

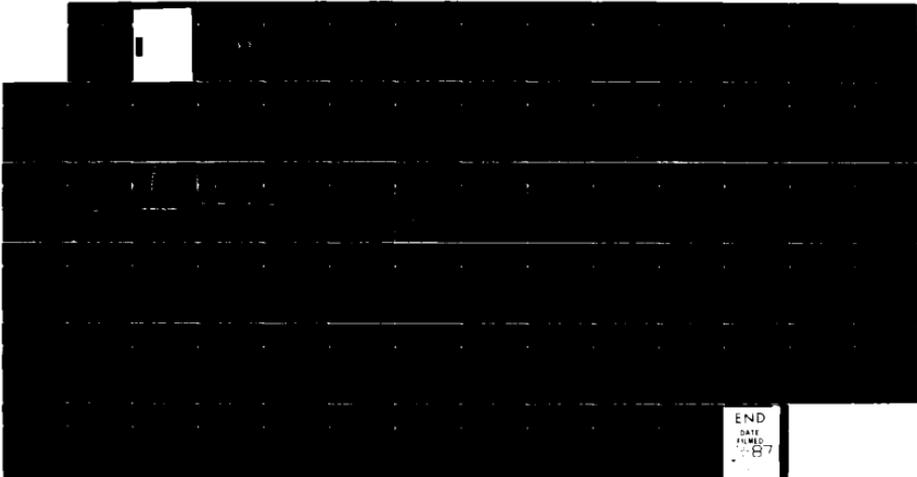
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ASSESSMENT OF ASPECTS OF AN ORGANIZATION IMPORTANT TO  
THE IMPLEMENTATION O... (U) NAVY PERSONNEL RESEARCH AND  
DEVELOPMENT CENTER SAN DIEGO CA J P SHEPSON ET AL  
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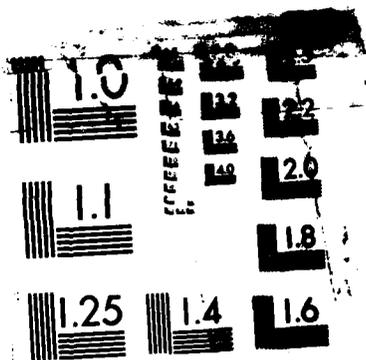
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NPRDC TR 87-12

December 1986

**ASSESSMENT OF ASPECTS OF AN ORGANIZATION IMPORTANT TO THE  
IMPLEMENTATION OF A QUALITY IMPROVEMENT EFFORT**

John P. Sheposh  
Joyce Shettel-Neuber

Reviewed by  
Steven L. Dockstader

Approved by  
Robert E. Blanchard

Released by  
B. E. Bacon  
Captain, U.S. Navy  
Commanding Officer

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**ELECTED**  
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Navy Personnel Research and Development Center  
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<p>An assessment that considered the work process, management system, and characteristics of the individual job was conducted at a Naval Air Rework Facility that is presently implementing an organization-wide quality control effort. The research was designed to assess aspects of the organization likely to promote or inhibit such an effort. A technical analysis and system scan were performed to study the work process. <i>In addition,</i> two questionnaires were designed, one to determine the nature of the management system, as perceived by four levels of managers, and one to measure job characteristics and impediments, as perceived by nonsupervisory personnel and their first-line supervisors.</p> <p>The technical analysis revealed that the overall work process was complex, required coordination of many people and departments, and was subject to disruption and problems. The managerial system was characterized by a moderate amount of cooperative teamwork and some subordinate input, but it</p>			
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22a. NAME OF RESPONSIBLE INDIVIDUAL John P. Sheposh		22b. TELEPHONE (include Area Code) (619) 220-2191	22c. OFFICE SYMBOL Code 42

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fell short of a system where ideas and methods of process control are communicated readily and accurately. At the individual job level, the majority of impediments to optimal performance were found to be management system problems. The results provide a picture of the state of the organization in terms of the quality improvement effort at the time of the assessment as well as information useful in planning and guiding the effort over time. *Keywords:*

Recommendations to improve quality control and product quality include: (1) placing emphasis on procedures and processes rather than inspection; (2) designing variance process control procedures that cut across departmental or functional lines; and (3) emphasizing operating efficiency. Periodic assessment is important to measuring the extent to which impediments to quality control have been removed. *h*

## FOREWORD

This is the first in a series of reports that will examine organizational and job characteristics that change as a result of converting from a product inspection approach to a process control approach. The purpose of this initial study, supported by a work request from the Naval Civilian Personnel Command, was to develop a framework for and conduct the assessment of a quality improvement program.

Appreciation is extended to RADM John Kirkpatrick, Commander of the Naval Aviation Logistics Center, and CAPT Philip Monroe, Commanding Officer of Naval Air Rework Facility, San Diego, for their support in initiating this work. The efforts of Mr. Tom Achter, manager of the site where the research was conducted, and CDR Joe Boudreaux, Quality and Engineering Officer, to apply the results of the research are greatly appreciated.

B. E. BACON  
Captain, U.S. Navy  
Commanding Officer

J. W. TWEEDDALE  
Technical Director



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## SUMMARY

### Problem

Many private and public sector organizations in the U.S. are initiating quality improvement efforts to remain competitive with foreign markets. Although the private sector leads the way, the public sector is also becoming involved in efforts to improve quality and productivity. Among the programs being developed by the U.S. Navy is one at the Naval Air Rework Facility (NAVAIREWORKFAC) in San Diego, California. Due to the large-scale investment of time, effort, and money required to implement such a program, it would be useful to know which organizational characteristics are likely to promote or inhibit the long-term success of these efforts.

To ensure success at NAVAIREWORKFAC, San Diego, the Naval Civilian Personnel Command requested researchers from the Navy Personnel Research and Development Center (NAVPERSRANDCEN) to conduct an assessment to determine which aspects of the organization were important for implementation of a quality improvement effort.

### Purpose

In light of the need to identify organizational properties that inhibit or promote quality improvement efforts, an assessment was designed that considered the work process, management system, and job characteristics of the organization under study. The purpose of the assessment was threefold: (1) to provide a picture of the state of the organization as it relates to the total quality effort, (2) to guide program development through future assessments as well as to help determine the extent to which implementation goals are being met over time, and (3) to develop a theoretical model for implementation of quality improvement efforts.

### Approach

Different methods and data sources were used to obtain information about the work process, management system, and job dimensions at NAVAIREWORKFAC:

1. A team of highly experienced individuals ( $N = 8$ ) representing various departments performed a system scan and technical analysis of the work process.
2. A questionnaire designed to assess the management system was administered to four levels of managers from seven departments ( $N = 42$ ).
3. A questionnaire measuring job characteristics and job impediments was completed by nonsupervisory personnel and their first-line supervisors from six departments ( $N = 108$ ).

### Results and Discussion

The technical analysis and system scan revealed that the overall work process is complex, involving a series of interlinking subprocesses and requiring the coordination of people from a variety of shops and departments. The complex nature of the work process indicates a high potential for system disruption and problems in control. The managerial system was found to be one where a moderate amount of cooperative teamwork and some subordinate input exist, but it falls short of a system where ideas and methods of process control are communicated readily and accurately. At the individual job level it was found

that the majority of impediments are management system problems (e.g., poor planning, supply and paperwork problems). Overall, the results of this assessment provided a picture of the state of the organization with reference to the quality improvement effort and also provided information helpful in planning and guiding this effort over time.

### Recommendations

1. A goal of customer-oriented quality should be established. Such an orientation cuts across departmental lines and puts emphasis on procedures and processes rather than inspection.

2. Variance process control procedures should involve individuals from all functional areas who must interact to perform the process in question.

3. The objective of total quality control should be twofold: better product quality and improved operating procedures.

4. Periodic assessment should be undertaken to aid in the planning and guiding of the implementation over time.

5. The organization-wide quality control effort should be developed and implemented by employees representing a variety of levels and functional areas in the organization rather than be a program created solely by management and turned over to employees to implement.

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## INTRODUCTION

### Problem

Stimulated by international competition, many U.S. organizations have implemented quality improvement efforts in recent years (Mroczkowski, 1984-1985). Although the private sector leads the way, the public sector is also becoming involved in efforts to improve quality and productivity. Among the programs being developed by the U.S. Navy is one at the Naval Air Rework Facility (NAVAIREWORKFAC) in San Diego, California, the largest U.S. Navy facility of its kind.

Given the large-scale investment of time, effort, and money required of such programs, it would be useful to know which organizational characteristics are likely to promote or inhibit an implementation effort over time. To ensure success at NAVAIRESWORKFAC, the Naval Civilian Personnel Command requested researchers from the Navy Personnel Research and Development Center (NAVPERSRANDCEN) to conduct an assessment of one of its production divisions to determine which organizational characteristics are critical for implementation of a quality improvement effort.

### Organizational Implications of Quality Improvement Efforts

Major approaches to a sustained improvement in quality organization-wide involve the following: a focus on systemic rather than individual causes of poor quality, the use of statistical evidence as the basis for quality improvement actions and for the assessment of their impact, an emphasis on intra- and interdepartmental communication in solving and preventing problems, and removal of defects through process improvement rather than through inspection (Deming, 1982). Full-scale adoption of these principles involves a major change in the organization's orientation toward the way work is conducted. For example, a strong emphasis is placed on employee participation, on systematic quantification of problems, on data-based decision making, and on minimization of fault-finding. According to Ishikawa (1985), companies that have applied total quality or process control principles have transformed themselves in six ways: (1) quality is their uppermost goal; (2) they have adopted a consumer orientation; (3) barriers of sectionalism have been broken down; (4) statistical methods are used; (5) they employ participatory management; and (6) a cross-functional approach is used to solve problems.

The above description by Ishikawa suggests that companies implementing total quality control (TQC) are required to change in some fundamental ways so that the changeover will be effective. Since the adoption of an organization-wide quality effort may have a significant impact on the way policies are carried out, resources used, and decisions made, it would be helpful to obtain information bearing on these areas before the implementation has begun and at subsequent points in time after it has been introduced. Such information could serve three purposes: (1) aiding the implementation of such efforts; (2) extending the information to other organizations that are adopting and implementing such programs; and (3) providing information helpful in understanding the implementation of organizational change.

### Approaches to Studying Organizational Issues Relevant to the Implementation of Quality Improvement Efforts

Diagnosis of an organization implementing TQC should include information about the work process, management style, and job design. There are several diagnostic approaches highly relevant to issues associated with organization-wide process control. Three

approaches in particular were regarded by NAVPERSRANDCEN researchers as appropriate for an assessment of an organization: (1) technical analysis of its work system (Pasmore & Sherwood, 1978; Trist & Bamforth, 1951), (2) management system analysis, using Likert's system categories (Likert, 1967), and (3) job dimensions analysis, based on Hackman, Oldham, Jansen, and Purdy's (1974) formulation relating work content to psychological processes. Each of these is discussed below.

### Technical Analysis

TQC emphasizes improvement through process control. It is important, therefore, to understand the interactive nature of the work process, key processes, locus of control of these processes, and outcome measures at one's disposal. One approach that describes the systematic nature of the work process is called a sociotechnical analysis (Pasmore & Sherwood, 1978). The analysis is comprised of two major components, a social analysis and a technical analysis. The present effort primarily emphasized the technical analysis. The technical analysis provides information about the way work is conducted, the existing and potential areas of measurement, and areas requiring change if quality is to be improved. This analysis is especially helpful when: (1) a complete work process is not readily observable, (2) several interacting technical systems are involved, (3) there is a high disruption potential in the work process, and (4) cause-and-effect relationships are not clearly understood. There is a strong likelihood that several or all of these conditions existed in the organization under study.

### Management Systems Analysis

Management is a major force in the success of quality improvement efforts. For example, Hayes and Abernathy (1979, cited in Mroczkowski, 1984-1985) place the responsibility for the decline of U.S. industrial competition squarely on the attitudes, emphases, and practices of American managers.

The much broader approach to quality management required of a TQC organization requires a fundamental organizational change in the direction of a more participative management style. This change is based on

. . . a concept of quality management in which each individual employee's contribution to quality is recognized. It means a participative management style in which individuals are asked their opinion and allowed to contribute at all stages of the process--in effect transferring primary responsibility for quality from the quality control department to the individual. (Houghton, 1984, p. 30)

The organizational characteristics recommended by Houghton for an environment conducive to total quality improvement are very similar to the ones found in Likert's description of the most highly evolved management system, as measured by his Profile of Organizational Characteristics (1967). The use of the Profile, which measures such organizational characteristics as communication patterns (i.e., the acceptance of upward and downward communication) and level of cooperation (i.e., sense of responsibility and level of fear) could be of value in assessing the management system that exists in an organization in which a quality program will be introduced and the type of system that is in place at subsequent points in time.

### Job Dimensions

Since TQC efforts require increased time and effort on the part of employees, it is important to determine the ways in which individuals may directly benefit from this effort. One way is in the reduction of impediments that keep employees from doing their best work. Such a change could make workers' jobs easier to perform. Another potential benefit to workers is the enhancement of job content, similar to that observed in job redesign (Rousseau, 1977).

The technical analysis provides information about the interrelationships of tasks within the organization. In addition, information about job impediments and job characteristics is useful because it deals with the nature of specific jobs rather than the overall work process. In combination with the technical analysis, a more complete picture of the work setting is given, providing the basis for linking aspects of specific jobs to other jobs and units. An examination of job content can also serve to give some indication of how jobs within that work system provide workers the opportunity to use a variety of skills, interact with others, and obtain feedback on how they are performing. Assessing employees' perceptions of job impediments should identify problems in the overall work process and complement the information obtained through the technical analysis.

### Purpose

In summary, there is a great deal of activity with respect to new techniques to upgrade quality and productivity. Although there are many examples of organizations implementing such techniques, too often they result in limited, short-term gains and fail to tap the full potential of the proposed change (Metz, 1984). In light of this problem, the need to fully understand the elements that are critical for successful implementation should be emphasized.

One approach to understanding the critical aspects of implementing TQC is the use of a theoretically guided assessment rather than an instrument that attempts to measure all aspects of the organization. In this particular study, three areas were considered relevant to the implementation and maintenance of a TQC effort: the work process, the management system, and characteristics of individual jobs. It was felt that successful implementation would yield an organization characterized by work processes that are under control, a management system that is participatory and provides a climate for effective communication vertically and laterally, and a diminution of job impediments at the individual level.

It was felt that the assessment employed in this study would be beneficial in several ways. One, it would provide a composite picture of the organization and its compatibility with the quality improvement effort. Two, information obtained through periodic assessments could be useful to the organization in providing direction for its implementation effort, and when accumulated from several administrations could provide an indication of the extent to which implementation goals have been met. Three, the information obtained in the assessment could lead to the development of a theoretical model identifying elements necessary to implement TQC.

## APPROACH

### Site of the Assessment

The production division and support divisions that are implementing the Deming approach to quality improvement are physically located within one building at NAVAIRE-WORKFAC. Located in San Diego County, it is the largest of the six U.S. Navy rework facilities. Over 6000 personnel perform or support the overhaul, repair, and modification of aircraft, engines, and aeronautical components.

The implementation site houses a variety of technical processes and is unique among Department of Defense (DoD) industrial facilities in that it combines these processes at one location. It is the only facility within DoD with the capability to determine the need for repair of aircraft components, to perform necessary repairs, to manufacture parts as required, to reassemble components, and to test them. Work processes include the (1) overhaul, manufacture, repair, modification, and testing of landing gear, helicopter dynamic components, and other miscellaneous aircraft parts and equipment; (2) machine shop operations for the manufacture, modification, and repair of aircraft and parts; (3) manufacture, repair, and modification of fixtures, tools, and jigs; (4) heat treating and welding operations; (5) manufacture of templates and pattern castings; (6) manufacture, overhaul, modification, and testing of aircraft hoisting and launching cables, chairs, hose, and tubes and related parts and assemblies; and (7) such processes as cleaning, plating, nondestructive testing, corrosion control, and painting of aircraft parts and components. Over 600 people of various trades work in the building.

### Assessment Techniques

In the present study, the work process was evaluated by a technical analysis, the management system was measured by Likert's Profile of Organizational Characteristics (1967), and characteristics of the individual job were measured by the Job Diagnostic Survey (Hackman et al., 1974) and a job impediments scale (Shepesh & Hulton, 1983).

Information about the work process, management system, and job dimensions was obtained from different sources. The technical analysis, which analyzed the work process, was conducted by a team of eight experienced personnel from the implementation site with the guidance of two researchers from NAVPERSRANDCEN. Data related to the building's management system were obtained by questionnaires administered to all levels of management represented there. Information describing the dimensions and impediments at the individual job level was based on questionnaire responses from nonmanagement personnel and first-line supervisors.

### Procedures for the Technical Analysis

#### The Technical Analysis Team

The technical analysis team had eight members. All had extensive experience with the operations in the building, and the majority of them had worked in it since its opening in 1972. The team members represented the following departments: Production, Production Engineering, Material, Quality Assurance, and Production Control. All members were managers, ranging from general foreman to division director.

### The Selection of the Component

To provide focus and reduce the degree of complexity of the study, it was decided that a single component should be the topic of the technical analysis. The F-14 nose landing gear was selected because it required most of the services provided in the building (e.g., cleaning, plating, grinding, painting) and comprised a significant part of the building's workload (approximately 35%) involving aircraft and components programs.

### The Scan

The scan provides an overview of the system and its inputs, products, boundaries, personnel, relationship to the environment, and presenting problems. The scan gives members of the organization the opportunity to view it as a system, a bounded region of a whole operational production unit. This perspective is in contrast to that resulting from conventional ways of describing organizations in terms of job assignments, tasks, procedures, and lines of authority. The scan attempts to look at the work in organizations in terms of the purpose or mission that the organizational system pursues.

The scan dealt with seven questions that were answered by the team and others. These questions, typical of those addressed in a scan (Cotter, 1983), were:

1. What is the mission of the building?
2. What is the output of the system?
3. What is the input of the system?
4. What are the boundaries of the system (technical, time, territorial)?
5. What are the important environmental elements outside the boundaries?
6. What are the economic objectives of the system?
7. What are the system's presenting problems?

### The Technical Analysis

The technical analysis accumulated information for identifying the following: the major stages in the work process, the points in the process that are critical to achieving the desired outcome, and the way control is exerted at these critical points.

### Procedures for Management System Analysis

The instrument used to analyze the management system was Likert's Profile of Organizational Characteristics (1967). It classifies management systems into four types: exploitative authoritative (System 1), benevolent/authoritative (System 2), consultative (System 3), and participative (System 4). Managers in Systems 1 and 2 use hierarchical pressure for results. Management is characterized by greater conflict and less cooperation, greater feelings of unreasonable pressure on the part of employees, and less favorable attitudes toward management. System 3 management is characterized by decision making at the top after management has consulted with people further down in the organization. A lower level of fear and a higher degree of trust are present among employees within such an organization. System 4 managers use principles of supportive

relationships and group methods of supervision to achieve work goals. Such an organization has employees who display greater cooperation and group loyalty, have fewer feelings of unreasonable pressure being exerted upon them, and have more favorable attitudes towards management.

The instrument consisted of 49 items (see Appendix A). Each of the items in the Profile has a 20-point response scale that is worded to reflect the four systems. The items represent eight categories of organizational characteristics: leadership processes, motivational forces, communication processes, interaction-influence processes, decision-making processes, goal setting, control processes, and performance goals and training.

The instrument was given to supervisors representing the seven departments that cooperate to perform the work in the building (Engineering, Quality Assurance, Production Control, Production Engineering, Material, and Production). Plans were made to administer it again at subsequent points in time to assess changes. The questionnaire was completed by 42 supervisors including foremen, sections heads, branch heads, and division directors.

#### Procedures for Job Dimensions Analysis

To identify job impediments and job characteristics, two measurement scales were used. The Job Diagnostic Survey developed by Hackman et al. (1974) consisted of 21 items representing 7 scales (skill variety, feedback from others, task significance, feedback from job, task identity, autonomy, and dealing with others). The response format was a 7-point scale, ranging from very accurate (1) to very inaccurate (7). A modified version of a job impediments scale developed by Sheposh and Hulton (1983) was also used. Subjects used a 7-point scale, ranging from very little (1) to a great deal (7), to indicate the extent to which 26 potential impediments kept them from doing good work. The job dimensions questionnaire, which contains both measurement scales, is presented in Appendix B. The questionnaire was administered to 108 nonsupervisory personnel and their first-line supervisors. Respondents were from four production shops (Examination and Routing, Plating, Aircraft Overhaul, and Painting) and their support codes.

## **RESULTS AND DISCUSSION**

### System Scan and Technical Analysis

#### Scan

The results of the system scan provided answers to each of the seven questions asked. The first issue addressed by the scan was the system mission.

System Mission. The system mission is a statement that provides information about the purpose and identity of the organization in a brief, easily remembered form. The mission statement developed by the team was:

The Building's Production Team is in business to provide and maintain the skills, tools, and procedures necessary to produce a product which meets the technical requirements of the requester and fulfills the intentions of the customer.

The "Building's Production Team" refers to employees in the Production Department and the other departments that provide support to that building. The key words in the statement are "product," "requester," and "customer." "Product" means finished manufactured metal components, reworked aviation subassemblies (e.g., landing gears, rotor heads, ordnance), and a variety of processing subassemblies in support of other production divisions. It also means in-process support, such as nondestructive testing (NDT), wet processing, and technical support including master alignment fixture and tooling calibration and manufacturing. The "requester" may be the Supply Code within the Material Department (for Navy overhauls) or the Customer Service Code within the Production Control Department. "Customer" is that person or group who will ultimately use the product. The "technical requirements of the requester" are the traditional quality verification guidelines, while "the intentions of the customer" refers to quality in terms of customer satisfaction regarding usability, cost, and timeliness.

System Output. The system output is the product of the system. The products identified in this scan were: parts/components/subassemblies ready for issue.

System Input. The input is the raw material that the system transforms into the output. In the implementation site, this is: repairable parts and components and requests for parts and tooling to be manufactured, as scheduled by the Naval Aviation Logistics Center and accepted by Planning and Estimating and the Components and Metal Division.

Boundaries. Boundaries are viewed from several perspectives. They can be technical, territorial, temporal, and social. The boundaries of the nose landing gear overhaul processes were defined as the following:

1. Input. Components are received from supply by one of the two production control branches that support the building. "Bits and pieces" parts and manufacturing are received by the other production control branch at Station 30 (an area at the rear of the building).
2. Output. Completed products are taken to Station 30 for transportation.
3. Physical. The physical boundaries of the system include: everything in the implementation building; planners and estimators in Hanger 2; foundry and drop hammer shops in Building 65; final aircraft finish in 466 complex, tooling and manufacturing in Building 90; and kitting, manufacturing, sheet metal storage, and precut in the Building 29 complex.
4. Time. The time boundaries for components ranged from 20 to 90 days. For parts, 1 to 60 days.
5. People. Includes representatives from the Administrative Services, Management Controls, Engineering, Quality Assurance, Production Control, Production Engineering, Material, and Flight Test Departments and the rest of the Production Department. The representatives are either located within the building or go there upon request.

Environmental Elements. The team also generated a list of elements outside the system boundaries that may have a significant effect on its operation. These are presented in Table 1.

Table 1

Environmental Elements Affecting the Implementation Site

---

OSHA  
San Diego County  
Equal Employment Opportunity  
Unions/associations - International Association of Machinists (IAM)  
Other Naval Air Rework Facilities as cognizant field activities  
Navy and quality assurance audits--external, internal, precious metals  
Tourists  
Utilities  
Private contractors  
Facilities  
Media  
Charitable groups--Combined Federal Campaign, blood mobile, etc.  
Computer systems  
Naval Aviation Logistics Center  
Naval Material Command  
Training  
Coronado Bridge (traffic congestion affecting arrival time)

---

Economic Objectives. The economic objectives of the system describe the product and mission in terms of dollars or other terms that can readily be converted into dollar or cost figures. The implementation building's objectives are listed in Table 2.

Presenting Problems. Presenting problems are a reflection of the process flow and call attention to areas that are to be addressed in the future. Some of these can be dealt with through process control, others may be resolved without resorting to formal problem-solving procedures, and others may involve changes in organizational policies and practices. The team identified the building's presenting problems (see Table 3).

One major point that is evident from the scan is the highly complex nature of the work system operating within the building. A variety of system inputs (e.g., repairable parts versus components) require transformation, resulting in a greater potential for lack of control.

Technical Analysis

The technical analysis provides a comprehensive picture of the process used for the overhaul of the F-14 nose landing gear. The analysis provides a picture of how work is accomplished by looking at the technical requirements (e.g., procedures, techniques, tools) across operations and separating these requirements from the people, control systems, and jobs that are involved in the overhaul of this component.

Table 2  
Economic Objectives of the Implementation Site

---

Conserve utilities  
Meet contract at or below price  
    Work each product by cost, not hours  
    Stay within cost in each step of process  
Operate with optimal workforce  
Avoid accidents  
Work within schedule  
Avoid damage from handling or storage  
Be competitive with public sector  
Avoid defective work and spoilage

---

Table 3  
Presenting Problems of the Implementation Site

---

Excess paperwork  
Material--poor quality, not available  
Poor/irregular maintenance  
Lack of critical skills  
Inconsistent disciplinary actions  
Three or more independent computer systems  
Absenteeism/tardiness  
Top management turnover  
Lack of on-site engineers  
Frequent reorganizations  
Facilities (e.g., noise, fumes, poor lighting)  
Lack of coordination/communication  
Poor workload scheduling  
Priority system and its circumvention by employees  
Lack of process engineering

---

Unit Operations. The first step in the technical analysis is the identification of the unit operations required to complete the technical process. Unit operations are the main parts or phases in the sequence of operations that are carried out to convert materials into products. Each unit operation is relatively self-contained and transforms the material in an identifiable way. The term "transformation" is defined as either a change of state in the raw material or a change of location or storage of the material.

Figure 1 shows the work flow for repair of the F-14 nose landing gear as developed by the technical analysis team. The process is broken into seven unit operations necessary for the conversion of input to output. The first unit operation shown in Figure 1 is induction of aircraft. This unit operation is outside the boundaries of the implementation site but was included since it was perceived to have a significant impact on the unit operations within that building. Based on inspection of the aircraft and accompanying logs, the aircraft is evaluated for rework. It is disassembled and various components, including the nose landing gear, sent to the appropriate repair sites. Theoretically, these components are scheduled for repair (correction of what keeps them from functioning) rather than for total overhaul (total renovation to put them in "like-new" condition). In practice, since new components are not generally available, the aircraft components are frequently overhauled.

The second unit operation is induction of component. The component is the basic input, in this particular analysis a repairable F-14 nose landing gear. This unit operation includes: disassembly, cleaning of the nose landing gear parts, evaluation for repair, and routing to appropriate locations for repair. Unit operations III and IV represent two different aspects of processing. Unit operation III, wet/dry processing, includes such operations as sand blasting, plating, and heat treating of component parts. Unit operation IV, machine processing, includes all machining operations, grinding, milling, and boring of the nose landing gear parts. Unit operation V, kitting, involves the collection and coordination of the processed parts for reassembly. Unit operation VI, assembly/final sell, consists of the reassembly of the repaired nose landing gear, finish-painting, and final acceptance by Quality Assurance. Unit operation VII, final disposition, takes place outside the implementation site. This unit operation deals with the delivery of the component to its destination.

In general, the nose landing gear repair progresses in a linear fashion through the five unit operations within the implementation site boundaries. Figure 1, however, includes bidirectional arrows between the two processing unit operations (III and IV). Several parts require more than one type of processing in one unit operation. Further, work frequently alternates between the two unit operations. A common sequence of events involves cleaning a part, pregrinding it for plating, applying metal plate, and finish-grinding the plate. Although not indicated in Figure 1, in some cases parts are sent from the processing operations to the induction operation for rerouting.

Variance Matrix. Subsequent to the identification of unit operations, the technical analysis team identified areas in the work process where the condition or state of the input requires control. These control points, which are subject to breakdown or variability, are termed variances. The variation or deviation that occurs is brought about either by the state of the input to the unit operation or by the way the work is carried out at that specific point. The team produced a list of 160 variances that are distributed throughout the 7 unit operations.

UNIT OPERATIONS

I

INDUCTION OF AIRCRAFT

REPAIRABLE NOSE LANDING GEAR  
(INPUT)

II

INDUCTION OF COMPONENT

III,  
IV

PROCESSING  
WET/DRY

PROCESSING  
MACHINING

V

KITTING

VI

ASSEMBLY/  
FINAL SELL

VII

FINAL DISPOSITION

SERVICEABLE NOSE LANDING GEAR  
(OUTPUT)

Figure 1. Flow diagram of unit operations in overhaul of F-14 nose landing gear.

Figure 2 shows both the seven unit operations involved in the repair of the F-14 nose landing gear and their respective variances. Figure 2 also shows the interrelations among the variances identified by the technical analysis team. The entries within the matrix convey the relationships that exist between pairs of variances throughout the technical system.

Several observations may be made about the variance matrix.

1. The technical analysis identified a large number of variances. This number may be due to the varied input to the system and to the extensive paperwork required to process those inputs.
2. A specific type of variance may occur in several unit operations (e.g., manpower availability, priorities).
3. The control or lack of control associated with a specific variance has an effect on subsequent variances in a large number of instances.
4. Unit operations II and III are marked by a high potential for variances to have an impact upon one another.

The matrix also enabled the team to identify the most important or key variances. Key variances have the potential for stopping or disrupting the work process and are likely to have more serious or widespread effects on performance outcomes than other variances. Variances were designated as "key" if they were seen to be related to one or more other variances. Key variances, thus, are frequently characterized on the matrix by a series of dots down the column below them, indicating that they are related to those subsequent variances.

Determination of key variances also was made on the basis of their effect on organizational outcomes. The four performance outcomes considered were: quality, cost, turnaround time, and customer satisfaction. These outcomes were broadly defined. Quality referred to such concerns as absence of defects and conformance to specifications. Turnaround time was defined in terms of completion of work within target dates (see discussion of time boundaries in the section on the scan). Cost was seen in terms of time above standard (e.g., excess hours for unplanned repairs and costs due to waste and scrapped material). Customer satisfaction was defined in terms of valid customer complaints.

The key variance numbers in Figure 2 are circled. Figure 3 displays only the key variances. In all, 69 variances were identified by the team as key and being most critical to work process and outcomes. The key variances affected at least two and in some cases three of the output criteria. With the exception of one, all of the key variances were seen by the team as influencing turnaround time. Cost was the second most frequently affected outcome; there was strong agreement among team members with respect to 27 variances (e.g., variances 49, 50, 93, 105). The team agreed on 17 variables affecting quality (e.g., 58, 93, 106). There was very little consensus regarding which variables influenced customer satisfaction. In addition, inspection of the matrix indicated that the variances fell into 6 clusters: documentation/paperwork (comprising 16 variances), workmanship (13 variances), material (12 variances), equipment (10 variances), scheduling (10 variances), and manpower (8 variances). Table 4 presents the composition of each cluster.





3

1

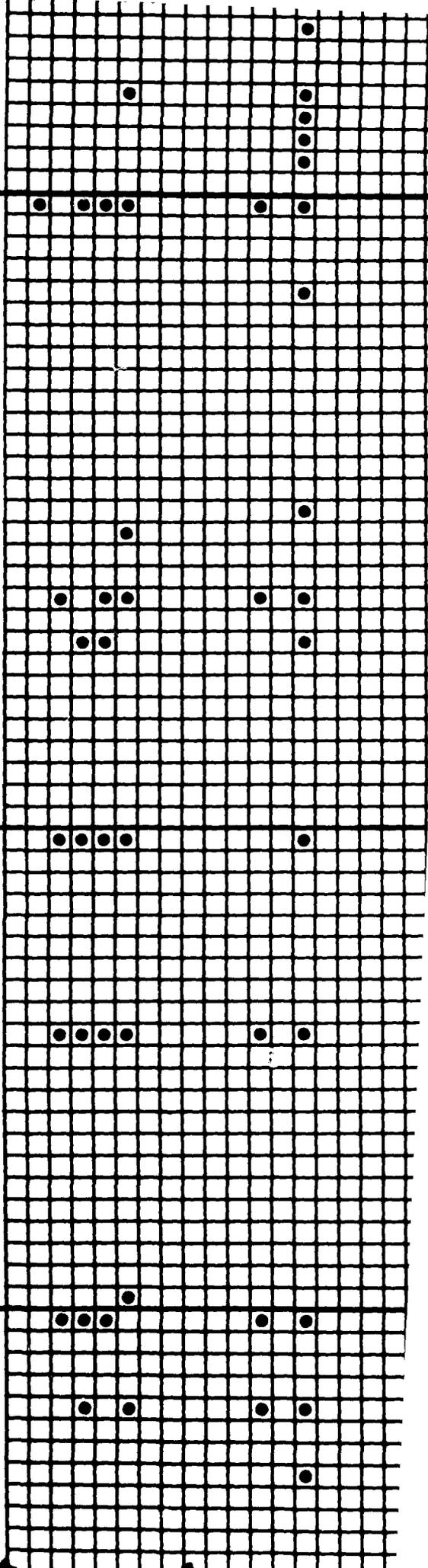
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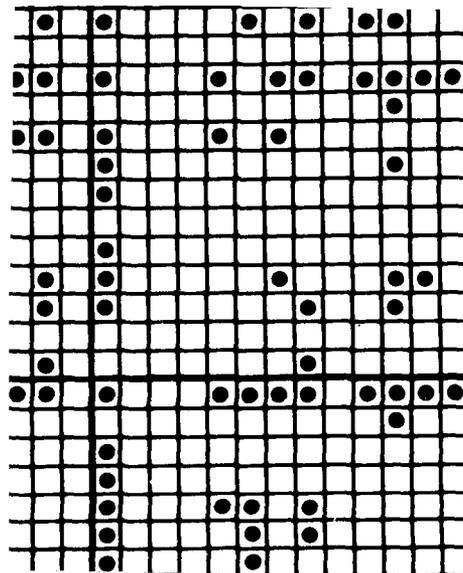
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4

III. PROCESSING  
(WET/DRY)

IV. PROCESSING  
(MACHINING)





1 6

(a)  
parts  
(peening)

malfunction  
load/scheduling  
specially Painting)  
d - staffed in the event of work (NDT)

water malfunction  
WIP  
malfunction/incorrect transaction (Metal Spray only)  
space  
inventory control  
show  
QA (periodic process audits)/slant 3s

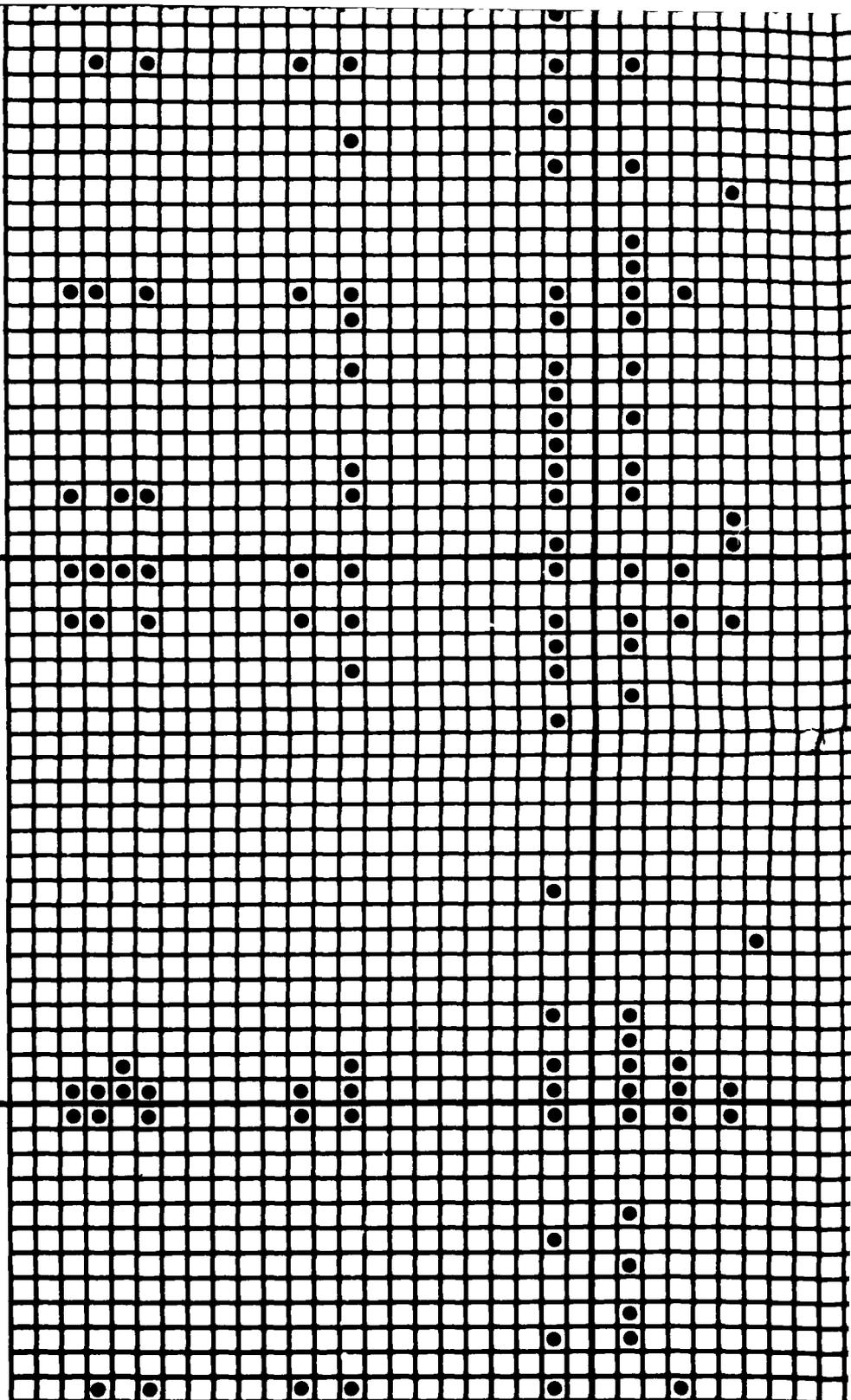
Manpower/skills availability									
82.	Utilities								
83.	Stacker service								
84.	Availability of holding fixtures								
85.	Quality/availability of tooling (consumables)								
86.	Availability of tooling (equipment)								
87.	Availability of technical data/SPI information								
88.	Defects/spoilage								
89.	UDAPS exceptions								
90.	Priorities/schedules								
91.	Machine maintenance/condition of equipment								
92.	Engineer availability								
93.	Condition of part								
94.	Kenway malfunction								
95.	Monorail malfunction								
96.	LPS 295, stress relief								
97.	QA verification/slant 3s								
98.	Safety/injury								
99.	Parts/paperwork mismatch/lost parts								
100.	Transactor malfunction/incorrect transaction								
101.	Link not on WIP								
102.	Storage space								
103.	Manpower/skills availability								
104.	Utilities								
105.	Parts/paperwork mismatch								
106.	Handling damage/parts protection								
107.	P & E's induction plan/schedules								
108.	Conflicting instructions/kitting lists								
109.	Backrobbing of parts from kitting area								
110.	Parts availability from Supply, feeder, process shops								
111.	Parts missing								

7

V. KITTING

VI. ASSEMBLY/  
FINAL SELL

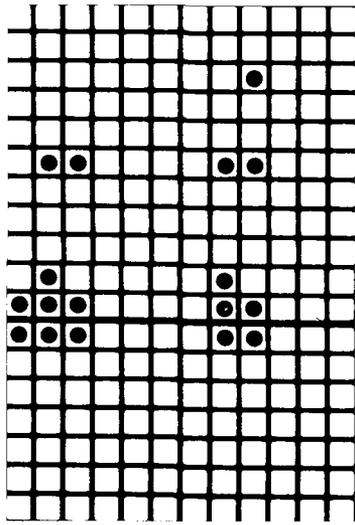
VII. FINAL  
DISPOSITION



I. INDUCTION  
OF AIRCRAFT

II.





orrect  
 (storage)  
 ability  
 ing from kitting units  
 of forklifts  
 y of inventory (bits and pieces)  
 acy of unit count (major assemblies)  
 ing errors  
 ommunication and coordination within building  
 QA/slant 3s  
 29 Workload fluctuation/priorities  
 125. Transactor malfunction/incorrect transaction  
 126. Link not on WIP  
 127. Manpower/skills availability  
 128. Utilities  
 129. Schedules  
 130. Parts/paperwork mismatch  
 131. Discrepancies found/condition of material  
 132. Missing parts/wrong parts received  
 133. Serial number mismatch  
 134. Handling damage  
 135. Lack of technical data  
 136. Availability of QA for verification  
 137. Waiting for engineering disposition  
 138. Availability of tooling (fixtures, workstands)  
 139. Waiting for decals  
 140. QA/slant 3s  
 141. Forklift transportation  
 142. Stacker service  
 143. Storage  
 144. Safety/injury  
 145. Transactor malfunction/incorrect transaction  
 146. Link not on WIPICS  
 147. Proper/complete assembly  
 148. Priorities  
 149. Manpower/skills availability  
 150. Utilities  
 151. Stacker service  
 152. Transportation (handling/destination)  
 153. Computer records (correct storage)  
 154. Link not on WIP  
 155. Computer system update (WIPICS, SDA, Kenway)  
 156. Weather  
 157. Availability of transportation equipment  
 158. Lost paperwork  
 159. Delivery unreported (item reconciliation)  
 160. Missed schedule

VI. ASSEMBLY/  
FINAL SELL

VII. FINAL  
DISPOSITION





III. PROCESSING  
(WET/DRY)

ny

IV. PROCESSING  
(MACHINING)

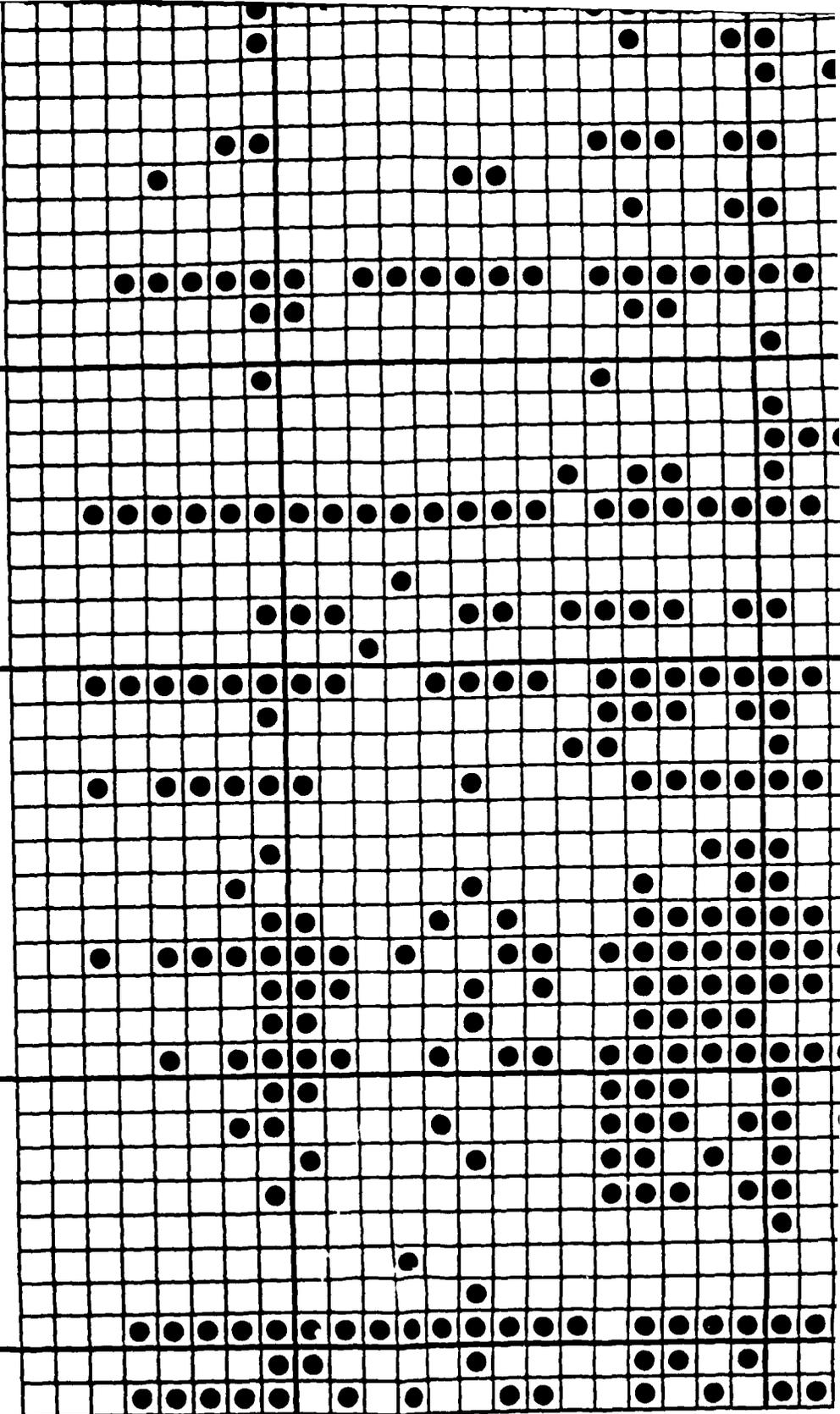
V. KITTING

VI. ASSEMBLY/  
FINAL SELL

VII. FINAL  
DISPOSITION

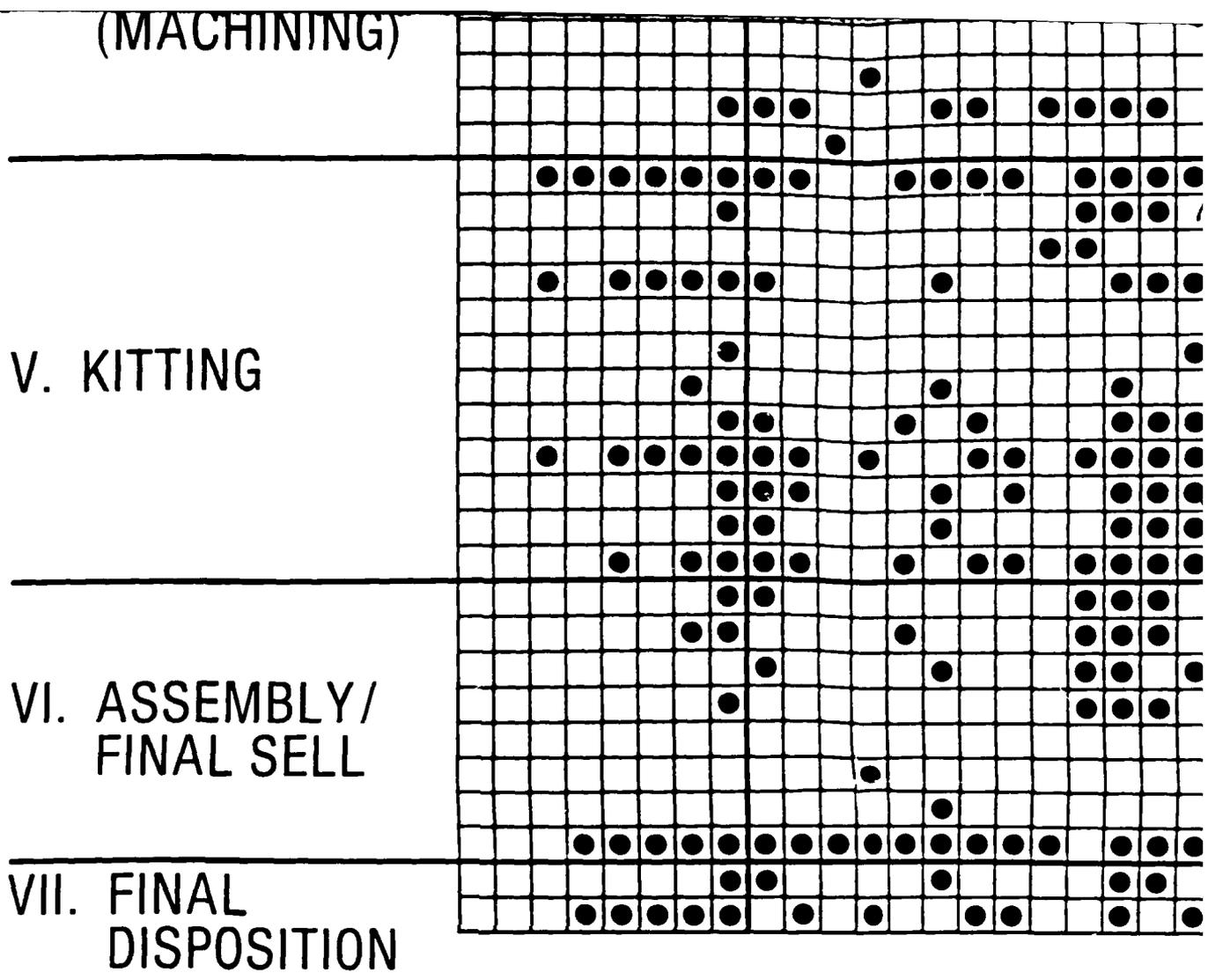
I. INDUCTION  
OF AIRCRAFT

II. INDUCTION  
OF COMPONENT  
(E & R,  
DISASSEMBLY,  
REPAIRS)









I.  
INDUCTION  
OF AIRCRAFT

II.  
INDUCTION  
OF COMPONENT  
(E & R,  
DISASSEMBLY,  
CLEANING)

Figure 3. Key va



formation

ition of equipment

- availability
- ork mismatch
- nage/parts protection
- uction plan/schedules
- ing instructions/kitting lists
- obbing of parts from kitting area
- ts availability from Supply, feeder, process shops
- parts missing
- Manpower availability

17. Material missing from kitting units

121. Kitting errors

124. Workload fluctuation/priorities

130. Parts/paperwork mismatch

131. Discrepancies found/condition of material

132. Missing parts/wrong parts received

133. Serial number mismatch

134. Handling damage

135. Lack of technical data

138. Availability of tooling (fixtures, workstands)

148. Priorities

158. Lost paperwork

160. Missed schedule

VI.  
ASSEMBLY/  
FINAL SELL

VII.  
FINAL  
DISPOSITION

gear.

9

Table 4

## Composition of Variance Clusters

Documentation/Paperwork		Workmanship	
3	Availability of processing paperwork	13	Oversight on initial evaluation
5	Documentation discrepancies	46	Handwritten
11	Paperwork	47	Errors in examination
26	Completeness of paperwork (SRC)	50	Second/third evaluations
38	Routing tag	61	Defects
40	SPI	63	Certification errors
62	Parts/paperwork mismatch	68	Correct application of media
66	Incorrect work documents	88	Defects/spoilage
67	Lack of technical data	106	Handling damage
87	SPI	109	Backrobbing
105	Parts/paperwork mismatch	121	Kitting errors
108	Conflicting instructions	131	Discrepancies
130	Parts/paperwork mismatch	134	Handling damage
133	Serial number mismatch		
135	Proper technical data		
158	Lost paperwork		
Material		Equipment	
21	Misrouting	28	Kenway mechanical malfunction
48	Misrouting	41	Burr tag machine malfunction
49	Wrong material ordered	58	Calibration (tanks)
56	Availability of material	59	Special tools (anodes)
57	Classification and acceptance of media	65	Maintenance of equipment
73	Lost totes	69	Kenway/plating monorail malfunction
85	Quality and availability of tools	74	Kenway computer malfunction
93	Condition of part	84	Holding fixtures
110	Parts available from supply	91	Machine maintenance
111	Parts missing	94	Kenway malfunction
132	Parts missing		
138	Availability of tooling		
Scheduling		Manpower	
1	Plane late	4	Manpower constraints
34	Engineering hold	24	Manpower/skills availability
39	Priorities	52	Manpower/skills availability
45	Material Review Board	64	Availability of certified/licensed artisans
70	Priorities	81	Manpower/skills availability
90	Priorities	92	Engineer availability
107	P & E induction plan	103	Manpower skills availability
124	Workload fluctuation	116	Manpower availability
148	Priorities		
160	Missed schedule		

A further examination of the clusters revealed that they relate to one another to varying degrees. Figure 4 shows these clusters and their relationships to each other and to the outcome criteria. The size of each circle roughly corresponds to the number of variances related to that cluster. The arrows indicate the direction of the relationship.

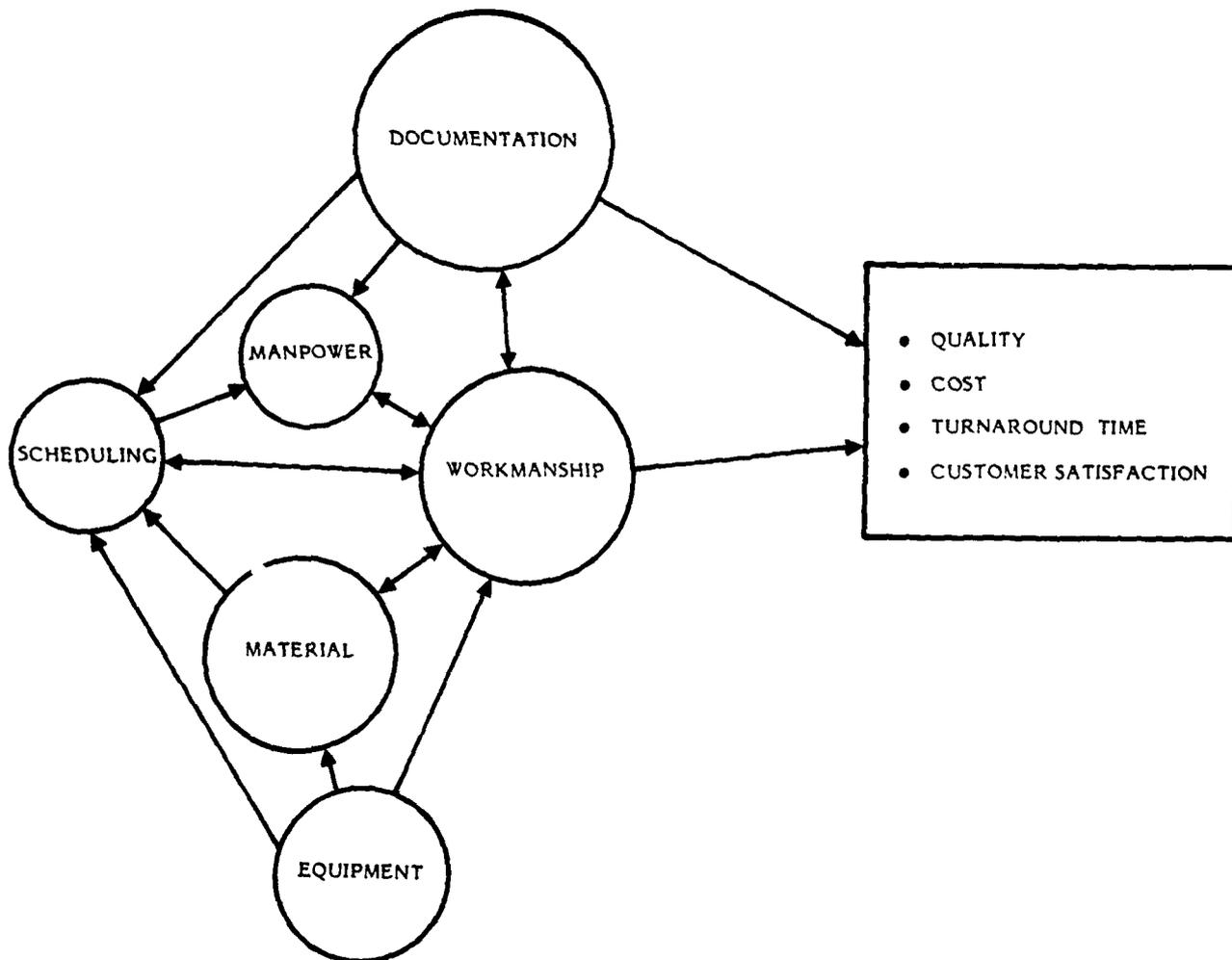


Figure 4. Variance clusters. The size of the circles indicates relative importance.

Based on the examination of the interrelationship of the key variances, the following conclusions were drawn. The documentation cluster is most closely related to (impacts on) the scheduling and manpower clusters. The workmanship cluster also is closely associated, but in a bidirectional fashion, with scheduling and manpower and, to a lesser degree, material. The scheduling cluster is primarily related to and/or affected by manpower and workmanship. Material variances appear to have the greatest impact on workmanship variances (a bidirectional relationship) and a lesser impact on scheduling. Equipment was found to be linked to material, and manpower most directly related to workmanship.

In general, the organization of these variances indicates the following:

1. Documentation (which includes technical data as well as other paperwork) tends to influence the state of other variables (e.g., manpower, scheduling, and to some extent, workmanship) more than it is affected by them.
2. The same relationships are evident for the equipment cluster, but to a lesser extent.
3. Workmanship affects other variances and is influenced as well by other variances.
4. The two variance clusters that were judged to have the greatest impact on outcomes were documentation and workmanship. Variances from the other clusters are seen to have a less direct impact on outcomes.

Variance Control. In the final phase of the technical analysis, focus was directed on the manner in which key variances are currently controlled. This was accomplished by listing the unit operation in which a key variance originates, the unit operation where it is observed, and the unit operations where it is controlled. Also listed is the control agent of the key variance, what actions are used to control variances, and sources of information for control. Table 5 provides, in summary form, information about control of three key variances. Using variance 58 (calibration of tanks) as an example of the information covered in Table 5, it can be seen that control of this variance involves several individuals (artisans, foremen of the shop, and material lab chemists) who are required to sample and test the tanks and provide feedback to chemical handlers (Code 650) who order the chemicals so that the proper chemical levels are maintained. Sources of information that serve as the basis for these activities include the chemist's log, vendor specifications, discrepancy reports (slant 3s), and artisan's observations of the tank's performance. Thus, this information provides a good picture of the range and variety of actions and individuals necessary to control this particular key variance.

An inspection of the variance control table indicates the following:

1. In general, controlling each variance requires the efforts of several individuals, usually from several different departments or codes and organizational levels. This clearly underscores the strong interrelationship between various operations in the work and gives further emphasis for the need for variance process control through highly coordinated, cooperative efforts involving parties whose jobs, goals, and perspectives differ.
2. Most variances require a variety of control activities. Furthermore, these activities can often be further delineated into corrective and preventive control activities.

Table 5  
Variance Control Table for Three Key Variances

Key Variance	Name of Unit Operation Where Occurs	Name of Unit Operation Where Observed	Where Controlled	By Whom	Activities Required to Control Variance	Information and Sources of Information Related to Control Activities
Calibration of tanks (plating) (58)	III	Nondestructive testing plating, grinding, QA, heat treating, nital etch, and all other shops down the line from Plating	III	Artisan Foreman—consults with chemist; notified if something added to tank Chemical handlers Material lab chemist (Code 340)—on call or during scheduled visits	Sample tanks and test Feedback to 630 (chemical handlers) who add chemicals during graveyard shift Supply ordering	Artisan's observation of tank performance Chemist's log Vendor specs Chemical company's specs Information from chemical handlers Information from foreman Discrepancy reports (Slant 3s)
Availability of special tooling (plating) (59)	E&R--(II)	E&R--(II)	Code 300--Aero Engin.	Engineer	Code 300 puts out specs (not necessarily involved)	Schedules
	Plating (III)	Plating (III)	Code 400--QA	QA specialist	QA inspects manufactured special tooling pieces	Local Engineering Standards (LESs)
			Code 610--Prod. Eng.	Ind. eng. tech.	Code 600 designs the tooling	Pilot overhaul, if they are processing a particular component for the first time
			Code 700--Material	Equip. specialists	Code 700 orders material	Information from Plating and E&R personnel
			Code 970--Manufacturing	Artisan	Code 970 manufacturers	
			Plating (III)	Artisan and supervisors	Plating discovers the availability of tooling E&R can discover they have no paper work for it E&R should alert Plating that they will need the special tools To correct: If something gets to Plating without the special tooling made, then Plating has to stop and do a red line delay, indicating work stoppage	Material order forms Specs from Code 300
Parts Availability (Kitting) (110)	V	V, VI	Code 200	All shop personnel	Preventive: Balanced workload Timely delivery of parts from Supply Reduce rework of parts Reduce lost parts and paperwork Establish priorities High and low limits in storeroom Shops work a good product mix Better inventory control system Shops work first in/first out (FIFO) No master scheduling in implementation building Ordering correct parts Kitting orders parts Corrective: Kitted parts received from Supply, feeder shops, and production shops. Control is best over parts produced in-house. Production Control (PC) tags in-house parts that should be expedited. PC can call feeder shops to provide parts, can put on computer priority list, and can issue red line delay. PC has no control over supply and does not know when supplies are exhausted until a request is made.	WIPICS shortage sheet Priorities list in PC Master schedule for the building Flow time on documents EDD (Estimated Delivery Date) list from Code 700
			Code 300	Production control		
			Code 400	Shop foremen		
			Code 500	Section heads		
			Code 600	Schedulers		
			Code 700	Program managers		
			Code 900	Branch heads		
				Equipment specialist (Code 700)		

3. To achieve control, most variances require several kinds of information (e.g., observational data, measurement, specifications, forms).
4. Since several individuals are involved in effecting control, delays between recognition of variances and remedial action may occur more frequently than is desirable.
5. The variance control table suggests possible problems arising from the temporary delay between recognition of a variance and remedial action to correct it.
6. The range of activities and information required to control the variances, particularly in a preventive mode, may require training that is tailored to deal with control issues.

### Management System

Means were calculated for the 49 items on the Profile of Organizational Characteristics for the 42 managers who completed the scale. By plotting the mean responses to the items on a scale divided into the four management systems, it is possible to obtain an overall profile of the managers' perceptions of their organization. Figure 5 shows a profile of the means of the answers to each item completed by the managers. For 40 items, 40 means fell in the lower half of System 3 (consultative style) and 9 in System 2 (benevolent/authoritative style). In general, the pattern can be characterized as borderline System 3.

Figure 6 presents a sample of actual items (roughly one-third) with the profile of responses superimposed on them. Examples of responses reflecting System 2 include: Responsibility for achieving organizational goals rests mainly with management (2d); policy decisions are made at the top with some delegation (5a); and review and control are concentrated somewhat at top management with moderate downward delegation (7c). Examples of responses reflecting System 3 are: There is a moderate amount of cooperative teamwork (4b); sometimes there is an informal organization that resists the formal one (7d); and subordinates have some influence on goals, methods, and activities in their units (4c). The overall pattern profiled in Figure 5 describes a system that falls short of one in which ideas and methods for developing better ways of controlling processes, achieving higher quality, and reducing waste are communicated readily, implemented effectively, and assessed accurately. Interestingly, this profile was essentially agreed upon by all levels of management. Analyses of variance failed to yield any significant differences among the four levels of managers.

In contrast, there were some differences in the responses from personnel in the three functional areas from which responses were obtained: examination and routing, plating, and aircraft overhaul. Figure 7 presents the pattern of means for organizational characteristics items for the three groups. Table 6 presents the characteristics for which mean responses differed significantly among the three groups as revealed by analyses of variance. The majority of items on which groups differed dealt with superior-subordinate relationships. Managers in the plating area perceived a greater gap between managers and subordinates than the other groups. For the majority of the items, the plating group was tilting toward System 2 to a greater degree than the other groups.

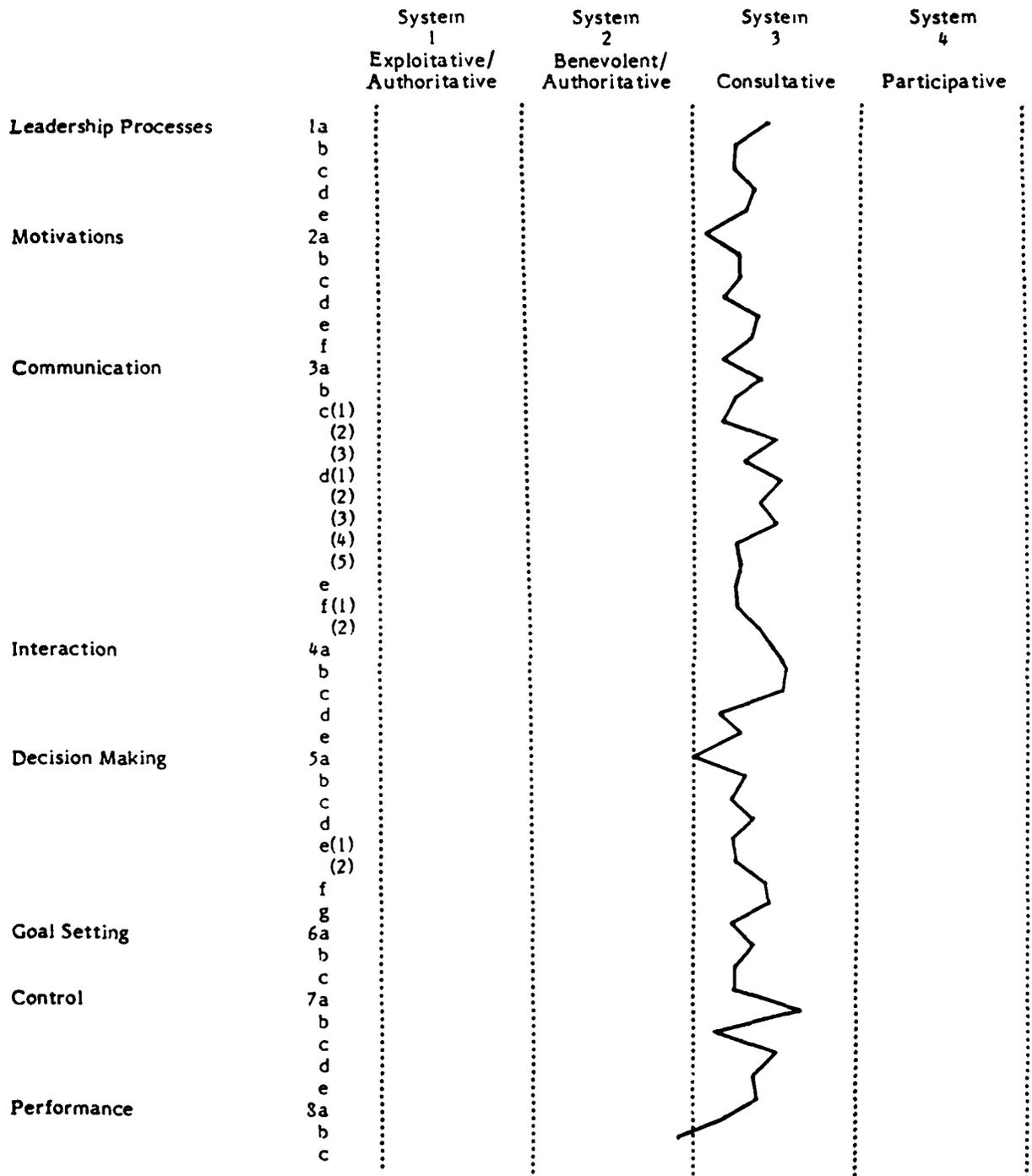


Figure 5. Mean responses of managers to Likert's Profile of Organizational Characteristics (1967).

Organizational Variables	System 1	System 2	System 3	System 4	Item No.
<b>LEADERSHIP</b>					
How much confidence and trust is shown in subordinates?	Virtually none	Some	Substantial amount	A great deal	1a
How often are subordinates' ideas sought and used constructively?	Scidom	Sometimes	Often	Very frequently	1c
<b>MOTIVATION</b>					
Is predominant use made of (1) fear, (2) threats, (3) punishment, (4) rewards, (5) involvement?	(1), (2), (3), occasionally (4)	(4), some (3)	(4) some (3) and (5)	(5), (4), based on group	2b
Where is responsibility felt for achieving organization's goals?	Mostly at top	Top and middle	fairly general	At all levels	2d
<b>COMMUNICATION</b>					
What is usual direction of information flow?	Downward	Mostly downward	Down and up	Down, up and sideways	3b
How is downward communication accepted?	With suspicion	Possibly with suspicion	With caution	With receptive mind	3c(3)
<b>INTERACTION</b>					
How much cooperative teamwork exists?	Very little	Relatively little	Moderate amount	Great deal	4b
How much can subordinates influence goals and activities?	None	Virtually none	Moderate amount	Great deal	4c

Figure 6. Sample item from Likert's Profile of Organizational Characteristics (1967).

Organizational Variables	System 1	System 2	System 3	System 4	Item No.
<b>DECISIONS</b>					
At what level are decisions made?	Mostly at top	Policy at top, some delegation	Broad policy at top, more delegation	Throughout but well-integrated	5a
Are subordinates involved in decisions related to their work?	Almost never	Occasionally consulted	Generally consulted	Fully involved	5r
<b>GOALS</b>					
How are organizational goals established?	Orders issued	Orders, some comments invited	After discussion, by orders	By group action (except in crisis)	6a
How much covert resistance to goals is present?	Strong resistance	Moderate Resistance	Some resistance at times	Little or none	6c
<b>CONTROL</b>					
How concentrated are review and control functions?	Very highly at top	Quite highly at top	Moderate delegation to lower levels	Widely shared	7c
Is there an informal organization resisting the formal one?	Yes	Usually	Sometimes	No---same goals as formal	7d
<b>PERFORMANCE</b>					
What are superiors goals for organizational performance?	Average	High	Very high	Extremely high	8a
What is level of desired management training received?	None	Some	Quite a bit	A Great deal	8b

Figure 6. (Continued).

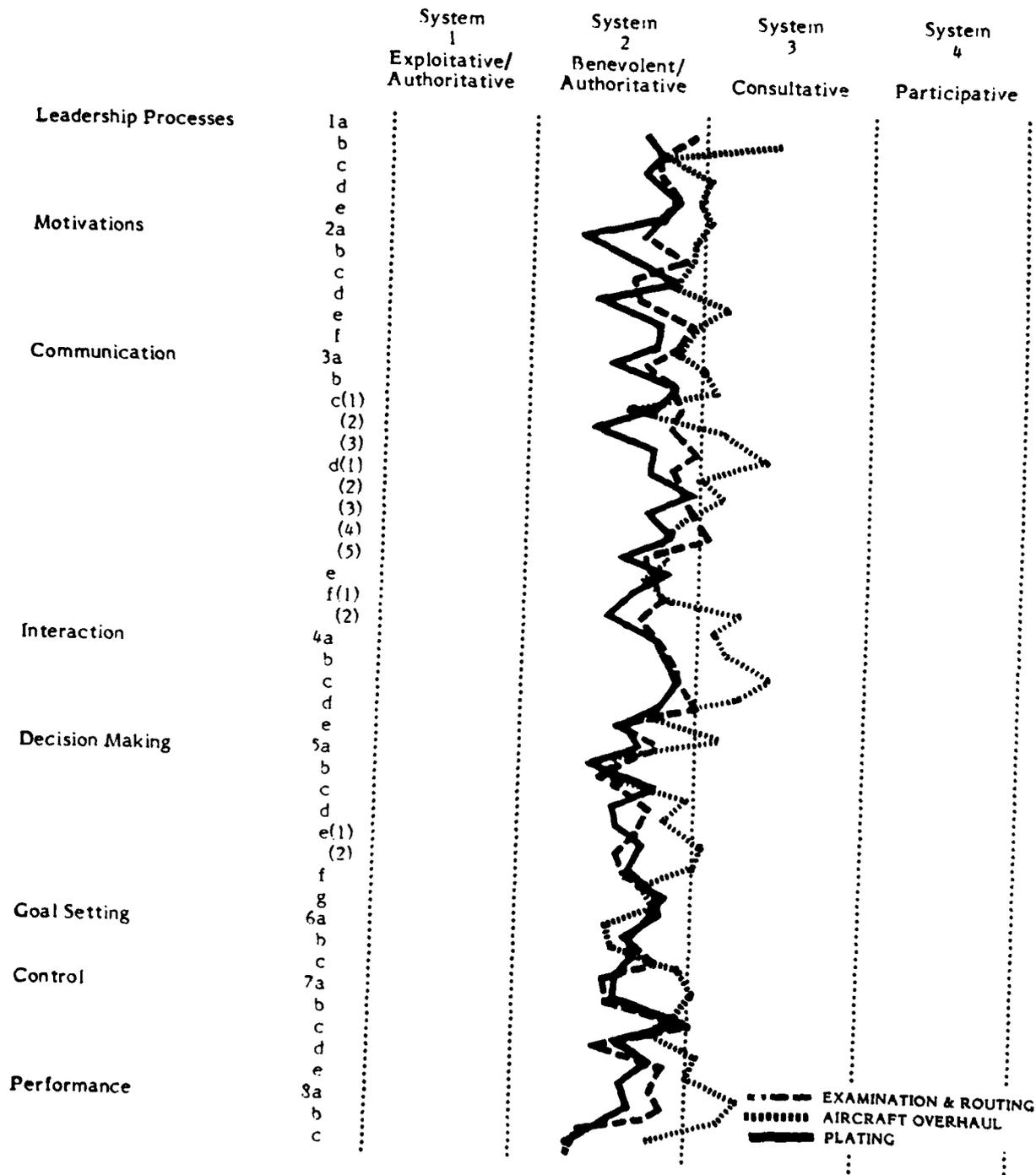


Figure 7. Mean responses of three groups of managers to Likert's Profile of Organizational Characteristics (1967).

Table 6

## Group Differences on Organizational Characteristics Items

Item	Examination and Routing	Plating	Aircraft Overhaul	F(df)
1A Supervisors have confidence in subordinates	11.89	9.87	16.00	5.19(2, 35)**
2A Type of motivators (extrinsic to intrinsic)	9.56	6.73	12.00	3.14(2, 35)*
2D Perceived responsibility of organizational goals	9.71	7.87	13.80	6.82(2, 34)**
3C2 Superiors share information	10.50	7.87	14.00	5.70(2, 35)**
3C3 Subordinates' acceptance of communication	12.67	10.47	15.40	5.23(2, 35)**
3F1 Superiors' understanding of subordinates' problems	10.28	8.60	14.80	6.25(2, 35)**
4B Amount of cooperative teamwork	12.44	12.00	16.40	3.39(2, 35)*
8B Management training provided	8.22	9.27	15.00	3.24(2, 34)*

\* $p < .05$ .\*\* $p < .001$ .

Overall, the organizational management system as described by the managers within the Components and Metal Division and related support divisions was borderline System 3. Such a system falls short of System 4 management, which would more closely characterize a system consistent with organization-wide quality control.

### Job Dimensions

Responses to the job impediments instrument (see Appendix B) were examined to determine which potential impediments were seen as keeping employees from doing their best work. Table 7 presents the percentage of individuals who indicated that each of these impediments created significant difficulties in the performance of their jobs (i.e., those who marked 5 or above on the 7-point response scale). The impediments are ordered by the percentage of respondents who perceived them as problematic. As seen in Table 7, 70.8 percent regarded poor planning as a serious impediment (a score of 5 or greater) to doing their jobs.

Table 7

Percentage of Respondents Indicating Factors That Were Impediments  
to the Performance of Their Jobs

Impediments	Percentage
1. Poor planning	70.8
2. Disciplinary standards inconsistent	65.0
3. Delay in receiving parts/supplies	64.9
4. Mismatched paperwork/parts	59.7
5. Stopping of one thing to start another	59.1
6. Supervisors not listening	57.2
7. Others not doing their job	56.5
8. Poor on-the-job training	50.7
9. Unclear/conflicting orders/instructions	48.3
10. Inadequate supplies from vendors	44.0
11. Inadequate equipment/tools	43.8
12. Procedures that inhibit job completion	43.2
13. Poor classroom training	42.7
14. Need to overlook regulations	41.6
15. Incoming units inadequate	41.1
16. Poor working conditions	39.6
17. Paperwork unclear/difficult to follow	39.6
18. Unclear goals/objectives	37.7
19. Lack of needed authority	36.7
20. Foreman not around to help	36.1
21. Too much expected during 8-hour shift	34.5
22. No people to do the job	31.3
23. Delay in receiving proper instructions	27.5
24. Unclear definitions: quality/standards	20.2
25. Fear of reporting problems, defects	19.2
26. Unclear how work affects end product	9.9

It is interesting to note that of the 10 most severe impediments, the majority are system problems (e.g., poor planning, waiting for parts and supplies, mismatched paperwork/parts, and inadequate supplies from vendors). The fact that they are systemic is not surprising due to the complexity of the work process and variance control. Impediments that were rated as less severe are more localized problems (e.g., too much expected during an 8-hour shift, foreman not around to help).

Table 8 presents group means for the seven job characteristics scales. A mean motivating potential score (MPS) also is shown. The MPS combines five of the job characteristics (skill variety, task identity, task significance, autonomy, and feedback from job) and indicates the motivating potential of workers' jobs.

Table 8  
Job Characteristics Means for NAVAIREWORKFAC  
Employees Compared to Norms

Item	NAVAIREWORKFAC	Norms <sup>a</sup>
Skill variety	2.95	3.47*
Task identity	3.29	3.35
Task significance	2.42	2.51
Autonomy	2.87	3.22*
Feedback from job	3.53	3.19*
Feedback from others	4.77	3.94*
Dealing with others	3.20	2.54*
<b>Motivating potential score</b>	<b>128.22</b>	<b>122.10</b>

<sup>a</sup>Oldham et al., 1978.

\*Significantly different.

Responses to the job characteristics items indicate that the jobs held by individuals who completed the questionnaire were perceived as offering overall variety. For purposes of comparison, Table 8 also presents norms from previous administrations of the scale involving individuals in 876 jobs from 56 organizations (Oldham, Hackman, & Stepina, 1978). Scores for NAVAIREWORKFAC employees compared favorably on most characteristics (lower scores indicate greater perceived amounts of that characteristic). Skill variety and autonomy were perceived as being present to a greater extent in their jobs by NAVAIREWORKFAC employees than by the employees who provided the norms. For three of the characteristics, feedback from job, feedback from others, and dealing with others, the mean responses for NAVAIREWORKFAC employees were significantly higher than the norms from typical organizations (indicating less feedback from the job and others and less cooperation with others). What bears further analysis is that feedback from others is seen by NAVAIREWORKFAC employees as provided significantly less often than it was provided in the organizations used for comparison. Feedback from others is essential for good quality management, and the perception of the extent to which it exists reflects the management system in operation.

## CONCLUSIONS

The assessment employed in this investigation was designed to serve several functions. First, it provided a picture of the state of the present organization as it relates to the quality improvement effort. Second, through future assessments it would provide direction for the quality control implementation and would indicate the extent to which implementation goals had been met. Third, information resulting from the use of periodic assessments could lead to the development of a theoretical model for the implementing TQC.

Based on the technical analysis, the normal, overall work process at the implementation site was found to be a complex one. Processing of the input involves the completion of a series of interlinking subprocesses and the coordination of people from a variety of shops and departments. Due to this complexity, there is a high potential for the overall system to be disrupted (e.g., parts unavailable, lack of documentation). That there are problems with the way work is processed is supported by data from workers who report breakdowns in the process such as parts arriving late, poor planning, and mismatched parts and paperwork, and from managers who describe a system that lacks adequate lateral and vertical communication and participative decision making.

The technical analysis also revealed that in such a complex system causal factors associated with dysfunctions are difficult to identify. This condition has implications for the way system dysfunctions are defined and resolved. At present, the tendency is to deal with them in a segmented or particularistic fashion, which may not be appropriate when the problem is a systemic one. It is evident from an examination of the control of system variances that the controls are highly localized, are not coordinated with those of others, and are often not effective on a system-wide basis.

Despite the shortcomings noted, the data indicate that this particular organization is one that could not only benefit from the TQC approach but is one that has properties well-suited for such an approach. The management system, while capable of being improved, is still fairly strong from the Likert management system perspective. Further, given that workers perceive their jobs as strongly motivating and that impediments are of a systemic nature, improved process control appears to have a good chance of producing positive effects.

Ideally, this assessment will satisfy two requirements for the measurement and implementation of this effort. One is the measurement of those organizational elements necessary for full implementation and the use of information about those elements in implementation planning. The other is the assessment of the achievement of the implementation goals. The first type of assessment is called formative and the second summative (Leithwood, 1981). Critical to the first objective is the establishment of an orientation among employees to remove defects through process improvement rather than through inspection. If the implementation is to succeed, it follows that knowledge of the process is required to effect such changes. Because the technical analysis describes the way work is conducted in terms of process rather than in terms of personalities or specific problems, it identifies and, to some extent, prioritizes the processes that should be analyzed and controlled. Further, this process control approach to quality improvement leads to fulfillment of the second objective through the identification of key variances and unit operations that could provide the basis for a measurement system that includes outcome measures necessary to improve performance.

Another key element of a TQC approach is the development of participative management (Ishikawa, 1985). As indicated earlier, in a Likert System 4 management system, an organization operates as a set of coordinated and interlinking departments or groups, with these groups relating to each other through individuals who serve as linking pins. Presently the management system at the implementation site is at the lower end of System 3. It would be helpful to measure over time whether the management system moves in a System 4 direction and to use the results of periodic administrations of the Profile of Organizational Characteristics (1967) to provide feedback to aid in the implementation. From a summative standpoint, this information also would be useful because it would indicate an organization evolving in the direction necessary to support a TQC effort.

A third issue relevant to formative and summative assessment is how the quality effort affects the individual. If employees' MPSs (motivating potential score) and perceptions of job impediments remain stable or change for the better over time, this could indicate that the quality effort is rewarding to the individual and, thus, more likely to endure. This information could be used by management to determine the viability of the program.

The danger with assessing an organization is that it will yield information specific only to that organization and will not contribute to a broader body of knowledge about the implementation and operation of organization-wide quality control. At this point we have attempted to select measurement areas that are central to organizational characteristics that would change if organization-wide participative management is instituted. The results of such an assessment effort may help to determine the relationships between such a quality effort and certain aspects of the organization and lead to the development of a theoretical model and the identification of components important to the effort. Information obtained from such a structured assessment may (1) aid in the identification of conditions necessary for a broad-based, sustained change, (2) provide a framework with which to test alternate hypotheses regarding the organizational effects of implementing TQC, and (3) identify aspects of change accompanying TQC that have implications for other areas of organizational change.

## RECOMMENDATIONS

Based on preliminary results, the following recommendations are made:

1. A goal of consumer- or customer-oriented quality should be established because then the responsibility for quality cuts across department lines (as indicated in the variance control tables) rather than residing solely in one functional area. Furthermore, the establishment of such a goal puts emphasis on procedures and processes rather than inspection.
2. Based on the technical analysis that showed strong interrelationships existing between various operations, effort should be made to design variance process control procedures that involve coordinating and cooperative efforts of individuals and parties whose positions, jobs, goals, and perspectives differ.
3. It should be recognized that the objective of implementing this program is not just better product quality, but also improved operating efficiency. The majority of the variances that were defined as key were identified on the basis that they affected turnaround time, an indicator of process quality not product quality. It is recommended,

therefore, that issues addressed in a total quality effort not deal just with product quality but with improved operating efficiency as well.

4. Additional, smaller-scale technical analyses should be conducted of specific sites or subprocesses to get a finer-grained analysis in those areas for purposes of controlling those specific work processes.

5. The information about the management system should be fed back to the organization through this and future assessments in order to provide direction and effect change in areas where management functioning appears to fall short.

6. Since new practices, such as this quality effort, need to provide rewards for people involved in the effort if the new practices are to become institutionalized, it is recommended that job characteristics and impediments be assessed periodically to see if there are positive changes (e.g., removal of barriers to completing the job).

7. The organization-wide quality control effort should be developed and implemented by employees representing a variety of levels and functional areas in the organization rather than be a program created solely by management and turned over to employees to implement.

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**APPENDIX A**  
**MANAGEMENT SYSTEM**

A-0

Please write your answer in the space provided.

1. What is your code number? \_\_\_\_\_
2. What is your grade/rank? \_\_\_\_\_
3. How many people do you supervise? \_\_\_\_\_
4. How long have you worked at NARF? \_\_\_\_\_
5. How long have you worked at your present job? \_\_\_\_\_
6. Age \_\_\_\_\_
7. Sex
  - a. Male
  - b. Female
8. What is your education level? (CIRCLE the highest grade completed.)
  - a. Some high school
  - b. Some high school and technical training
  - c. High school graduate or General Educational Development (GED)
  - d. Some college or technical training beyond high school (1 to 3 years)
  - e. Graduated from college or university (B.A., B.S., or other bachelor's degree)
  - f. Some graduate school
  - g. Graduate or professional degree (please indicate) \_\_\_\_\_
9. How many more years do you plan to work before leaving or retiring from U.S. government employment? (CIRCLE your answer.)

a. Less than five years	d. 16-20
b. 6-10	e. 21 years or more
c. 11-15	

PROFILE OF ORGANIZATIONAL CHARACTERISTICS

Instructions

1. On the lines below each organizational variable (item), please place an X at the point which, in your experience, describes the organization at the present time. Treat each item as a continuous variable from the extreme at one end to the other.

Organizational variable

1. Leadership processes  
 a. Extent to which superiors have confidence and trust in subordinates

Have no confidence and trust in subordinates	Have condescending confidence and trust, such as a master has to servant	Substantial but not complete confidence and trust; still wishes to keep control of decisions	Complete confidence and trust in all matters
--	--	--	--

b. Extent to which subordinates, in turn, have confidence and trust in superiors

Have no confidence and trust in superiors	Have subservient confidence and trust, such as servant has to master	Substantial but not complete confidence and trust	Complete confidence and trust
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c. Extent to which superiors display supportive behavior toward others

Display no supportive behavior or virtually none	Display supportive behavior in condescending manner and situations only	Display supportive behavior quite generally	Display supportive behavior fully and in all situations
--	---	---	---

d. Extent to which superiors behave so that subordinates feel free to discuss important things about their jobs superior

Subordinates feel completely free to discuss things about the job with their superior	Subordinates feel rather free to discuss things about the job with their superior	Subordinates do not feel very free to discuss things about the job with their superior	Subordinates do not feel at all free to discuss things about the job with their superior
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<p>e. Extent to which immediate superior in solving job problems generally tries to get subordinates' use of them</p>	<p>Always gets ideas and opinions and always tries to make constructive use of them</p>	<p>Usually gets ideas and opinions and usually tries to make constructive use of them</p>	<p>Sometimes gets ideas and opinions of subordinates in solving job problems</p>	<p>Seldom gets ideas and opinions of subordinates in solving job problems</p>
<p>2. Character of motivational forces</p>				
<p>a. Underlying motives tapped</p>				
<p>Physical security, economic needs, and some use of the desire for status</p>	<p>Economic needs and moderate use of personal motives, e.g., desire for status, affiliation, and achievement</p>	<p>Economic needs and considerable use of personal and other major motives, e.g., desire for new experiences</p>	<p>Full use of economic, personal, and other major motives, as, for example, motivational forces arising from group goals</p>	
<p>b. Manner in which motives are used</p>				
<p>Fear, threats, punishment, and occasional rewards</p>	<p>Rewards and some actual or potential punishment</p>	<p>Rewards, occasional punishment, and some involvement</p>	<p>Economic rewards based on compensation system developed through participation and involvement in setting goals, improving methods, appraising progress</p>	
<p>c. Kinds of attitudes developed toward organization and its goals</p>				
<p>Attitudes are strongly favorable and provide powerful stimulation to behavior implementing organization's goals</p>	<p>Attitudes usually are favorable and support behavior implementing organization's goals</p>	<p>Attitudes are sometimes hostile and counter to organization's goals and are sometimes favorable to the organization's goals and support the behavior necessary to achieve them</p>	<p>Attitudes usually are hostile and counter to organization's goals</p>	

<p>d. Amount of responsibility felt by each member of organization for achieving organization's goals</p>	<p>Personnel at all levels feel real responsibility for organization's goals and behave in ways to implement them</p>	<p>Substantial proportion of personnel, especially at higher levels, feel responsibility and generally behave in ways to achieve the organization's goals</p>	<p>Managerial personnel usually feel responsibility; rank and file usually feel relatively little responsibility for achieving organization's goals</p>	<p>High levels of management feel responsibility; lower levels feel less; rank and file feel little and often welcome opportunity to behave in ways to defeat organization's goals</p>
<p>e. Attitudes toward other members of the organization</p>	<p>Favorable, cooperative attitudes throughout the organization with mutual trust and confidence</p>	<p>Cooperative, reasonably favorable attitudes toward others in organization; may be some competition between peers with resulting hostility and some condescension toward subordinates</p>	<p>Subservient attitudes toward superiors; competition for status resulting in hostility toward peers; condescension toward subordinates</p>	<p>Subservient attitudes toward superiors coupled with hostility; hostility toward peers and contempt for subordinates; distrust is widespread</p>
<p>f. Satisfaction derived</p>	<p>Relatively high satisfaction throughout the organization with regard to membership in the organization, supervision, and one's own achievements</p>	<p>Some dissatisfaction to moderately high satisfaction with regard to membership in the organization, supervision, and one's achievements</p>	<p>Dissatisfaction to moderate satisfaction with regard to membership in the organization, supervision, and one's own achievements</p>	<p>Usually dissatisfaction with membership in the organization, and with one's own achievements</p>
<p>3. Communication process</p>	<p>a. Amount of interaction aimed at achieving organization's objectives</p>	<p>Very little</p>	<p>Quite a bit</p>	<p>Much with both individuals and groups</p>

b. Direction of information flow	Downward	Mostly downward	Down and up	Down, up, and with peers
c. Downward communication (1) Where initiated	Initiated at all levels	Patterned on communication from top but with some initiative at lower levels	Primarily at top or patterned on communication from top	At top of organization or to implement top directive
(2) Extent to which superiors willingly share information with all subordinates	Provide minimum of information	Gives subordinates only information superior feels they need	Gives information needed and answers most questions	Seeks to give subordinates all relevant information they want
(3) Extent to which communications are accepted by subordinates	Generally accepted, but, if not, openly and candidly questioned	Often accepted but, if not, may or may not be openly questioned	Some accepted and some viewed with suspicion	Viewed with great suspicion
d. Upward communication (1) Adequacy of upward communication via line organization	Very little	Limited	Some	A great deal
(2) Subordinates' feeling of responsibility for initiating accurate upward communication	None at all	Relatively little, usually communicates "filtered" information and only when requested; may "yes" the boss	Some to moderate degree of responsibility to initiate accurate upward communication	Considerable responsibility felt and much initiative; group communicates all relevant information

<p>(3) Forces leading to accurate or distorted upward information</p>	<p>Virtually no forces to distort and powerful forces to communicate accurately</p>	<p>Occasional forces to distort along with many forces to communicate accurately</p>	<p>Many forces to distort; also forces for honest communication</p>	<p>Powerful forces to distort information and deceive superiors</p>
<p>(4) Accuracy of upward communication via line</p>	<p>Accurate</p>	<p>Information that boss wants to hear flows; other information may be limited or cautiously given</p>	<p>Information that boss wants to hear flows; other information is restricted and filtered</p>	<p>Tends to be inaccurate</p>
<p>(5) Need for supplementary upward communication system</p>	<p>No need for any supplementary system</p>	<p>Slight need for supplementary system; suggestion systems may be used</p>	<p>Upward communication often supplemented by suggestion system and similar devices</p>	<p>Great need to supplement upward communication by spy system, suggestion system, and similar devices</p>
<p>e. Sideward communication, its adequacy and accuracy</p>	<p>Usually poor because of competition between peers, corresponding hostility</p>	<p>Fairly poor because of competition between peers</p>	<p>Fair to good</p>	<p>Good to excellent</p>
<p>f. Closeness of superiors to subordinates (i.e., friendliness between superiors and subordinates)</p>	<p>Usually very close</p>	<p>Fairly close</p>	<p>Can be moderately close if proper roles are kept</p>	<p>Far apart</p>
<p>(1) How well does superior know and understand problems faced by subordinates?</p>	<p>Knows and understands problems of subordinates very well</p>	<p>Knows and understands problems of subordinates quite well</p>	<p>Has some knowledge and understanding of problems of subordinates</p>	<p>Has no knowledge or understanding of problems of subordinates</p>

(2) How accurate are the perceptions by superiors and subordinates of each other?	Often in error	Often in error on some points	Moderately accurate	Usually quite accurate
4. Character of interaction-influence process				
a. Amount and character of interaction	Extensive, friendly interaction with high degree of confidence and trust	Moderate interaction, often with fair amount of confidence and trust	Little interaction and usually with some condescension by superiors; fear and caution by subordinates	Little interaction and always with fear and distrust
b. Amount of cooperative teamwork present	Very substantial amount throughout the organization	A moderate amount	Relatively little	None
c. Extent to which subordinates can influence the goals, methods, and activity of their units and departments	None	Virtually none	Moderate amount	A great deal
(2) As seen by subordinates	None except through "informal organization" or via union-ization	Little except through "informal organization" or via union-ization	Moderate amount both directly and via unionization (where it exists)	Substantial amount both directly and via unionization (where it exists)

<p>d. Amount of actual influence which superiors can exercise over the goals, activity, and methods of their units and departments</p>	<p>Believed to be substantially but actually moderate unless capacity to exercise severe punishment is present</p>	<p>Moderate to somewhat more than moderate, especially for higher levels in organization</p>	<p>Substantial but often done indirectly, as, for example, by superior building effective inter-action-influence system</p>
<p>e. Extent to which an effective structure exists enabling one part of organization to exert influence upon other parts</p>	<p>Highly effective structure exists enabling exercise of influence in all directions</p>	<p>Moderately effective structure exists; influence exerted largely through vertical</p>	<p>Limited capacity exists; influence exerted largely via vertical lines and primarily downward</p>
<p>5. Character of decision-making process</p>	<p>a. At what level in organization are decisions formally made?</p>	<p>Bulk of decisions at top of organization</p>	<p>Policy at top, many decisions within prescribed framework made at lower levels but usually checked with top before action</p>
<p>b. How adequate and accurate is the information available for decision making at the place where the decisions are made?</p>	<p>Information is generally inadequate and inaccurate</p>	<p>Reasonably adequate and accurate information available</p>	<p>Decision making widely done throughout organization, although well integrated through linking process provided by overlapping groups</p>
<p></p>	<p>Information is generally inadequate and inaccurate</p>	<p>Relatively complete and accurate information available based both on measurements and efficient flow of information in organization</p>	<p></p>

c. To what extent are decision makers aware of problems, particularly those at lower levels in the organization?	Generally quite well aware of problems	Moderately aware of problems	Aware of some, unaware of others	Often are unaware or only partially aware
d. Extent to which technical and professional knowledge is used in decision making	Used only if possessed at higher levels	Much of what is available in higher and middle levels is used	Much of what is available in higher, middle, and lower levels is used	Most of what is available anywhere within the organization is used
e. Are decisions made at the best level in the organization as far as	Overlapping groups and group decision processes tend to push decisions to point where information is most adequate or to pass the relevant information to the decision-making point	Some tendency for decisions to be made at higher levels than where most adequate and accurate information exists	Decisions often made at levels appreciably higher than levels where most adequate and accurate information exists	Decisions usually made at levels appreciably higher than levels where most adequate and accurate information exists
(1) Availability of the most adequate and accurate information bearing on the decision				
(2) The motivational consequences (i.e., does the decision-making process help to create the necessary motivation in those persons who have to carry out the decision?)	Substantial contribution by decision-making processes to motivation to implement	Some contribution by decision-making to motivation to implement	Decision making contributes relatively little motivation	Decisions making contributes little or nothing to the motivation to implement the decision, usually yields adverse motivation



7. Character of control processes

a. At what hierarchical levels in organization does major or primary concern exist with regard to the reporting, monitoring activities?	At the very top only	Primarily or largely at the top	Primarily at the top but some shared feeling of responsibility felt at middle and to a lesser extent at lower levels	Concern for performance of control functions likely to be felt throughout organization
b. How accurate are the measurements and information used to guide and perform the control function, and to what extent do forces exist in the organization to distort and falsify this information	Strong pressures to obtain complete and accurate information to guide own behavior and behavior of own and related work groups; hence information and measurements tend to be complete and accurate	Some pressure to protect self and colleagues and hence some presures to distort; information is only moderately complete and contains some inaccuracies	Fairly strong forces exist to distort and falsify; hence measurements and information are often incomplete and inaccurate	Very strong forces exist to distort and falsify; as a consequence, measurements and information are usually incomplete and often inaccurate
c. Extent to which the review and control functions are concentrated	Highly concentrated in top management	Relatively highly concentrated, with some delegated control to middle and lower levels	Moderate downward delegation of review and control processes; lower as well as higher levels perform these tasks	Review and control done at all levels with lower units at times imposing more vigorous reviews and tighter controls than top management

<p>d. Extent to which there is an informal organization present and supporting or opposing goals of formal organization</p>	<p>Informal organization present and opposing goals of formal organization</p>	<p>Informal organization partially resisting goals</p>	<p>Informal organization may either support or partially resist goals of formal organization</p>	<p>Informal and formal organization are one and the same; hence all social forces support efforts to achieve organization's goals</p>
<p>e. Extent to which control data (e.g., accounting, productivity, cost, etc.) are used for self-guidance or group problem solving by managers and non-supervisory employees, or used by superiors in a punitive, policing manner</p>	<p>Used for policing and in punishing manner</p>	<p>Used for policing coupled with reward and punishment, sometimes punitively; used somewhat for guidance but in accord with orders</p>	<p>Used for policing with emphasis usually on reward but with some punishment; used for guidance in accord with orders; some use also for self-guidance</p>	<p>Used for self-guidance and for coordinated problem solving and guidance; not used punitively</p>
<p>8. Performance goals and training</p>	<p>a. Level of performance goals which superiors seek to have organization achieve</p>	<p>Seek to achieve extremely high goals</p>	<p>Seek very high goals</p>	<p>Seek average goals</p>
<p>b. Extent to which you have been given the kind of management training you desire</p>	<p>Have received no management training of kind I desire</p>	<p>Have received some management training of kind I desire</p>	<p>Have received quite a bit of management training of kind I desire</p>	<p>Have received a great deal of management training of kind I desire</p>
<p>c. Adequacy of training resources provided to assist you in training your subordinates</p>	<p>Training resources provided are excellent</p>	<p>Training resources provided are very good</p>	<p>Training resources provided are good</p>	<p>Training resources provided are only fairly good</p>

**APPENDIX B**  
**JOB DIMENSIONS QUESTIONNAIRE**

Please write your answer in the space provided.

1. What is your code number? \_\_\_\_\_
2. What is your grade (e.g. WG-9)? \_\_\_\_\_
3. How long have you worked at the NARF? \_\_\_\_\_
4. How long have you worked at your present job? \_\_\_\_\_
5. Age? \_\_\_\_\_

CIRCLE the letter next to your answer.

6. Sex
  - A. Male
  - B. Female
7. What is your education level? (CIRCLE the highest grade completed.)
  - A. Some high school
  - B. Some high school and technical training
  - C. High school graduate or General Educational Development (GED)
  - D. Some college or technical training beyond high school (1 to 3 years)
  - E. Graduated from college or university (B.A., B.S., or other bachelor's degree)
  - F. Some graduate school
  - G. Graduate or professional degree (please indicate) \_\_\_\_\_
6. How many more years do you plan to work before leaving or retiring from U.S. government employment?

A. Less than five years	D. 16-20
B. 6-10	E. 21 years or more
C. 11-15	
9. Are you presently involved in or have you in the last six months been involved in any of the following programs?
  - A. A Quality Circle
  - B. A Pride Team
  - C. Other (please indicate) \_\_\_\_\_

JOB IMPEDIMENTS

There may be certain things that occur at work to keep you from doing the best job possible. Please indicate the extent to which each statement keeps you from doing your best work by writing a number in the blank beside each statement using the following scale.

	1	2	3	4	5	6	7	8
	VERY LITTLE						A GREAT DEAL	DOES NOT APPLY
___ 1.								
___ 2.								
___ 3.								
___ 4.								
___ 5.								
___ 6.								
___ 7.								
___ 8.								
___ 9.								
___ 10.								
___ 11.								
___ 12.								
___ 13.								
___ 14.								
___ 15.								
___ 16.								
___ 17.								
___ 18.								

1	2	3	4	5	6	7	8
VERY LITTLE						A GREAT DEAL	DOES NOT APPLY

- \_\_\_ 19. Disciplinary standards inconsistent between supervisors.
- \_\_\_ 20. Waiting for proper instructions.
- \_\_\_ 21. Having to overlook or disregard regulations to get the job done.
- \_\_\_ 22. Workmanship of incoming units inadequate or of poor quality.
- \_\_\_ 23. Supplies from vendors inadequate or of poor quality.
- \_\_\_ 24. Supervisors not listening to problems or suggestions in order to improve process.
- \_\_\_ 25. Fear of reporting problems, defects.
- \_\_\_ 26. Not enough time to do what is expected during an 8-hour shift.

## JOB CHARACTERISTICS

Listed below are some questions about a variety of areas relating to your job. Write a number in the blank beside each question that best describes your job using the following scale.

### Section 1

	1	2	3	4	5	6	7
	VERY MUCH			UNCERTAIN			VERY LITTLE
_____ 1.	To what extent does your job require you to work closely with other codes or people in related jobs at the NARF?						
_____ 2.	To what extent does your job permit you to decide on your own how to do your job?						
_____ 3.	To what extent does your job involve doing a "whole" and identifiable piece of work? Does the job have an obvious beginning and end? Or is it only a small part of the overall piece of work, which is finished by other people or automatic machines?						
_____ 4.	How much variety is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?						
_____ 5.	In general, how important is your job? That is, are the results of your work likely to strongly affect the lives or well-being of other people?						
_____ 6.	To what extent do your supervisors or co-workers let you know how well you are doing on your job?						
_____ 7.	To what extent does doing the job itself provide you with information about your work performance? That is, does the actual work itself provide information about how well you are doing--aside from any "feedback" co-workers or supervisors may provide?						

Section 2

Please use this scale to answer the following questions.

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1	2	3	4	5	6	7
VERY ACCURATE			UNCERTAIN			VERY INACCURATE

---

- \_\_\_ 8. The job requires me to use a number of high-level skills.
- \_\_\_ 9. The job requires a lot of coordination with other people.
- \_\_\_ 10. The job is arranged so that I do not have a chance to do an entire piece of work from beginning to end.
- \_\_\_ 11. Just doing the work required by the job provides many chances for me to figure out how well I am doing.
- \_\_\_ 12. The job is quite simple and repetitive.
- \_\_\_ 13. The job can be done adequately by a person working alone--without talking or checking with other people.
- \_\_\_ 14. The supervisor and co-workers on this job almost never give me any "feedback" about how well I am doing.
- \_\_\_ 15. This job is one where a lot of other people can be affected by how well the work gets done.
- \_\_\_ 16. The job denies me any chance to use my personal initiative or judgement in carrying out the work.
- \_\_\_ 17. Supervisors often let me know how well I am performing my job.
- \_\_\_ 18. The job provides me the chance to completely finish the work I begin.
- \_\_\_ 19. The job itself provides very little information about whether or not I am performing well.
- \_\_\_ 20. The job gives me considerable opportunity for freedom in how I do the work.
- \_\_\_ 21. The job itself is not very significant or important in the broader scheme of things.

JOB SATISFACTION

Below are some questions about how satisfied you are with your job. Write a number indicating your level of satisfaction in the blank beside each statement using the following scale:

---

1	2	3	4	5	6	7
VERY SATISFIED			NEITHER SATISFIED NOR DISSATISFIED			VERY DISSATISFIED

---

- \_\_\_ 1. How satisfied are you with the people you work with?
- \_\_\_ 2. How satisfied are you with the opportunity to develop your skills and abilities?
- \_\_\_ 3. How satisfied are you with the recognition you get for doing a good job?
- \_\_\_ 4. How satisfied are you with seeing the results of your work?
- \_\_\_ 5. How satisfied are you with this organization, compared to most others?
- \_\_\_ 6. How satisfied are you with your job?
- \_\_\_ 7. How satisfied are you with your immediate supervisor?
- \_\_\_ 8. How satisfied are you with the way you are evaluated on the job?

COMMITMENT

Listed below are a series of statements that represent possible feelings that individuals might have about the company or organization for which they work. With respect to your own feelings about NARF North Island, please indicate the extent of your agreement or disagreement with each statement by writing a number in the blank beside each statement using the following scale.

	1	2	3	4	5	6	7
	STRONGLY AGREE			NEITHER AGREE NOR DISAGREE			STRONGLY DISAGREE
_____	1.	I talk up the NARF to my friends as a great organization to work for.					
_____	2.	I find that my values and the NARF's values are very similar.					
_____	3.	I am proud to tell others that I am part of this organization indefinitely.					
_____	4.	I am extremely glad that I chose this organization to work for over others.					
_____	5.	There's not too much to be gained by sticking with this organization to work for over others.					
_____	6.	For me this is the best of all possible organizations for which to work.					
_____	7.	Deciding to work for the NARF was a definite mistake on my part.					
_____	8.	My job is very important compared to other interests in my life.					
_____	9.	If I had the chance, I would take a different job within this organization.					
_____	10.	I would like to look for a new job in the next year.					

JOB CONCERNS

Please use the following scale to indicate the extent to which you agree or disagree with each statement. Write the appropriate number in the blank beside each statement.

1	2	3	4	5
STRONGLY AGREE		NEITHER AGREE NOR DISAGREE		STRONGLY DISAGREE
___				
___				
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### JOB INVOLVEMENT

The statements below concern how involved you may be with your job. Use the scale below to indicate how much you agree or disagree with each statement by writing the appropriate number in the blank beside each statement.

	1	2	3	4	5
	STRONGLY AGREE		NEITHER AGREE NOR DISAGREE		STRONGLY DISAGREE
_____ 1.					
_____ 2.					
_____ 3.					
_____ 4.					
_____ 5.					
_____ 6.					
_____ 7.					
_____ 8.					
_____ 9.					
_____ 10.					
_____ 11.					
_____ 12.					
_____ 13.					
_____ 14.					
_____ 15.					

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