be undertaken.

c. Based on the results of the diagnostic stage and goal setting, consider as wide a range of techniques as possible including structural and humanistic approaches.

d. Consider problems of implementation carefully. Visibility and intensity are important factors.

3. If a diagnostic stage is entered in the future, consideration should be given to utilizing the data from the three measurements used in this research as <u>one</u> possible diagnostic tool.

APPENDICES

APPENDIX A

SURVEY INSTRUMENT

PRIVACY ACT STATEMENT

In accordance with para 30, AFR 12-35, Air Force Privacy Act Program, the following information about this survey is provided as required by the Privacy Act of 1974.

a. Authority. This survey information is authorized for solicitation by Federal Statute Title 10, United States Code, Section 8012, Executive Order 9397, DODI 1100.13, 17 April 1968, and AFR 30-23, 22 Sept 76.

b. Principle Purpose. This survey is being conducted to gain the attitudes and opinions of Air Force R&D personnel toward Team Development programs.

c. Routine use. The survey data will be converted to statistical information for use by AFIT researchers and laboratory personnel.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

USAF SCN 78-7

I. BIOGRAPHIC INFORMATION

Please circle the appropriate letter.

1. How old were you on your last birthday?

   A. Less than 25 years
   B. 25-29 years
   C. 30-34 years
   D. 35-39 years
   E. 40-44 years
   F. 45-49 years
   G. 50-54 years
   H. 55-59 years
   I. Over 59 years

2. What is your present grade?

   A. GS 2-4
   B. GS 5-7
   C. GS 8-11
   D. GS 12
   E. GS 13
   F. GS 14-16 or PL 313
   G. E1-E5
   H. E6-E9
   I. 01 or 02
   J. 03
   K. 04-05

3. How long have you been assigned to your current division?

   A. Less than 6 months
   B. 6 months but less than 1 year
   C. 1 year but less than 2 years
   D. 2 years but less than 3 years
   E. 3 years but less than 4 years
   F. 4 years but less than 5 years
   G. More than 5 years

4. How long have you been assigned to this laboratory?

   A. Less than 2 years
   B. 2-5 years
   C. 6-10 years
   D. 11-15 years
   E. 16-20 years
   F. 21-25 years
   G. More than 25 years

5. What is your highest level of formal education?

   A. Some high school (no diploma)
   B. High school graduate (no college)
   C. Some college or technical school (no degree)
   D. Bachelor's degree
   E. Some graduate work (no degree)
   F. Master's degree
   G. Some work beyond master's degree (no doctorate)
   H. Doctoral degree

6. To which division are you currently assigned?

A. Aeromechanics
B. Structural Mechanics
C. Vehicle Equipment
D. Collocated in _____ from another organization
E. Flight Control

7. What is your current job/position?

A. Clerk, Stenographer or Secretary
B. Technician
C. Scientist or engineer
D. Group leader
E. Branch chief
F. Other

II. ORGANIZATIONAL CLIMATE

Please circle the appropriate letter for each of the following eight questions.

8. Which one of the following shows how much of the time you feel satisfied with your job?

A. Never
B. Seldom
C. Occasionally
D. About half of the time
E. A good deal of the time
F. Most of the time
G. All the time

9. Choose one of the following statements which best tells how well you like your job.

A. I hate it
B. I dislike it
C. I don't like it
D. I am indifferent to it
E. I like it
F. I am enthusiastic about it
G. I love it

10. Which one of the following best tells how you feel about changing your job?

A. I would quit this job at once if I could.
B. I would take almost any other job in which I could earn as much as I am earning now.
C. I would like to change both my job and my occupation.
D. I would like to exchange my present job for another job.
E. I am not eager to change my job, but I would do so if I could get a better job.
F. I cannot think of any jobs for which I would exchange.
G. I would not exchange my job for any other.

11. Which one of the following shows how you think you compare with other people?

A. No one dislikes his job more than I dislike mine.
B. I dislike my job much more than most people dislike theirs.
C. I dislike my job more than most people dislike theirs.
D. I like my job about as well as most people like theirs.
E. I like my job better than most people like theirs.
F. I like my job much better than most people like theirs.
G. No one likes his job better than I like mine.

12. On most work days, how often does time seem to drag for you?

A. About half the day or more
B. About 1/3 of the day
C. About 1/4 of the day
D. About 1/8 of the day
E. Time never seems to drag

13. Some people are completely involved in the job--they are absorbed in it night and day. For others, their job is simply one of several interests. How involved do you feel in your job?

A. Very little; my other interests are more absorbing
B. Slightly involved
C. Moderately involved; my job and my other interests are equally absorbing to me
D. Strongly involved
E. Very strongly involved; my work is the most absorbing interest in my life

14. How often do you do extra work for your job which is not really required of you?

A. Almost every day
B. Several times a week
C. About once a week
D. Once every few weeks
E. About once a month or less

15. Would you say you work harder, less hard or about the same as other people doing your type of work in your work organization?

A. Much harder than most others
B. A little harder than most others
C. About the same as most others
D. A little less hard than most others
E. Much less hard than most others

Please indicate your degree of agreement/disagreement, or the extent to which the following exist by circling the appropriate letter for each question.

16. The amount of information you receive about what is going on in the laboratory within your immediate work group is adequate to meet your needs.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

17. To what extent do the objectives of your work group support the objectives of the laboratory?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

18. I am given credit for the work I have done.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

19. When you talk with your supervisor, to what extent does he pay attention to what you are saying?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

20. As far as I can see, there isn't very much personal loyalty to the laboratory.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

21. Within my working group, I can make decisions and solve problems without checking with my supervisor each step of the way.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

22. A friendly atmosphere prevails among the people in my work group.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

23. The promotion system is effective (i.e., the right/most qualified person generally receives a promotion when one opens up).

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

24. To what extent does your supervisor maintain high personal standards of performance?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

25. To what extent are those <u>above you</u> willing to listen to your ideas and suggestions?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

26. To what extent do members in your work group help you find ways to improve your performance?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

27. When I am assigned a job, I know what is expected of me.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

28. To what extent does your work group plan together and coordinate its efforts?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

29. In my branch the rewards and encouragements you get usually outweigh the threats and the criticism.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

30. My supervisor is friendly and easy to approach.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

31. When you talk with members in your work group, to what extent do they pay attention to what you are saying?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

32. To what extent do members in your work group exchange opinions and ideas?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

33. People in this organization take pride in the excellence of their performance.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

34. In my branch people are rewarded in proportion to the excellence of their job performance.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

35. To what extent do you have confidence and trust in members of your work group?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

36. Decisions are usually made by the people with the most relevant information, no matter what their position in the organization.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

37. To what extent does your supervisor encourage people to give their best effort?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

38. To what extent are those with whom you work directly willing to share information, ideas and suggestions?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

39. I have the opportunity to influence major decisions within my work group.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

40. Around here there is a feeling of pressure to continually improve personal and group performance.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

41. Information is widely shared within the laboratory so that those who make decisions have access to all available facts.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

42. The amount of information you receive about what is going on within your branch is adequate to meet your needs.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

43. To what extent does your supervisor encourage the people who work for him to exchange opinions and ideas?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

44. When decisions are being made, to what extent are the people affected asked for their ideas?

A. To a very little extent
B. To a little extent
C. To some extent
D. To a great extent
E. To a very great extent

45. The amount of information you receive about what is going on <u>within your division</u> is adequate to meet your needs.

A. Definitely disagree
B. Inclined to disagree
C. Undecided
D. Inclined to agree
E. Definitely agree

III. NATURE OF WORK QUESTIONS

This section is to be filled out by scientists and engineers, group leaders and branch chiefs only.

Indicate what percent of your time at work is spent doing each of the activities listed in the next five items. The five items are considered a set, and responses to them should total 100 percent.

(46,47)* ____% In-House Research and Development

(48,49) ____% Contract R&D Guidance

(50,51) ____% Technical Support of Others

(52,53) ____% Program Administration (includes planning, budgeting, documentation of programs, etc.)

(54,55) ____% Supervision

Indicate how many of the following you have authored/presented/briefed over the past year.

(56,57) ____ Published Papers in Professional/Technical Journals

(58,59) ____ Technical Reports

(60,61) ____ Technical Memorandums or Test Data Reports

(62,63) ____ Presentations at Symposia, Meetings of Professional Organizations, and Technical Conferences

(64,65) ____ Hardware/Software Specifications, Statements of Work, Requests for Proposals, Test Plans, and Test Reports

(66,67) ____ In-House Studies, Technical and/or Managerial Assessments

(68,69) ____ Presentations to General Office Level Audiences (count multiple audiences of same presentation as one)

(70,71) ____ Professional or Technical Committee Participation (external to laboratory)

* Numbers are for keypunching

COMMENTS:

APPENDIX B

FACTOR ANALYSIS OF ORGANIZATIONAL CLIMATE ITEMS

Table B-1
Factor Analysis of Climate Questions -- Combined Data (N = 1061)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Q16	.19285	.22740	.15717	.71217	.13298
Q17	.29670	.14817	.21206	.33851	.17296
Q18	.11856	.60316	.38754	.06770	.15495
Q19	.22641	.69436	.14147	.11339	.30748
Q20	-.19372	-.08099	-.50998	-.14625	-.16787
Q21	.20374	.59020	-.01831	.26473	-.17688
Q22	.54529	.37320	.10023	.04667	.00926
Q23	.08239	.12155	.67602	.12724	.05091
Q24	.14573	.38825	.19137	.12374	.63598
Q25	.28597	.49752	.25935	.30946	.04870
Q26	.57613	.04356	.22925	-.00678	.29318
Q27	.16421	.36841	.21591	.26658	.11574
Q28	.47326	.12707	.22561	.36907	.33319
Q29	.25567	.58739	.44190	.11275	.08555
Q30	.18693	.67350	.09787	.12451	.25828
Q31	.72681	.24185	.06300	.11835	-.00600
Q32	.75427	.06873	.07714	.14143	.21485
Q33	.52753	.15893	.44334	.13168	.16737
Q34	.17064	.33203	.67705	.10465	.15492
Q35	.70424	.23787	.21260	.11119	.11043
Q36	.10153	.15722	.67595	.15539	.06567
Q37	.14181	.34058	.17552	.16159	.73033
Q38	.73569	.15334	.08513	.12374	.10573
Q39	.44898	.35144	.05663	.36674	-.02770
Q40	.14108	-.16515	.17613	.13546	.64076
Q41	.09544	-.04808	.58662	.40673	.21904
Q42	.14007	.26353	.18300	.75328	.17206
Q43	.30495	.43051	.09800	.25224	.58541
Q44	.24806	.32326	.41128	.29704	.24703
Q45	.03461	.37968	.37968	.73680	.13394
Eigenvalue	10.57	2.01	1.51	1.34	1.20
Percent Variance Explained	35.2	6.7	5.0	4.5	4.0

Table B-2
Factor Analysis of Climate Questions -- 1980 Data (N = 341)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Q16	.28854	.32400	.12917	.60174	.20490
Q17	.26482	.14197	.27452	.23151	.13965
Q18	.10800	.59927	.42790	.07633	.15341
Q19	.26327	.71887	.13203	.14762	.23320
Q20	-.24615	-.09924	-.36448	-.22377	-.21213
Q21	.29628	.48860	.05075	.34759	.18166
Q22	.48086	.41793	.02768	.12032	.05184
Q23	.07698	.12064	.69680	.07618	.07095
Q24	.12341	.39362	.12637	.12128	.66781
Q25	.37464	.57113	.25290	.19665	.02297
Q26	.50199	.11838	.26120	-.13875	.38901
Q27	.17870	.41028	.16017	.28025	.10715
Q28	.50509	.14805	.25723	.32671	.33869
Q29	.35993	.47755	.50657	.12824	.04481
Q30	.12550	.74452	.15536	.12390	.16046
Q31	.75567	.21119	.07401	.12216	-.00844
Q32	.73750	.07592	.07473	.08800	.29602
Q33	.54569	.18644	.36793	.15554	.24426
Q34	.14907	.30286	.71082	.16378	.08839
Q35	.66484	.22010	.16843	.17352	.13536
Q36	.09187	.16868	.68997	.09080	.08707
Q37	.11644	.41656	.20078	.18194	.65331
Q38	.78210	.14774	.03506	.11432	.14755
Q39	.58345	.20062	.25160	.28388	-.02209
Q40	.19546	-.16827	.11618	.12519	.70075
Q41	.10324	-.10229	.62503	.43752	.24986
Q42	.25699	.29788	.17818	.75944	.12326
Q43	.35637	.45049	.19489	.15367	.55501
Q44	.39856	.26099	.39831	.17966	.26658
Q45	.08678	.16036	.30026	.79292	.12908
Eigenvalue	11.10	1.92	1.59	1.18	1.00
Percent Variance Explained	37.0	6.4	5.3	3.9	3.3

APPENDIX C

ORGANIZATIONAL CLIMATE FACTOR ITEM INTERCORRELATIONS

Table C-1
Item Intercorrelations: Climate Factor One
Immediate Work Group (N = 1061)

	Q22	Q26	Q28	Q31	Q32	Q33	Q35	Q38	Q39
Q22	1.0	.30	.32	.40	.38	.41	.48	.47	.29
Q26		1.0	.43	.40	.43	.34	.44	.42	.26
Q28			1.0	.34	.47	.44	.46	.40	.47
Q31				1.0	.55	.42	.50	.46	.39
Q32					1.0	.46	.50	.56	.38
Q33	All correlations					1.0	.53	.41	.40
Q35	significant at						1.0	.49	.35
Q38	$p \leq .001$							1.0	.34
Q39									1.0

Table C-2
Item Intercorrelations: Climate Factor Two
Employee/Supervisor Interactions (N = 1061)

	Q18	Q19	Q21	Q25	Q29	Q30	Q43
Q18	1.0	.51	.32	.41	.56	.40	.43
Q19		1.0	.33	.56	.49	.60	.56
Q21			1.0	.35	.35	.31	.26
Q25				1.0	.45	.38	.43
Q29	All correlations				1.0	.48	.46
Q30	significant at					1.0	.51
Q43	$p \leq .001$						1.0

Table C-3
Item Intercorrelations: Climate Factor Three
Organizational Warmth (N = 1061)

	Q20	Q23	Q29	Q33	Q34	Q36	Q41	Q44
Q20[a]	1.0	-.26	-.31	-.42	-.33	-.35	-.35	-.32
Q23		1.0	.33	.31	.49	.37	.38	.36
Q29			1.0	.43	.61	.35	.29	.45
Q33				1.0	.44	.39	.36	.42
Q34	All correlations				1.0	.41	.41	.45
Q36	significant at $p \leq .001$					1.0	.42	.45
Q41							1.0	.49
Q44								1.0

Table C-4
Item Intercorrelations: Climate Factor Four
Organizational Communication (N = 1061)

	Q16	Q41	Q42	Q45
Q16	1.0	.36	.61	.56
Q41		1.0	.39	.49
Q42			1.0	.66
Q45				1.0

All correlations significant at $p \leq .001$

Table C-5
Item Intercorrelations: Climate Factor Five
Supervisory Support (N = 1061)

	Q24	Q37	Q40	Q43
Q24	1.0	.62	.34	.54
Q37		1.0	.38	.63
Q40			1.0	.33
Q43				1.0

All correlations significant at $p \leq .001$

APPENDIX D

PRODUCTIVITY FACTOR ITEM INTERCORRELATIONS

Table D-1#
Item Intercorrelations: Productivity Factor One
External Professional Development (N = 685)

	Q51	Q54
Q51	1.0	.44
Q54		1.0

Table D-2#
Item Intercorrelations: Productivity Factor Two
Technical Data (N = 685)

	Q52	Q53
Q52	1.0	.35
Q53		1.0

Table D-3#
Item Intercorrelations: Productivity Factor Three
Management Studies (N = 685)

	Q56	Q57
Q56	1.0	.45
Q57		1.0

All correlations significant at $p \leq .001$

APPENDIX E

DATA ANALYSIS FOR HIERARCHICAL GROUPS

Table E-1
Differences Among Divisions on Hoppock Scores:
Hierarchical Groups (1978)

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	18.50 (2.36) n = 4	17.81 (3.80) n = 16	16.70 (4.24) n = 10	.41
2	Technicians	19.58 (3.77) n = 19	18.17 (4.66) n = 23	19.29 (4.54) n = 17	.43
3	S&Es	18.63 (3.49) n = 57	19.37 (3.04) n = 82	17.83 (3.83) n = 47	3.12*
4	Group Leaders	19.06 (3.30) n = 17	19.27 (2.10) n = 11	18.78 (3.15) n = 9	.07
5	Branch Chiefs	22.00 (5.66) n = 2	20.71 (3.09) n = 7	20.00 (2.16) n = 4	.26

*$p \leq .05$

Table E-2
Differences Among Divisions on Patchen Scores:
Hierarchical Groups (1978) #

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	14.50 (1.29) n = 4	13.24 (3.47) n = 17	13.10 (4.07) n = 10	.25
2	Technicians	15.06 (2.88) n = 18	13.29 (3.51) n = 21	13.97 (3.42) n = 16	.97
3	S&Es	13.44 (2.88) n = 57	13.72 (3.33) n = 81	14.38 (3.27) n = 47	1.19
4	Group Leaders	15.59 (2.74) n = 17	15.18 (3.57) n = 11	12.44 (1.89) n = 9	1.77
5	Branch Chiefs	16.50 (2.12) n = 2	16.57 (2.76) n = 7	16.75 (1.50) n = 4	.01

None of the above results are statistically significant

Table E-3
Differences Among Divisions on Organizational
Climate Factor One: Hierarchical Groups (1978)

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	31.00 (3.46) n = 4	28.73 (6.88) n = 15	27.60 (6.99) n = 10	.38
2	Technicians	21.53 (6.58) n = 19	29.08 (7.49) n = 24	29.82 (7.58) n = 17	.97
3	S&Es	31.12 (5.72) n = 57	32.34 (5.26) n = 83	31.68 (6.11) n = 47	.80
4	Group Leaders	35.18 (4.73) n = 17	34.64 (3.47) n = 11	34.13 (3.23) n = 8	.19
5	Branch Chiefs	32.50	37.14	37.00	4.54*

*$p \leq .04$

Table E-4
Differences Among Divisions on Organizational
Climate Factor Two: Hierarchical Groups (1978) #

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	26.00 (3.56) n = 4	24.88 (5.70) n = 16	23.33 (4.87) n = 9	.43
2	Technicians	26.17 (6.09) n = 18	23.21 (6.67) n = 24	26.47 (4.73) n = 15	1.45
3	S&Es	24.93 (5.55) n = 56	25.19 (4.82) n = 83	24.24 (5.35) n = 46	.51
4	Group Leaders	24.65 (5.24) n = 17	24.18 (3.25) n = 11	25.00 (4.63) n = 8	.08
5	Branch Chiefs	25.50 (2.12) n = 2	30.57 (4.35) n = 7	30.50 (1.73) n = 4	1.69

None of the above results are statistically significant

Table E-5
Differences Among Divisions on Organizational
Climate Factor Three: Hierarchical Groups (1978) #

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	27.00 (2.94) n = 4	23.63 (4.65) n = 16	22.20 (6.75) n = 10	1.17
2	Technicians	23.39 (4.74) n = 18	22.08 (5.19) n = 24	23.60 (4.98) n = 15	.43
3	S&Es	21.84 (4.59) n = 56	22.62 (4.78) n = 81	21.95 (5.22) n = 43	.51
4	Group Leaders	22.35 (4.24) n = 17	23.09 (3.83) n = 11	24.13 (3.76) n = 8	.54
5	Branch Chiefs	26.50 (2.12) n = 2	28.29 (4.07) n = 7	28.25 (5.68) n = 4	.13

None of the above results are statistically significant

Table E-6
Differences Among Divisions on Organizational Climate Factor Four: Hierarchical Groups (1978)

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	15.75 (1.26) n = 4	12.25 (3.04) n = 16	10.40 (3.78) n = 10	4.09*
2	Technicians	12.58 (4.05) n = 19	11.50 (3.49) n = 24	11.24 (3.68) n = 17	.49
3	S&Es	10.30 (3.29)	11.00 (3.49)	10.38 (4.18)	.76
4	Group Leaders	10.82 (3.56) n = 17	11.81 (2.86) n = 11	11.63 (1.51) n = 8	.42
5	Branch Chiefs	13.00 (1.41) n = 2	14.71 (3.09) n = 7	14.50 (4.12) n = 4	.21

*$p \leq .03$

Table E-7
Differences Among Divisions on Organizational
Climate Factor Five: Hierarchical Groups (1978)

Group	Name	Mean and (Std Dev) FX	FB	FE	F Value
1	Secretaries	14.50 (3.11) n = 4	12.82 (2.58) n = 17	13.77 (3.07) n = 9	.74
2	Technicians	13.63 (4.54) n = 19	12.92 (3.12) n = 24	14.41 (2.69) n = 17	.62
3	S&Es	12.80 (3.15) n = 56	12.64 (2.73) n = 81	12.36 (2.89) n = 45	.89
4	Group Leaders	13.59 (2.15) n = 17	12.27 (3.29) n = 11	14.00 (1.69) n = 8	1.38
5	Branch Chiefs	12.00 (0) n = 2	16.14 (2.41) n = 7	16.75 (.96) n = 4	4.41*

*$p \leq .05$

Table E-8
Differences Among Divisions on Hoppock Scores:
Hierarchical Groups (1979)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	18.80 (1.30) n = 5	17.53 (3.11) n = 15	17.22 (3.49) n = 9	19.44 (3.24) n = 16	1.42
2	Technicians	20.33 (2.97) n = 15	18.62 (4.32) n = 26	21.06 (2.62) n = 16	19.33 (3.08) n = 6	1.48
3	S&Es	18.86 (3.23) n = 59	19.06 (3.30) n = 52	18.41 (4.05) n = 39	18.76 (3.92) n = 72	.25
4	Group Leaders	18.25 (4.37) n = 12	18.80 (2.20) n = 10	18.22 (2.44) n = 9	18.80 (3.46) n = 10	.10
5	Branch Chiefs	18.00 (3.00) n = 3	24.25 (2.36) n = 4	21.00 (1.83) n = 4	20.60 (1.82) n = 5	3.68*

*$p \leq .04$

Table E-9
Differences Among Divisions on Patchen Scores:
Hierarchical Groups (1979) #

Group	Name	Mean and (Std. Dev) FX	FB	FE	FG	F Value
1	Secretaries	16.00 (1.26) n = 6	13.07 (3.27) n = 14	14.40 (3.47) n = 10	15.50 (2.45) n = 16	2.34
2	Technicians	14.20 (3.26) n = 15	14.31 (3.56) n = 26	14.81 (2.76) n = 16	14.33 (2.80) n = 6	.13
3	S&Es	13.66 (3.19) n = 58	14.13 (3.05) n = 52	14.21 (3.20) n = 39	13.39 (3.24) n = 72	.84
4	Group Leaders	15.18 (2.36) n = 11	14.80 (3.39) n = 10	16.33 (2.35) n = 9	14.90 (2.02) n = 10	.69
5	Branch Chiefs	16.33 (.58) n = 3	15.75 (3.30) n = 4	15.75 (1.89) n = 4	16.60 (1.52) n = 5	.32

None of the above results are statistically significant.

Table E-10
Differences Among Divisions on Organizational Climate Factor One: Hierarchical Groups (1979)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	30.67 (4.03) n = 6	31.00 (6.12) n = 15	29.40 (5.59) n = 10	31.13 (4.65) n = 16	.25
2	Technicians	31.93 (4.11) n = 15	29.00 (6.74) n = 26	32.25 (4.95) n = 16	33.33 (5.28) n = 6	1.86
3	S&Es	29.19 (6.44) n = 58	32.37 (5.21) n = 49	31.67 (5.67) n = 39	30.93 (5.96) n = 72	2.87*
4	Group Leaders	33.75 (6.54) n = 12	33.20 (3.12) n = 10	36.22 (4.27) n = 9	32.20 (3.88) n = 10	1.21
5	Branch Chiefs	34.00 (3.46) n = 3	35.50 (.71) n = 2	35.50 (4.65) n = 4	36.50 (1.73) n = 4	.25

*$p \leq .04$

Table E-11
Differences Among Divisions on Organizational Climate Factor Two: Hierarchical Groups (1979)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	26.60 (3.21) n = 5	24.73 (5.69) n = 15	23.70 (5.10) n = 10	26.00 (4.29) n = 15	.62
2	Technicians	25.20 (6.48) n = 15	22.92 (5.61) n = 25	28.19 (3.31) n = 16	26.67 (4.63) n = 6	2.90*
3	S&Es	24.69 (4.93) n = 59	26.20 (4.87) n = 50	24.63 (5.79) n = 38	25.92 (5.07) n = 72	1.31
4	Group Leaders	26.50 (6.43) n = 12	26.60 (2.84) n = 10	26.11 (4.68) n = 9	24.90 (5.13) n = 10	.25
5	Branch Chiefs	25.67 (3.51) n = 3	31.25 (4.35) n = 4	28.75 (3.59) n = 4	28.40 (2.07) n = 5	1.63

*p < .03

Table E-12
Differences Among Divisions on Organizational
Climate Factor Three: Hierarchical Groups (1979)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	23.20 (5.31) n = 5	24.73 (6.03) n = 15	21.30 (5.87) n = 10	25.29 (4.78)	1.16
2	Technicians	23.47 (4.85) n = 15	21.58 (4.86) n = 26	25.63 (3.74) n = 16	26.50 (4.23) n = 6	3.19*
3	S&Es	20.74 (4.93) n = 58	23.02 (3.90) n = 47	22.51 (5.38) n = 37	23.01 (5.02) n = 71	2.89**
4	Group Leaders	21.75 (4.41) n = 12	27.50 (2.76) n = 10	24.22 (3.67) n = 9	21.80 (4.64) n = 10	4.83***
5	Branch Chiefs	26.67 (2.31) n = 3	28.25 (.50) n = 4	27.50 (2.65) n = 4	26.00 (4.36) n = 5	.35

*$p \leq .02$ **$p \leq .04$ ***$p \leq .01$

Table E-13
Differences Among Divisions on Organizational
Climate Factor Four: Hierarchical Groups (1979) #

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	11.17 (4.02) n = 6	12.27 (3.53) n = 15	12.30 (3.83) n = 10	11.38 (3.01) n = 16	.30
2	Technicians	12.07 (4.17) n = 15	11.27 (3.63) n = 26	13.06 (3.59) n = 16	13.00 (3.85) n = 6	.83
3	S&Es	10.53 (3.66) n = 59	11.61 (3.42) n = 51	12.34 (3.44) n = 38	11.46 (3.61) n = 71	2.15
4	Group Leaders	10.17 (4.13) n = 12	13.50 (3.37) n = 10	13.56 (1.88) n = 9	13.40 (3.89) n = 10	2.53
5	Branch Chiefs	13.33 (3.06) n = 3	15.00 (1.15) n = 4	15.00 (1.63) n = 4	14.80 (2.49) n = 5	.35

None of the above results are statistically significant

Table E-14
Differences Among Divisions on Organizational
Climate Factor Five: Hierarchical Groups (1979) #

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	15.40 (3.21) n = 5	13.80 (2.54) n = 15	14.10 (2.92) n = 10	15.00 (1.74) n = 16	.92
2	Technicians	14.20 (3.59) n = 15	12.35 (3.45) n = 26	15.00 (1.90) n = 16	14.17 (2.04) n = 6	2.30
3	S&E's	12.64 (3.03) n = 59	12.90 (3.13) n = 50	13.61 (2.99) n = 38	13.19 (2.87) n = 72	.89
4	Group Leaders	13.92 (2.87) n = 12	14.20 (2.53) n = 10	14.33 (2.18) n = 9	13.80 (2.57) n = 10	.72
5	Branch Chiefs	15.00 (1.73) n = 3	16.00 (1.41) n = 4	15.75 (2.63) n = 4	16.40 (1.14) n = 5	.64

None of the above results are statistically significant

Table E-15
Differences Among Divisions on Hoppock Scores:
Hierarchical Groups (1980) #

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	18.75 (1.50) n = 4	16.55 (3.39) n = 11	18.33 (4.23) n = 6	17.63 (3.20) n = 8	.61
2	Technicians	19.44 (3.18) n = 18	17.05 (5.03) n = 22	18.45 (3.39) n = 11	18.67 (2.07) n = 6	1.24
3	S&E's	18.70 (3.04) n = 50	18.84 (3.27) n = 58	18.56 (2.63) n = 32	18.96 (3.61) n = 52	.12
4	Group Leaders	18.30 (4.19) n = 10	18.71 (1.38) n = 7	18.00 (2.94) n = 7	18.90 (3.93) n = 10	.09
5	Branch Chiefs	22.00 (2.82) n = 2	21.25 (1.71) n = 4	21.33 (1.15) n = 3	21.50 (1.64) n = 6	.09

None of the above results are statistically significant

Table E-16
Differences Among Divisions on Patchen Scores:
Hierarchical Groups (1980) #

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	14.75 (2.22) n = 4	13.73 (2.90) n = 4	13.17 (3.87) n = 6	14.00 (3.12) n = 8	.22
2	Technicians	13.65 (3.46) n = 17	12.71 (4.15) n = 21	12.91 (3.86) n = 11	11.67 (2.50) n = 6	.46
3	S&E's	13.70 (2.92) n = 50	13.95 (3.01) n = 58	13.41 (2.99) n = 32	13.87 (3.02) n = 52	.25
4	Group Leaders	15.60 (2.50) n = 10	14.14 (2.41) n = 7	16.43 (1.40) n = 7	14.70 (2.16) n = 10	1.55
5	Branch Chiefs	16.50 (.71) n = 2	15.50 (3.11) n = 4	15.66 (1.55) n = 3	16.33 (1.51) n = 6	.21

None of the above results are statistically significant.

Table E-17
Differences Among Divisions on Organizational Climate Factor One: Hierarchical Groups (1980)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	29.00 (6.48) n = 4	29.18 (5.08) n = 11	30.83 (7.99) n = 6	30.13 (5.17) n = 8	.13
2	Technicians	31.72 (5.05) n = 18	27.36 (6.57) n = 22	28.81 (8.90) n = 11	34.17 (3.66) n = 6	2.59*
3	S&E's	30.58 (6.00) n = 50	31.97 (6.57) n = 58	32.77 (4.76) n = 31	31.37 (6.56) n = 52	1.02
4	Group Leaders	35.80 (5.69) n = 10	34.43 (2.88) n = 7	33.71 (4.79) n = 7	33.70 (4.81) n = 10	.40
5	Branch Chiefs	37.00 (7.07) n = 2	37.00 (4.55) n = 4	40.33 (4.04) n = 3	37.00 (1.10) n = 6	.65

*$p \leq .07$

Table E-18
Differences Among Divisions on Organizational Climate Factor Two: Hierarchical Groups (1980)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	23.75 (3.95) n = 4	24.55 (6.33) n = 11	25.50 (7.66) n = 6	24.75 (6.09) n = 8	.06
2	Technicians	25.67 (6.20) n = 18	20.27 (6.14) n = 22	26.63 (4.92) n = 11	27.33 (3.88) n = 6	4.99*
3	S&E's	24.34 (4.85) n = 50	25.78 (4.87) n = 58	25.00 (4.81) n = 32	25.63 (5.83) n = 52	.85
4	Group Leaders	26.20 (5.47) n = 10	27.71 (3.50) n = 7	24.14 (4.71) n = 7	26.90 (6.84) n = 10	.56
5	Branch Chiefs	29.50 (2.12) n = 2	31.00 (4.32) n = 4	31.33 (2.31) n = 3	30.33 (1.63) n = 6	.22

*$p \leq .004$

Table E-19
Differences Among Divisions on Organizational
Climate Factor Three: Hierarchical Groups (1980)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	22.25 (4.57) n = 4	24.00 (4.69) n = 11	22.83 (7.55) n = 6	21.50 (4.14) n = 8	.37
2	Technicians	25.22 (5.17) n = 18	19.64 (5.09) n = 22	22.64 (7.06) n = 11	27.50 (3.15) n = 6	5.24*
3	S&E's	21.50 (4.97) n = 50	22.74 (4.56) n = 58	22.94 (4.23) n = 32	23.27 (4.62) n = 52	1.38
4	Group Leaders	24.40 (4.72) n = 10	27.57 (3.21) n = 7	24.86 (3.39) n = 7	25.10 (5.59) n = 10	.75
5	Branch Chiefs	25.50 (.71) n = 2	29.50 (4.43) n = 4	30.33 (3.21) n = 3	26.67 (1.75) n = 6	1.86

*$p \leq .003$

Table E-20
Differences Among Divisions on Organizational
Climate Factor Four: Hierarchical Groups (1980) #

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	13.75 (2.75) n = 4	12.73 (4.08) n = 11	12.83 (4.62) n = 6	11.38 (3.96) n = 8	.36
2	Technicians	12.50 (3.47) n = 18	10.64 (3.86) n = 22	10.82 (3.79) n = 11	13.67 (1.75) n = 6	1.76
3	S&E's	10.56 (3.27) n = 50	11.03 (3.63) n = 58	12.00 (.282) n = 32	11.67 (3.90) n = 52	1.47
4	Group Leaders	12.60 (3.37) n = 10	15.86 (.90) n = 7	13.86 (2.48) n = 7	12.70 (3.74) n = 10	2.00
5	Branch Chiefs	12.00 (5.66) n = 2	14.50 (3.70) n = 4	16.00 (4.36) n = 3	16.67 (.82) n = 6	1.19

None of the above results are statistically significant.

Table E-21
Differences Among Divisions on Organizational
Climate Factor Five: Hierarchical Groups (1980)

Group	Name	Mean and (Std Dev) FX	FB	FE	FG	F Value
1	Secretaries	14.70 (1.50) n = 4	12.82 (2.14) n = 11	14.83 (3.66) n = 6	13.25 (2.96) n = 8	1.02
2	Technicians	14.56 (2.52) n = 18	11.14 (3.88) n = 22	14.09 (3.48) n = 11	14.33 (1.21) n = 6	4.56*
3	S&E's	12.24 (2.82) n = 50	13.12 (3.04) n = 58	13.97 (2.36) n = 32	12.63 (3.89) n = 52	2.18
4	Group Leaders	14.60 (2.80) n = 10	14.87 (1.35) n = 7	14.00 (1.91) n = 7	12.80 (2.10) n = 10	1.62
5	Branch Chiefs	15.50 (3.54) n = 2	15.75 (2.63) n = 4	16.67 (.58) n = 3	16.17 (2.14) n = 6	.14

*$p \leq .007$

APPENDIX F

1979 SURVEY ITEM RESPONSES (MEAN/STANDARD DEVIATION)

Table F1
Survey Item Responses*
(1979)

Question	Short Name	Mean/Std Deviation 1979
1	Age	3.45/2.16
2	Grade	3.74/1.55
3	Years in Division	5.53/1.86
4	Years in Lab	3.36/1.72
5	Education Level	4.79/1.67
6	Division	a
7	Position	2.93/1.14
8	Hoppock-1	4.87/1.23
9	Hoppock-2	4.94/1.00
10	Hoppock-3	4.69/1.05
11	Hoppock-4	4.51/ .90
12	Patchen-1	3.96/1.18
13	Patchen-2	3.22/ .76
14	Patchen-3	3.41/1.24
15	Patchen-4	3.71/ .82
16	Info: Group	3.27/1.29
17	Objectives	3.86/ .81
18	Credit for Work	3.53/1.23
19	Supv Pays Attn	3.73/ .95
20	Organ'l Loyalty	3.09/1.15
21	Autonomy	4.13/1.02
22	Group Friendly	4.17/ .94
23	Promot Sys Effectv	2.32/1.14
24	Supv Hi Standards	3.68/ .94
25	Supv Esteem	3.31/ .87
26	Group Help	2.76/1.02
27	Know What's Exptd	3.80/1.00
28	Group Plan	3.11/1.04

*N (1979) = 412
a = N/A

Table F1 (cont'd)**

Question	Short Name	Mean/Std Deviation 1979
29	Rewards GT Criticism	3.34/1.24
30	Supv Friendly	4.19/ .99
31	Group Pays Attn	3.66/ .74
32	Group Exchg Ideas	3.54/ .82
33	Organizational Pride	3.60/1.03
34	Rewards	2.76/1.12
35	Group Trust	3.65/ .89
36	Decisions	2.65/1.09
37	Supv Encourage Best Effort	3.54/ .92
38	Group Sharing	3.69/ .83
39	Influence Decisions	3.37/1.20
40	Pressure to Improve	3.00/1.04
41	Info: Sharing	2.56/1.05
42	Info: Branch	3.27/1.13
43	Supv Encourages Ideas	3.37/ .95
44	People Asked Ideas	2.91/ .99
45	Info: Division	2.82/1.13
46	R&D (In-House)	26.85/25.32
47	Contract Guidance	20.25/20.37
48	Technical Support	16.33/18.31
49	Program Admin	25.59/20.66
50	Supervision	9.75/17.06
51	Published Papers	.34/ .75
52	Technical Reports	.37/ .71
53	Technical Memos	.74/1.46
54	Presentations	.79/1.26
55	Specifications	1.84/2.88
56	In-House Studies	1.57/3.21
57	Gen Officer Briefings	1.19/2.23
58	Committee Partic	.87/1.40

**For Questions 46-58, N (1979) = 245

APPENDIX G

FACTOR TREND PLOTS

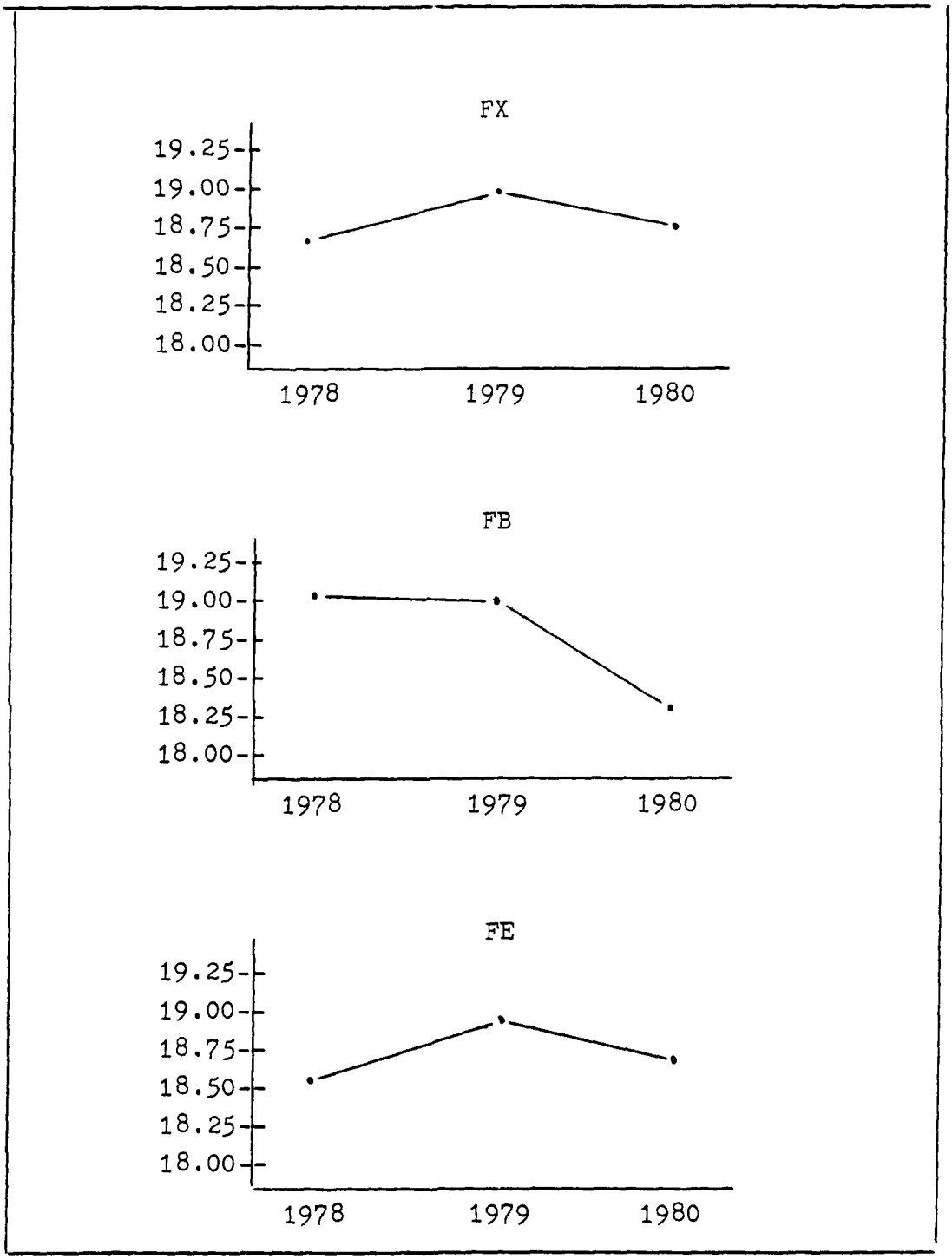

Figure G-1 Factor Trend Plot: Hoppock

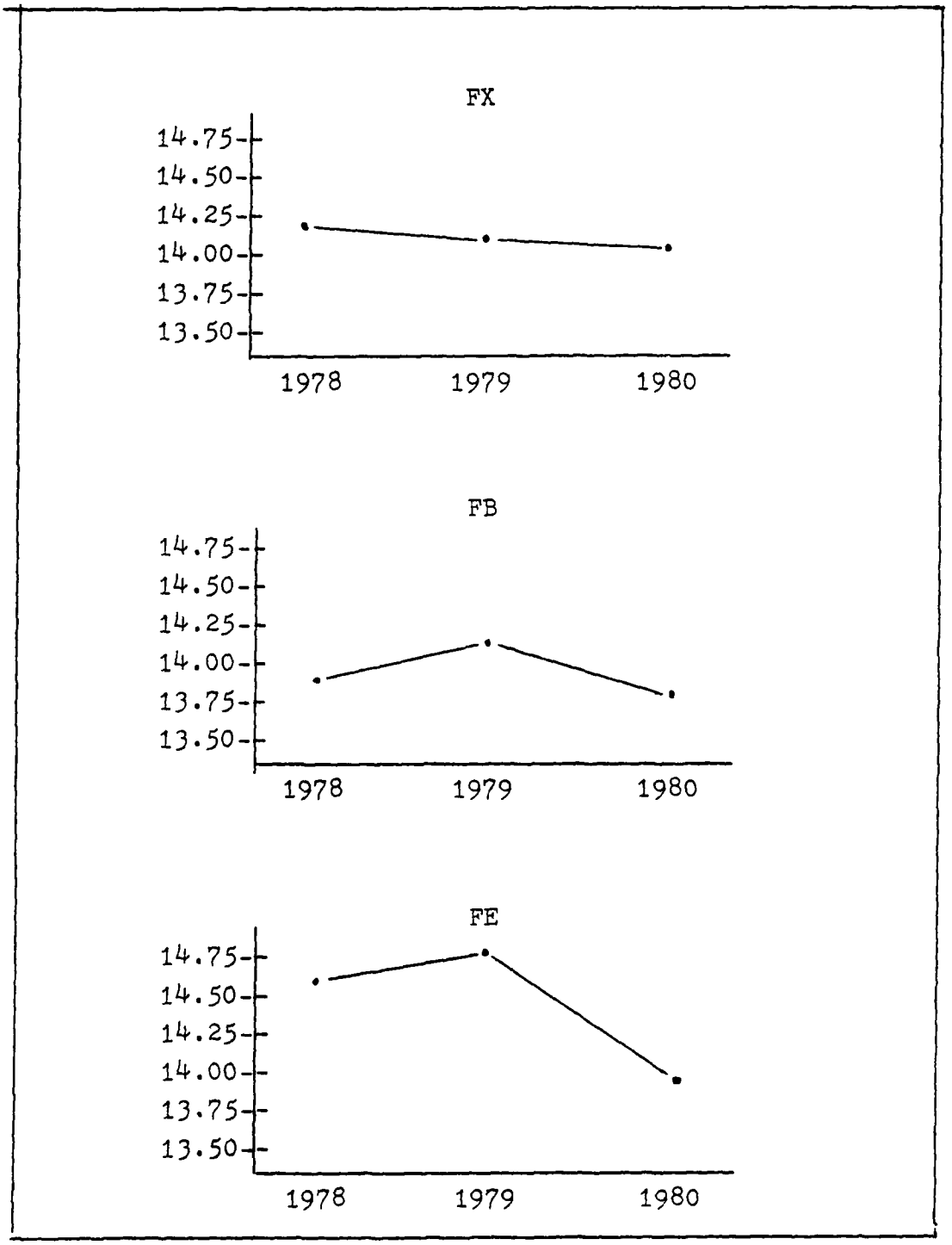

Figure G-2 Factor Trend Plot: Patchen

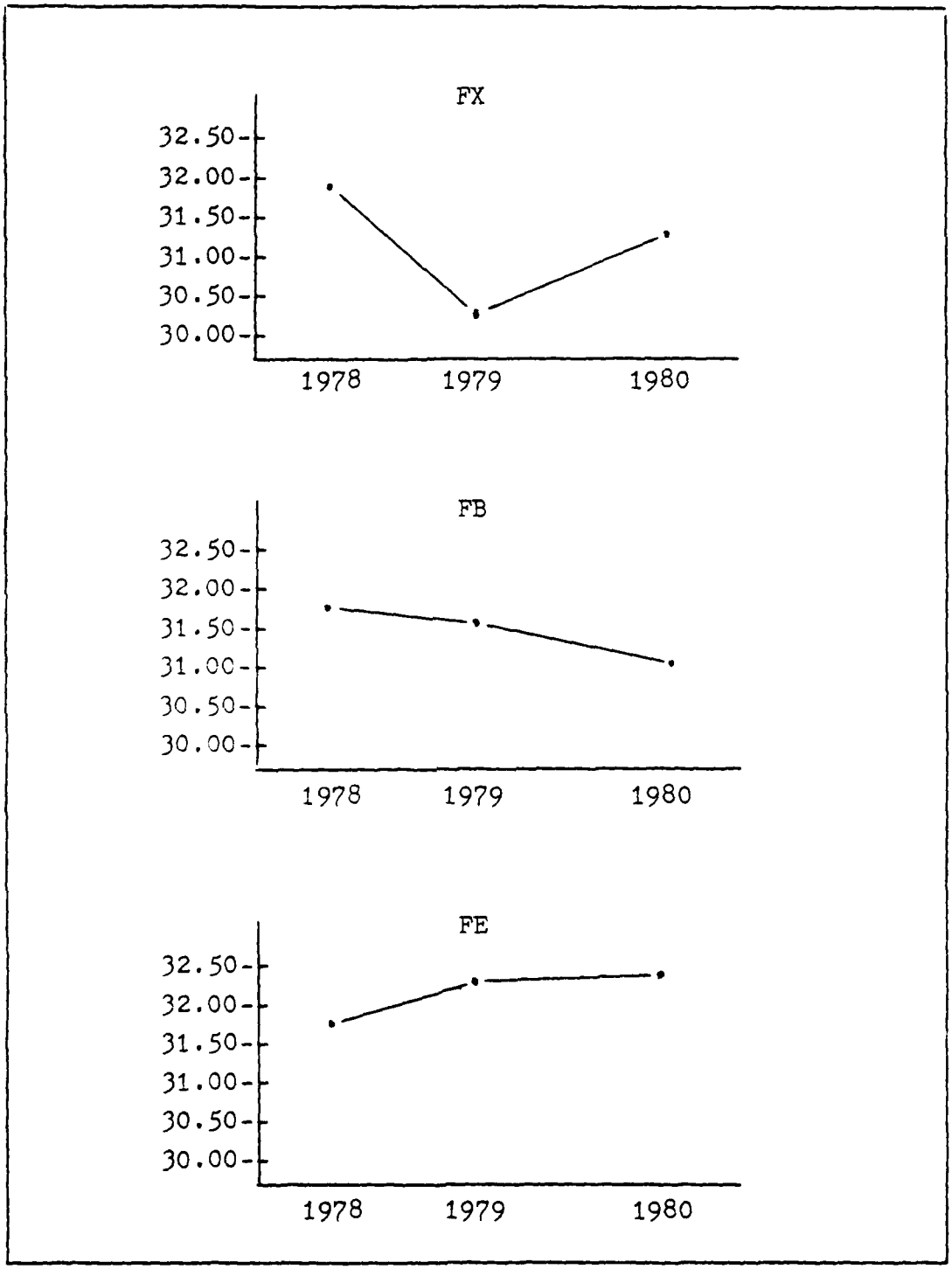

Figure G-3 Factor Trend Plot: Climate Factor One

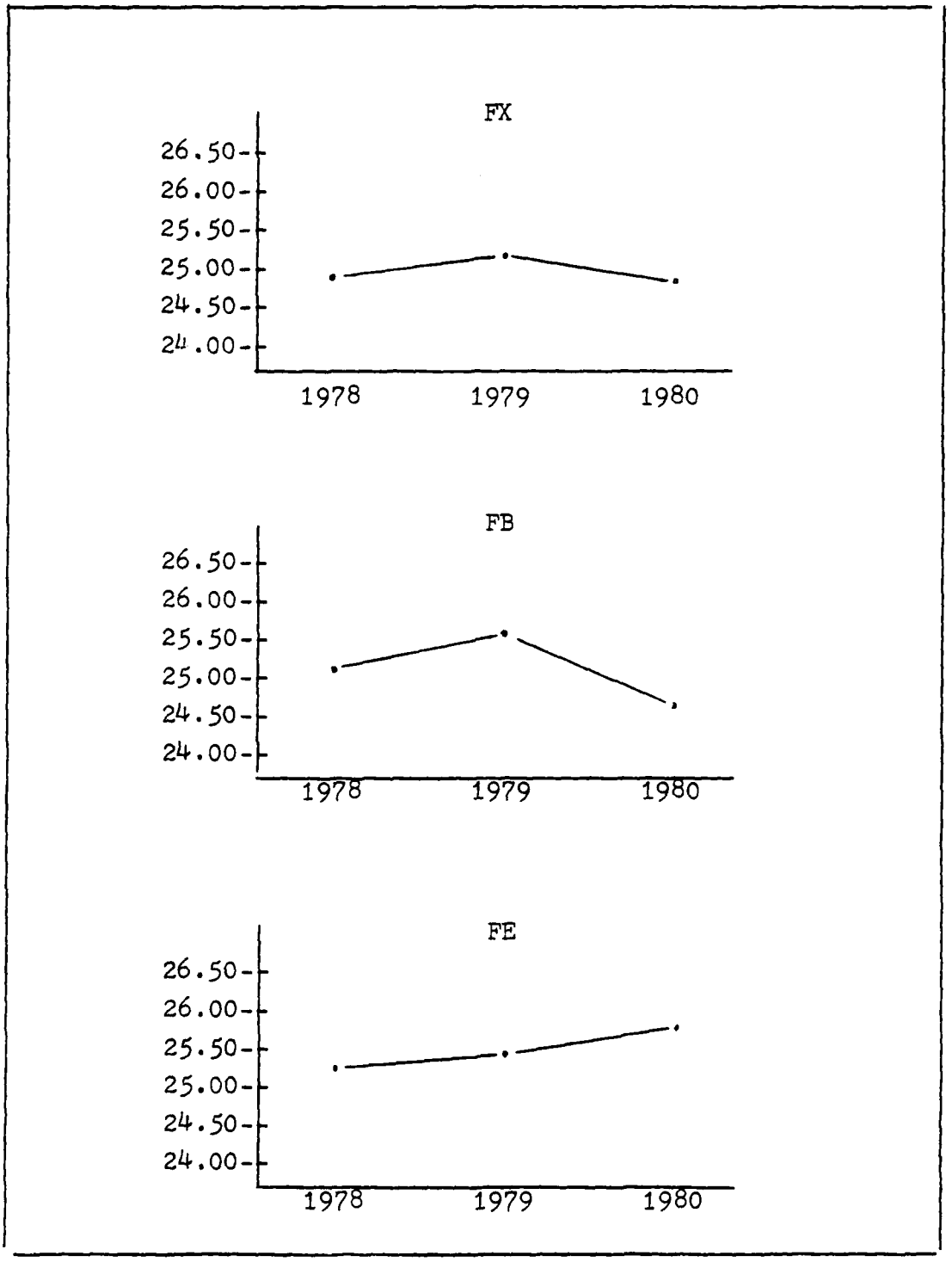

Figure G-4 Factor Trend Plot: Climate Factor Two

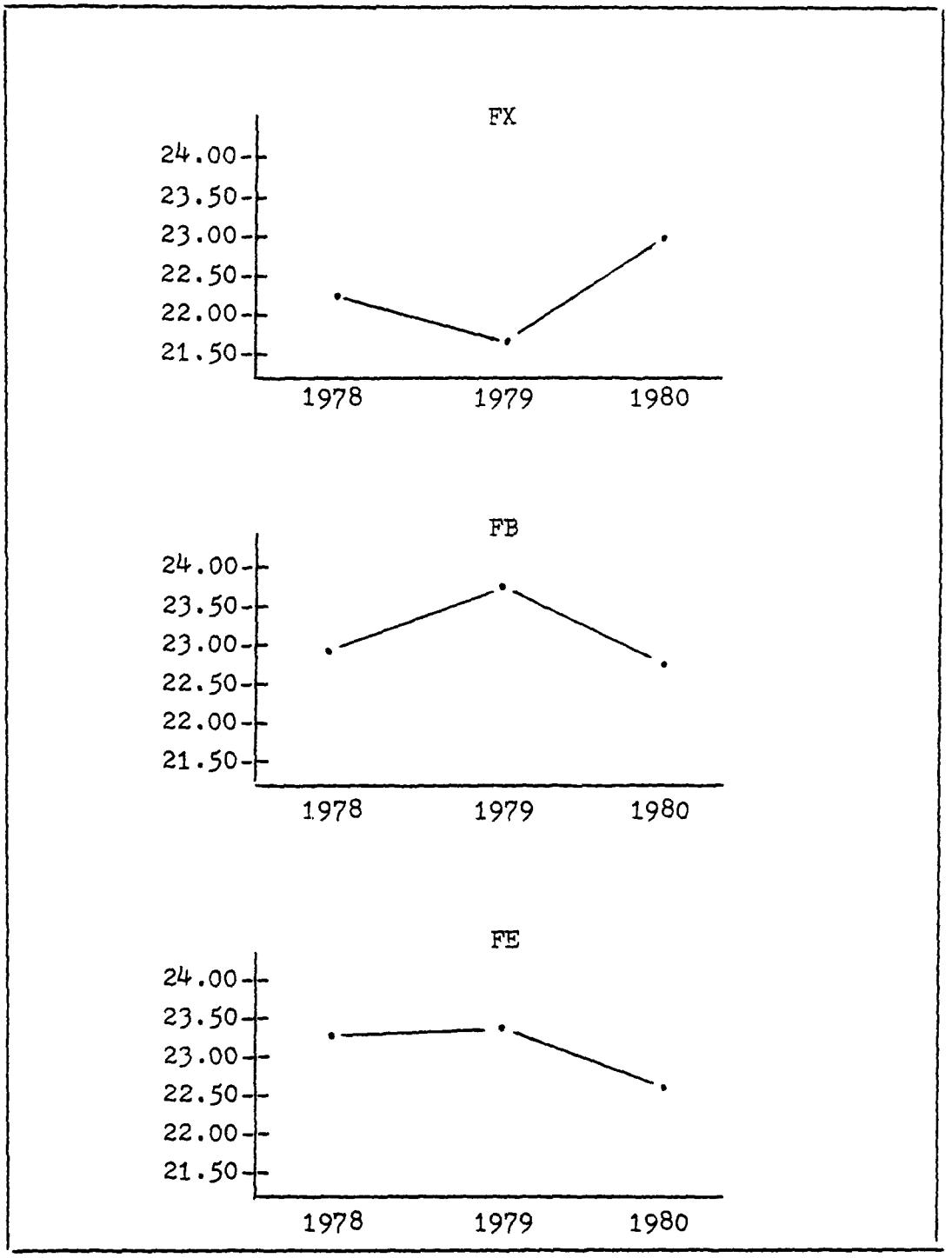

Figure G-5 Factor Trend Plot: Climate Factor Three

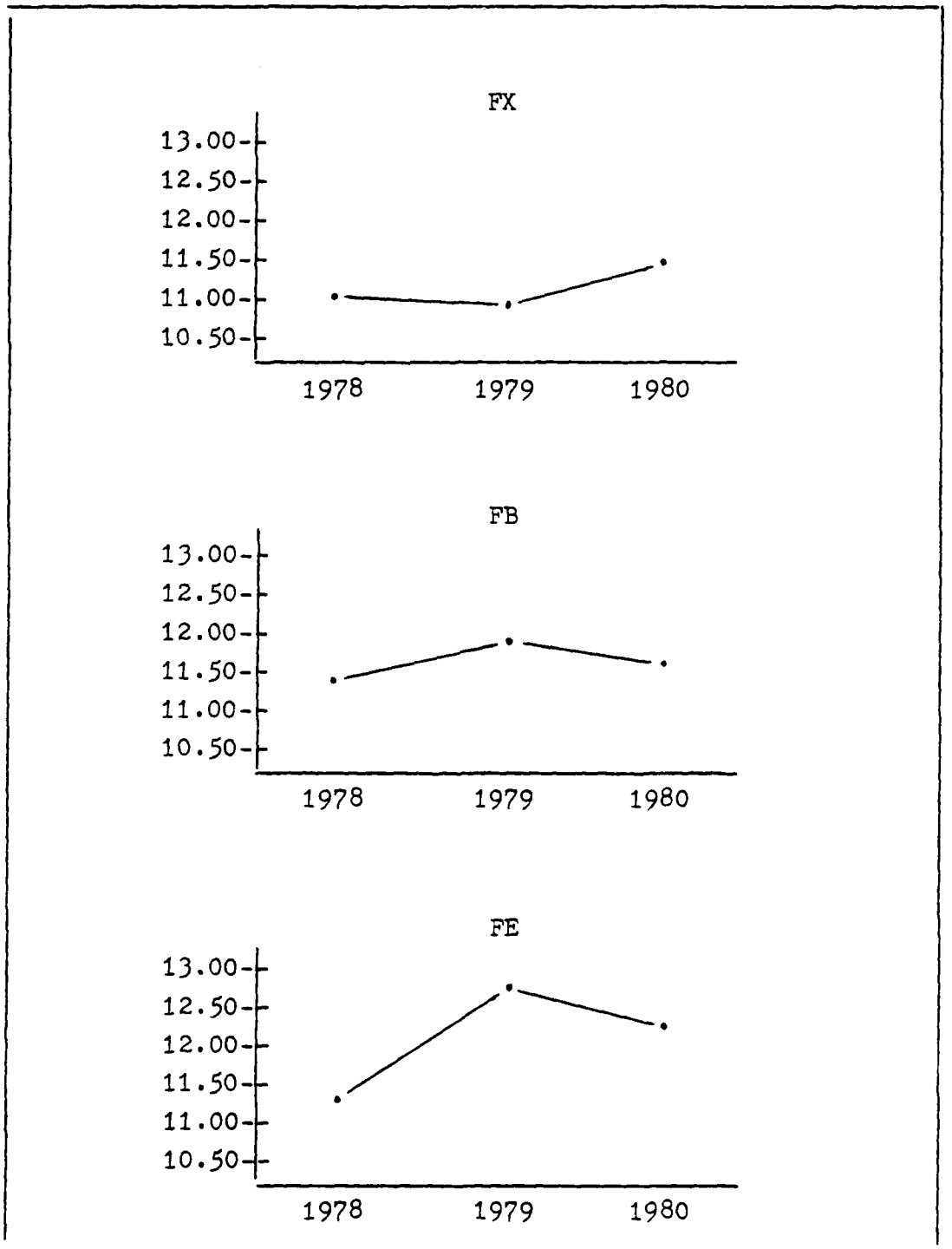

Figure G-6 Factor Trend Plot: Climate Factor Four

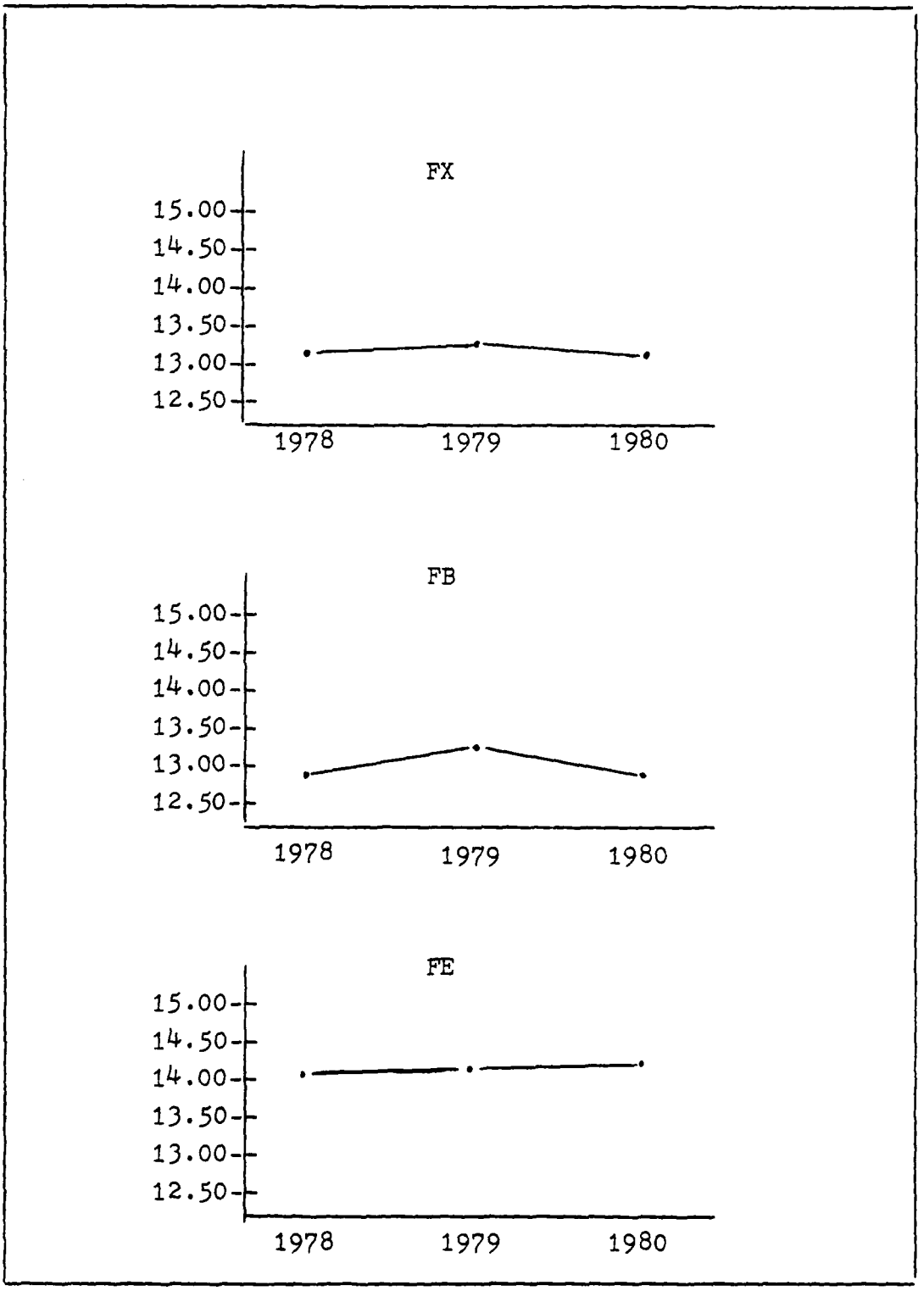

Figure G-7 Factor Trend Plot: Climate Factor Five

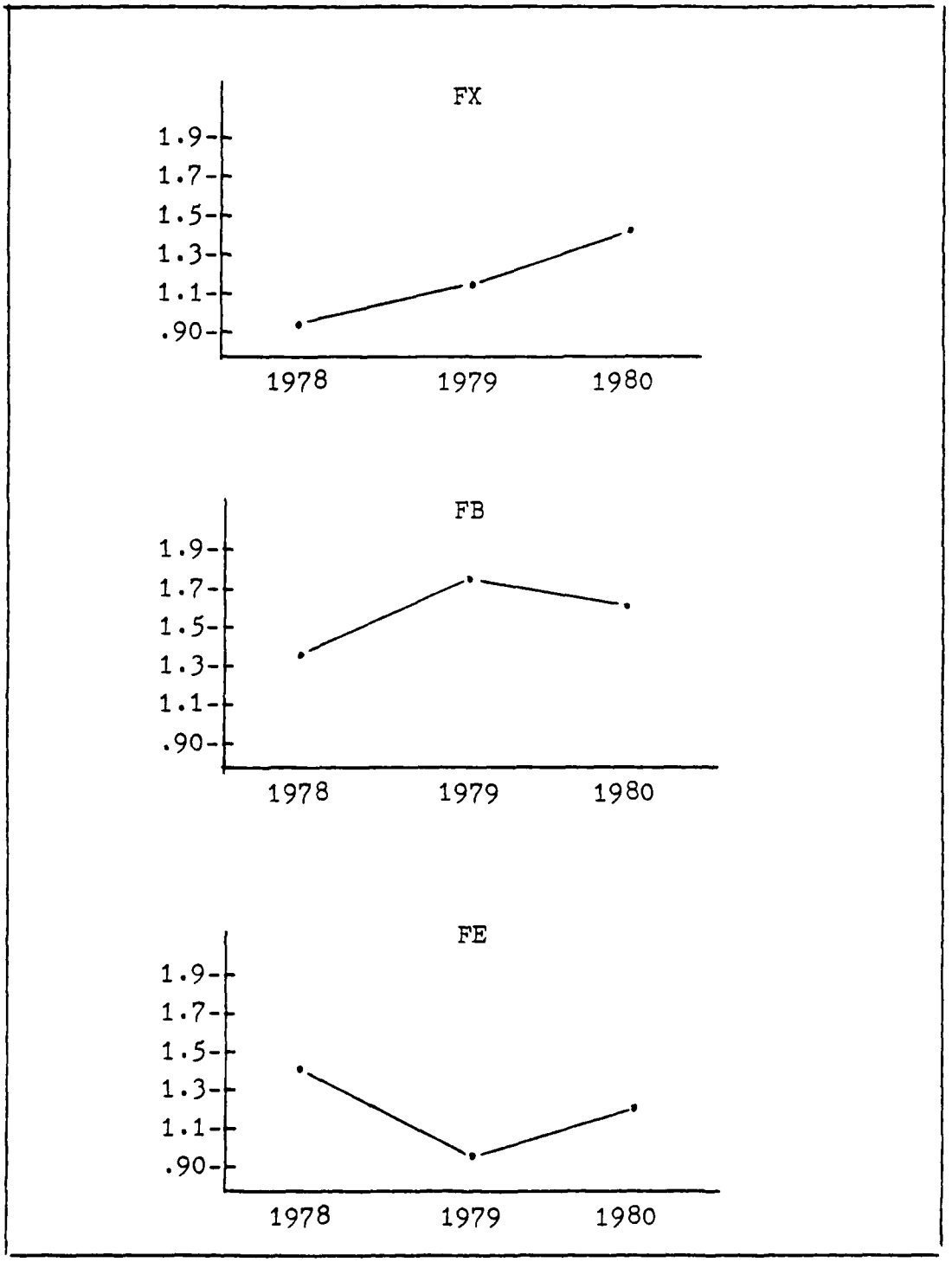

Figure G-8 Factor Trend Plot: Productivity Factor One

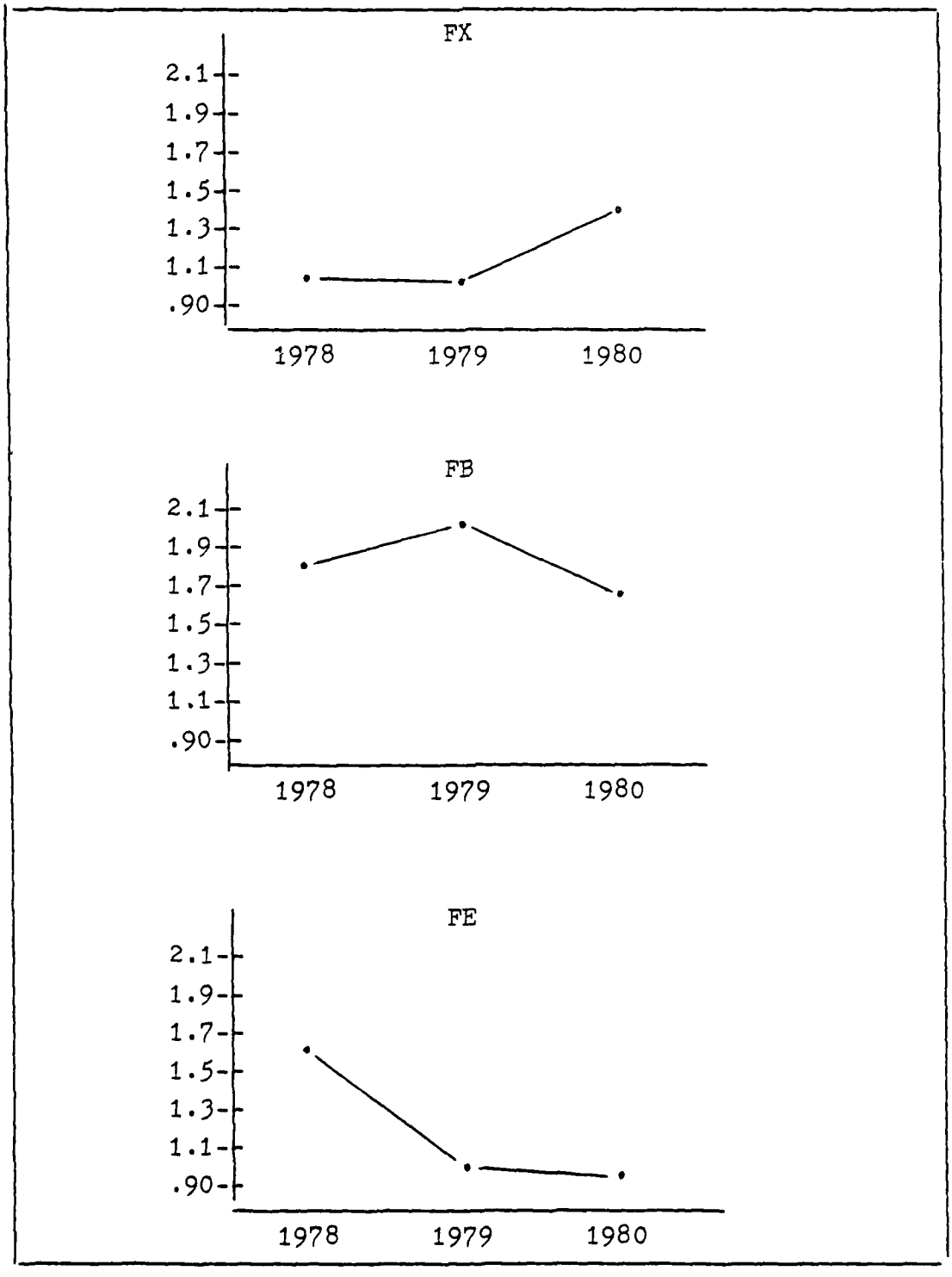

Figure G-9 Factor Trend Plot: Productivity Factor Two

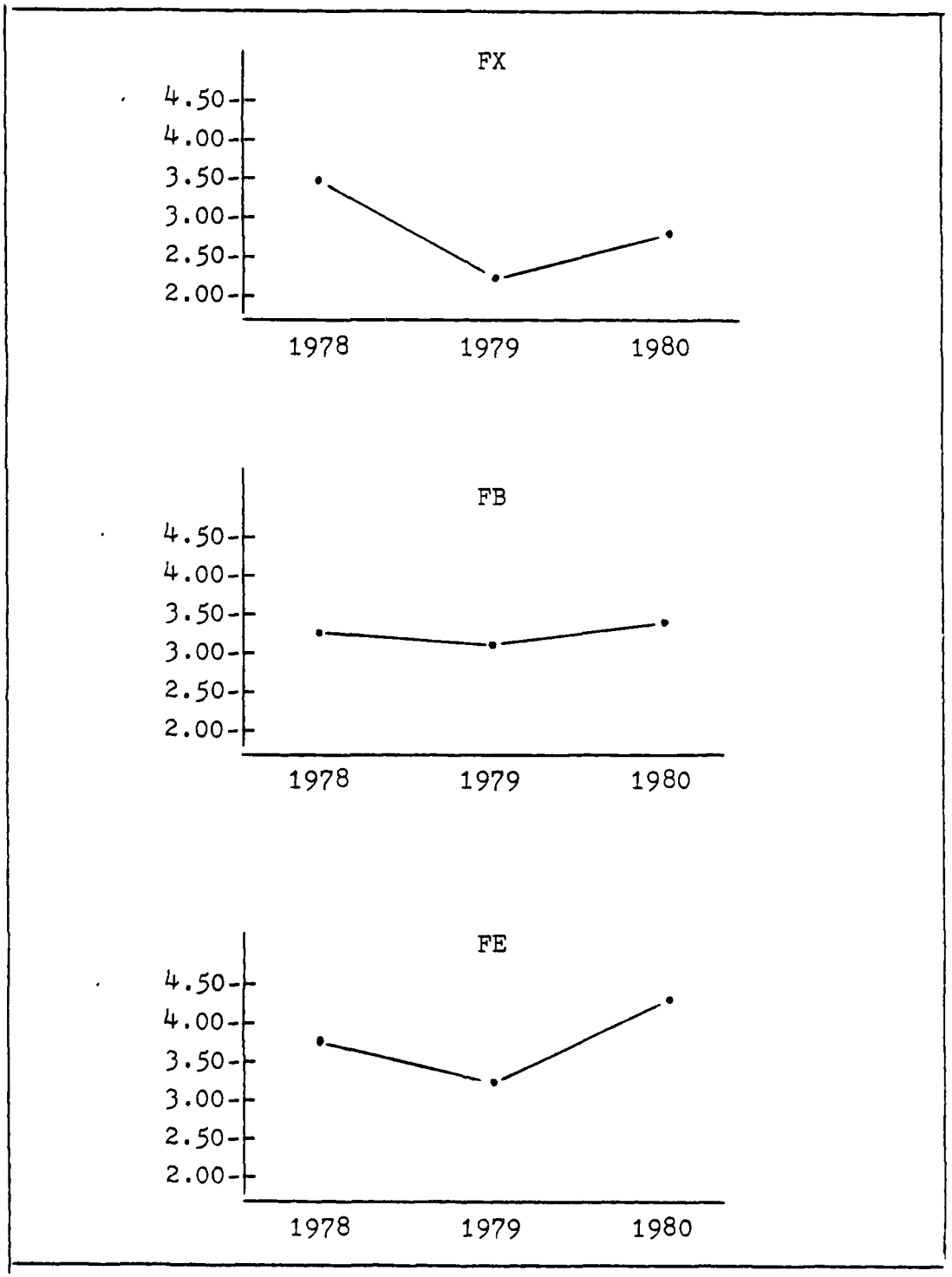

Figure G-10 Factor Trend Plot: Productivity Factor Three

APPENDIX H

REVIEW OF WRITTEN COMMENTS BY AFFDL PERSONNEL

As a result of the number of unsolicited written comments received by Dekok on his surveys in 1979, a comment page was added to survey for the 1980 measurement. Several of the comments already presented provided insight into several areas. This appendix contains no specific comments concerning the OD program at AFFDL. Several of the questions in the questionnaire generated comments which revealed problems, or perceived problems, by AFFDL personnel in three areas: organizational objectives, communication within the laboratory, and promotions. These comments are provided as background information on perceptions of employees at AFFDL.

1. Organizational Objectives.

A number of personnel questioned the existence of specific objectives for AFFDL. These responses referred not to objectives for the OD program but to the laboratories' normal stated objectives. Two written comments which were representative are:

> Organizational Objectives: If there are any, I've never heard what they are! Why doesn't somebody communicate with us? How can I support organizational objectives if I don't know what they are [GS-13 in FB]?

> I don't believe the laboratory has a clear-cut, simple concise statement of objectives [FG employee].

2. Communications Within the Laboratory

A number of personnel perceived a breakdown in communications above the branch level. Several cited staff

actions as examples of this lack of communication. One S&E wrote:

> The atmosphere of cooperation and friendship through branch level is outstanding. Beyond that level it begins to break down. There appears to be less concern for the working engineer beyond branch level [S&E in FX].

3. Promotions

Many personnel saw promotions as a key issue in the areas of job motivation, job satisfaction and retention. The question in the survey on promotion policy, Q23, scored the lowest of any of 30 climate questions in all three measurements. The following written comments were typical:

> Morale is poor. . . . Promotion policy makes it difficult to maintain incentive. As I look ahead, I see no future gains [S&E in FX].

> Our only avenue for substantial raises in salary is through promotions, which have been very few and slow for several years. This has been a major problem in recruiting for the labs and in retaining good people [S&E in FG].

While two AFFDL employee's questioned the unefulness of the survey and questionnaire, one individual found an unexpected use for it and wrote:

> After answering the questions it is obvious that I have my own problem areas which need improvement [FX employee].

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