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Issues Related to Effects of New Maintenance Concept on AF Specialists Working in the Field

Working Paper

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Preface

This working paper was prepared by the Transportation Systems Center, Operator performance and Safety Analysis Division (DTS-45) for the Federal Aviation Administration. The paper provides initial thinking on groups of human resource issues related to the effects of the new maintenance concept of AF specialists working in the field.

In addition to identifying issues, this working paper proposes tentative approaches to solving problems associated with these issues. Clearly the focus of these issues is on AF specialists themselves, and hence only indirectly on the AF organization. As well, these issues are not concerned with the systems, facilities, or equipment of NAS involved in the new maintenance concept. Issues are identified which have the potential to affect the performance and productivity of AF specialists working in the field and hence the overall efficiency of the new maintenance concept.

Additional work is planned to turn this working paper into a formal proposal for comprehensive study of the human resource issues identified which affect AF specialists working in the field.

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1.0 Introduction

This working paper represents initial thinking on groups of issues related to effects of the new maintenance concept on AF specialists working in the field.

Upcoming changes in the systems, facilities, and equipment of the National Airspace System (NAS) require a new maintenance concept to achieve the full potential of the advanced technology. The three-phased implementation of the new maintenance concept in the form of centralized Maintenance Control Centers (MCC) will result in improved user services at less cost and greater productivity. The implementation will begin in 1990 and continue through the year 2000.

In the end-state, an information flow process will be established to provide a clear monitoring of the status of NAS systems, facilities, and equipment. In one such flow, information will be relayed digitally from the Remote Maintenance Monitoring System (RMMS) over the Telecommunications Network (TCN) to the Maintenance Processor Subsystems (MPS) at a particular sector's MCC. Monitor and Control Software (MCS) resident in the MPS will alert Air Facilities (AF) specialists at the MCC to conditions that have gone out of tolerance.

- What happens then

Such information flows, which monitor and control an underlying continuous flow of technologically generated user services, will present a number of challenges to the AF organization. Key among these challenges will be the changes in the way AF specialists work. As the end-state, new maintenance concept is achieved, AF specialists will experience substantial changes in the technical, operational, and cultural components of their working environment. In essence, many will be transformed from remote work-center based, hardware-oriented technicians to MCC centrally located systems specialists whose work flow is determined by the quality, reliability and performance of technology. This transformation will enhance the role of AF specialists because new skills and challenges will be required as emphasis is directed toward overall system integrity.

It is of the utmost importance that these adjustments occur with minimum disruption to all AF specialists whether working in a MCC or in the field so that the full potential

of the end-state, new maintenance concept can be quickly realized. The culture of 'pride-of-ownership' inherent in the old concept of maintenance must be preserved in the new way. As well, AF specialists must be appropriately selected or fitted to specific differences that exist among working environments. Situations which may cause stress among AF specialists must be addressed by the AF organization. As well, a new skill mix among AF specialists must be established and retained.

The transition to the end-state, new maintenance concept will also bring about changes in the AF organization that supplies support to the AF specialists, particularly in the areas of training, recruitment, and worker retention. Training will be undertaken to develop and preserve the new skill mix. This training will combine the traditional classroom setting as well as with computer based training (CBT). Both types of instruction will require new allocations of resources on the part of the AF organization. Training is recognized as being important to give AF specialists the understanding and confidence necessary to deal with complex situations which may occasionally occur under stressful conditions.

1.1 Purpose

The purpose of this working paper is to suggest specific clusters or groups of issues involved in helping AF specialists working in the field make a successful adjustment to the end-state, new maintenance concept with a minimum of disruption and stress. As importantly as identifying issues, this working paper proposes tentative approaches to solving problems associated with these issues. Clearly the focus of these issues is on AF specialists themselves, and hence only indirectly on the AF organization. As well, these issues are not concerned with the systems, facilities, or equipment of NAS involved in the new maintenance concept. Issues are identified which have the potential to affect the performance and productivity of AF specialists working in the field and hence the overall efficiency of the new maintenance concept. Some of the clusters of issues addressed are:

- maintaining a stable work force
- new job descriptions
- selection of AF specialists
- recruitment of AF specialists
- training program development
- career development
- minimizing transitional stress
- use of contract maintenance workers
- performance evaluation

Methods for determining the extent of concern, as well as methodologies for alleviating potential problems, are also discussed. However, no specific solutions are suggested for these human resource and organization issues.

At least two benefits to be realized from the new maintenance concept make it imperative to consider such human resource and organization issues: (1) overall AF specialists work force levels required to maintain NAS will be reduced in the year 2000 to two-thirds of the 1980 level [1]; and (2) the total cost of field operations will be maintained at an inflation-adjusted 1980 level net of capital investment for modernization [1]. The potential rapid attrition of AF specialists that might occur because of the age and length of service of the AF work force also makes it important to consider these issues. By the year 2000, half of the work force will have met current requirements for retirement eligibility. Many new workers will have to be trained in the use of the new maintenance technology. Hence, it is important to minimize the technical, operational, and cultural impacts of the end-state, new maintenance concept.

Running through the nine groups of issues are a number of common themes which appear to be critical factors to the human resource side of the new maintenance concept:

- the importance of the pride-of-ownership concept in determining the motivation and skill attainment of AF specialists;

- the importance of forming a conception of the desirable characteristics that an AF specialist should possess at various stages in the career path; and

- the importance of training.

1.2 Approach

The following sections present issues which may be important in the redefined job procedures of AF specialists working in the field. After a discussion of a particular group of issues, approaches for further study are mentioned.

2.0 Maintaining a Stable Work Force

In many ways this issue is central to the success of the new maintenance concept. For the past thirty years AF specialists have experienced a great deal of stability in their work situation. If the AF organization can continue to maintain a stable, satisfied work force then the likelihood of providing continued superior AF facility performance is practically assured. At least the personnel aspects of the AF system would be operating smoothly. Clearly, this is not a simple task. All the problems discussed in the sections below apply to the solution.

There are several standard components of maintaining a stable work force, regardless of the specific nature of the job. They include the following:

- Assuring a clear and complete understanding of job requirements and responsibilities;
- Providing a management system that both recognizes and rewards outstanding performance in an equitable manner;
- Providing appropriately challenging work and job responsibility with just the right amount of work flow so that high levels of boredom or stress do not develop;
- Paying employees an adequate and competitive salary;
- Assuring employees of support (in all aspects of employment); and
- Providing for job enhancement and advancement.

2.1 Method

The AF organization must give emphasis to providing human resource management to AF specialists. Consideration should be given to the degree to which employee participation groups will allow AF specialists to determine how the work tasks produced by the new technology will be accomplished. Also it will be important to examine the role of unions representing AF specialists in developing recommendations for changes in working procedures. Clearly for major issues affecting AF specialists, the participation of unions is a necessity.

3.0 New Job Descriptions

It is recognized that under the new maintenance concept, AF specialists whether working in the field or the MCC will continue to be the most important asset. In order to keep the required skill balance and provide motivation to AF specialists, it is necessary to establish an orderly career path based on accomplishments of work and training. There will be four principal job levels in the career path of the AF specialists: (1) pre-development; (2) development; (3) system-level; and (4) advanced. It will be necessary to carefully determine the content of each of the job levels. The functional responsibilities of these job levels must be balanced in such a manner as to allow for the efficient assignment of AF specialists to new maintenance demand conditions. Some of the functional content of job levels must overlap to allow one level to be substituted for another under certain prescribed conditions. At other times, it will be necessary for the functional capabilities of the job levels be complementary. What a higher level can do, the lower level cannot. As such, a maintenance problem is solved with a minimum of redundancy of skills and cost efficiencies. The constraint of cost efficiency under the new maintenance concept is strong. The work force levels of AF specialists required to maintain NAS will be reduced in the year 2000 to two-thirds of the 1980 level. The total cost of field operations will be maintained at an inflation-adjusted 1980 level net of capital investment for modernization. Hence, the distribution of functional skills among job levels must be efficient.

3.1 Method

In order to establish the functional content of these job levels, there are three basic steps that should be undertaken. First, a functional description of the current jobs performed by AF specialists must be developed for each of the facility types. This description must then be evaluated against the new systems in order to establish (1) which tasks will still be required; (2) which will be required, but in a modified way; and (3) which new tasks will be required under the new system. The functional analyses may have to incorporate regional/environmental differences.

Second, depending on the job requirements, a grade structure must be established within the four general categories of AF specialists. Third, the task requirements, which will include training — discussed below — must be matched to the grade structure to establish job descriptions for each level.

The certification process will determine eligibility for the various job levels and possibly grades within levels. Certification will also continue to provide the method of instilling the pride of ownership in AF specialists. Pride of ownership is recognized as being so extremely important in achieving productivity.

4.0 Selection of AF Specialists

In order to assure that the most suitable AF specialist trainees are selected for the new functional tasks associated with AF maintenance, a new requirements/test selection system will have to be developed. The skills associated with a remotely monitored solid state system of AF will be different than those currently required by AF specialists. The new maintenance concept will require that individuals have the abilities to become experts in particular facility maintenance and trouble shooting. These individuals will generally be of two types suitable for different career tracts: (1) those who will be satisfied remaining as specialists (probably with a lower grade ceiling than now exists); and (2) those who wish to move through the career ladder and become MCC or TSO staff.

In selecting prospective AF specialists, the most beneficial approach would probably be to select those with career development goals. This will assure that adequate numbers of qualified and motivated men and women will be available to eventually staff the MCC's and TSO's. There will most likely be a few Sector Field Office jobs available for individuals who do not wish to move to MCC or TSO positions. However, both the job and the people selected for training into the various AF specialist jobs should be such that they will find the jobs at least as satisfying and rewarding as in the past.

4.1 Method

Appropriate screening tools for the recruitment of AF specialists need to be developed. There is, as mentioned above, potential for an increased attrition rate in the 1990's because of the age/service distribution of the AF work force. Such potential makes the development of these screening tools all the more important. Some pulling together of the ideas about the characteristics which successful AF specialists have possessed in the past would be useful. To the degree that certain functional tasks remain the same, these characteristics should be integrated with the new functional requirements of AF specialists into a generalized profile of what the ideal pre-development candidate might be like. The generalized 'profile' should also be expanded to include specific contingent characteristics that reflect different work environments among work centers. For instance, temperament and personal preferences may differ among AF specialists working in urban vs. rural work center settings. Hiring practices should be based on recognition of these generalized and specific characteristics that make for productive AF specialists in order to maximize the probability of assembling an incoming work force that can fulfill the need for an orderly progression along the AF specialist's career path.

Also, the experience that the military and large institutions have had in developing profiles and adjusting these profiles to specific conditions should be examined.

5.0 Recruitment of AF Specialists

The recruitment of AF specialists, at the pre-development level, becomes especially important because during the final phases of the end-state, new maintenance concept because there is potential for rapid attrition of experienced AF specialists resulting from their age\length of service distribution. By the year 2000, half of the work force will have met current requirements for retirement eligibility. Thus, many new workers may have to be recruited based on efficient selection criteria developed with the considerations mentioned above. Obviously, the recruitment should take place at locations likely to yield efficient results.

5.1 Method

The AF organization should investigate making pipeline relationships with vocational schools and colleges in areas where the local labor market has conditions favorable to recruitment of desirable pre-development AF specialists. Consideration, also, should be given to integrating further back into the educational pipeline by sponsoring and promoting educational programs at the high school level. In making these relationships, the AF organization should identify educational institutions which are in labor markets which are competitive with the AF wage rates. Emphasis should also be given to the extent to which the military can continue to serve as a source of new AF specialists.

Careful thought should be given to the substance of the recruitment campaign. Messages must be developed which address the needs of the types of people the AF organization wishes to select in its recruitment.

6.0 Training Program Development

Training requirements must be developed on two levels: (1) training for new recruits; and (2) retraining for current AF specialists. Also, training programs must be developed for each of the four principal job levels of AF specialists and for the various grades within each job level.

Within the overall training program, work must be coordinated with the Academy in Oklahoma City to determine which aspects of training will be accomplished at the Academy facility and which aspects will be developed for remote computer based training (CBT). The ultimate curriculum development for these programs will be the responsibility of the Academy.

6.1 Method

Very careful consideration must be given to the demand that the new maintenance concept will place on AF organizational training resources. New additions to training capacity must be understood in terms of the lead times necessary to develop programs lest bottlenecks develop. CBT programs must be developed and tested for effectiveness in meeting the stated need. Also, an investigation into the reaction of AF specialists to CBT should be done.

7.0 Career Development

This issue is not separate in and of itself, but is contained in several of the other issues. However, it is an issue which must be addressed separately. The success of the new maintenance concept depends critically on the AF specialists. In order to keep AF specialists motivated, there must be a clear exposition of potential career development within the AF organization. Crucially, there must be an understanding of the potential to be equitably rewarded for job performance and educational investment on the part of AF specialists. This understanding must include not only advancement within the classification of AF specialists but also methods for advancing into the MCC or TSO organization.

7.1 Method

Detailed consideration must be given to quantifying the career paths of AF specialists under the new maintenance concept. An indication of what the expectation and timing of career advancement is for a new recruit in the pre-development level. This expectation and timing, along with wage rates and benefits, should be compared to similar

career fields against which the AF organization must compete to retain and recruit AF specialists.

8.0 Minimizing Transitional Stress

The three-phased implementation of the new maintenance concept will raise questions among existing AF specialists about future job security, working conditions, required training, relocation, work shift hours, etc. AF specialists may experience doubt and anxiety about what the future holds. This doubt has the potential to degrade performance and increase attrition rates.

Clearly the force affecting the change is the adoption of new technology. The new technology requires that the AF organization structure also change and that AF specialists change as well. The end-state technology will require AF specialists to let go of some old values, attitudes, and behaviors. This 'unfreezing' must occur so AF specialists can be receptive to new operational procedures which will encompass the adoption of new values, attitudes, and behaviors. Undoubtedly resistance will be encountered at various points in the implementation process.

8.1 Method

The implementation of the new maintenance concept will require that the human resource aspects of the transition be managed. It will become important to discover the exact nature of any resistance. Such discovery may be achieved by surveying or the formation of employee discussion groups. The Employee Involvement Program might be used as a vehicle for addressing the concerns that may produce stress among AF specialists.

An understanding of similar technological transitions in the military or private industry should be undertaken with emphasis given to the discovery of critical success factors. Such an understanding will allow the AF organization to start out on a lower part of the learning curve.

9.0 Use of Contract Maintenance

Under the new maintenance concept, not only will the role of AF specialists change, but so too will the use of private contractors for maintenance – particularly equipment maintenance. Heretofore, contract maintenance was ancillary in nature. Now private contractors will work on some of the equipment of the NAS system at least for the immediate period after installation of the new equipment. These contractors will be restricted to working on specific pieces of equipment and it has been assumed that such effort will not impinge on the functions of AF specialists. Unquestionably these private contract maintenance agreements will help achieve the goals of increased productivity of the new maintenance concept. Thought is being given to in the future increasing the number of private contractors performing maintenance.

Contract maintenance

9.1 Method

The use of contractors should be closely monitored for any negative effect on the performance of AF specialists. As was discussed under the issues affecting new job descriptions, functional analysis could be used to determine the work content responsibilities of each job level and even grades within job levels. Done at the very beginning of implementation of the new maintenance concept, the functional requirements could serve as a bench mark to determine if private contractors are assuming, or affecting, roles traditionally performed by AF specialists.

Who will be doing the work?

10.0 Performance Evaluation

At every stage in the three-phased implementation, the performance of AF specialists in making the transition to the end-state maintenance concept should be analyzed. Constant feedback can be used to make sure the transition is as smooth as possible.

10.1 Method

Automatic-MCC reporting functions may serve as a basis for determining how well certain functional responsibilities of AF specialists are being performed. This information, and other sources of information, should be analyzed periodically.

1. need much of reports
b/c of interfaces
only resp time to report
+ resp time to report
but not of control

Conclusion

In this initial exposition, a number of groups of issues have been identified that are important to the human resource aspects of the new maintenance concept. While approaches for further study of these issues have been given, no solution for potential problems relating to these issues has been given.

The next step is to gain consensus on which groups of issues are important for further definition and analyses.

Shortly, analysts from the Transportation Systems Center, Cambridge, MA, will be making site visits to those work centers and MCC which are furthest along in achieving the end-state new maintenance concept.

After the focus is directed to the most relevant issues, and upon completion of site visits, a more formal proposal will be undertaken.

The Transportation Systems Center will use its internal resources in undertaking the formal proposal as well as the services of capable consultants procured through OMNI contracting arrangements.

References

- [1] "Concept for Maintenance of the National Airspace System," Robert O. Phillips, Transportation Systems Center, September 1989, Working Paper (Draft).