VALUE MANAGEMENT APPLIED TO ORGANIZATIONAL EFFECTIVENESS.

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ABSTRACT:

This paper describes a Value Management (VM) case study conducted in a service industry and details the innovative techniques developed and used in the construction of the "Function Analysis System Technique (FAST)" diagram and the application of "Sensitivity Analysis (SA)" to it. The focal point of the case study being the organizational structure of the Equipment (rolling stock) Maintenance department (EM) and specifically how should effective "Technical Support" (TS) be provided in the maintenance of equipment?

INTRODUCTION:

Passenger rail service in Canada is provided by VIA, a federal Crown Corporation. Rail services are provided on a transcontinental and inter-city basis; additionally, VIA is mandated to provide service to remote areas of Canada that have no other means of public transportation. In common with most, if not all industrialized nations, passenger rail transportation is subsidized by government funding.

During 1989 the government, targeted VIA for a reduction in funding but with the constraint of maintaining a national passenger network. In response to the government's directive, a "revised train services network" was developed which maintained a national passenger network withreduced frequencies and retained services to remote areas. Most regional services were cancelled. The level of funding for the years 1990 through 1992 was progressively reduced, and a new base reference level of funding for 1993 and beyond was established.

The project selected by the EM VM Steering Committee(SC), to assist in meeting corporate objectives was an organizational one. The perceived problem was that TS as a resource within EM was too large and fragmented.

I participated as a facilitator in the case study and believe that the paper should serve as a guide for other practitioners in the application of VM to similar problems of organizational effectiveness. The paper demonstrates the applicability of VM to a service-related industry, consistent with the following definition of VM, as "an organized effort directed at analyzing the functions of goods or services to achieve those functions and essential characteristics in the most cost effective manner". This is the basic fundamental principle that all practitioners should strive to attain.

INITIATION OF THE PROJECT:

The Opportunity:

The briefing given by the management SC to the VM facilitation team, identified the following symptoms of a problem.

- It was thought that TS was provided by approximately 70 persons; that this was too many and that a reduction was desirable;
- There was a need for clarification of roles and greater accountability within the organization and structure of TS;
- There was duplication of effort and that it was desirable to eliminate it to improve both productivity and accountability;

In summary, the management SC objective was identified as a need to "achieve an improvement in the organizational effectiveness and role of TS within EM".

PREPARATION AND PLANNING:

Define "Technical Support":

The first task undertaken by the VM facilitation team was to obtain a copy of EM's organization structure to determine who in the organization constituted and contributed to providing TS in the maintenance of equipment.

To accomplish this task, a loose definition for TS was established as "those persons in the organization who contributed to or provided technical advice or data, irrespective of format or group within the organization". Once this definition had been established, copies of the corresponding position descriptions were obtained to review and confirm each position's contribution to TS.

This task identified 89 TS positions in lieu of the 70 commonly thought to exist. Also, the review of position descriptions indicated duplications in defined roles and responsibilities and hence the various group elements within the organization. Fig.#1 indicates the group elements of TS that existed.

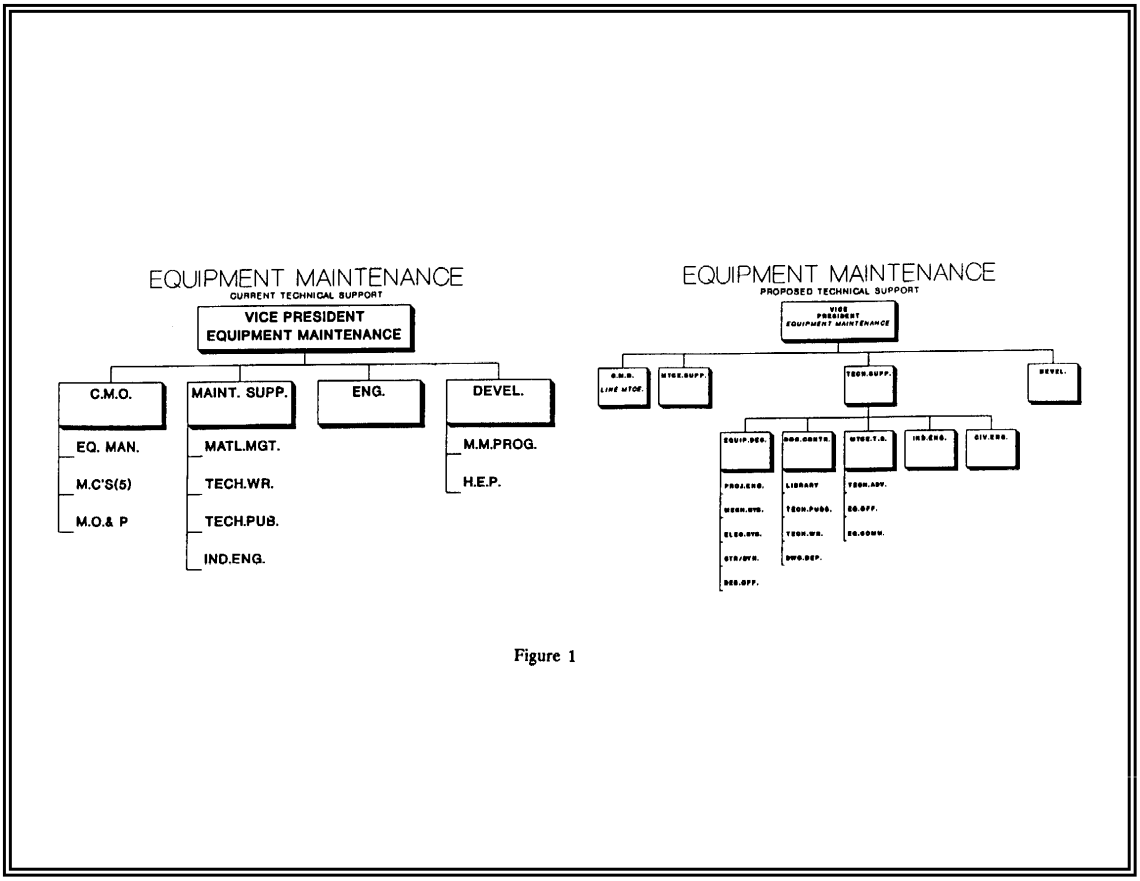

Figure 1

Conduct Survey:

A series of questions were developed to gather information supplementary to that obtained from the position descriptions. The questions were structured to measure how TS personnel felt they performed their responsibilities relative to their position descriptions. The specific informationrequested was:

- List all the tasks that you believe it is your responsibility to perform, for which you are held accountable. Give a percentage of time for each.
- List all the tasks you consider part of your responsibility to perform but are not included in your position description. Give a percentage of time for each.
- What tasks are you performing as part of your position responsibilities that you feel you should not be responsible or held accountable for? Give a percentage of time for each.
- What tasks are you not currently performing that you would like to or feel should form part of your position responsibilities? Give a percentage of time for each.

Fig.#2A illustrates the results obtained and clearly indicates that respondents believed that their position descriptions reflected the responsibilities that they should be held accountable for.

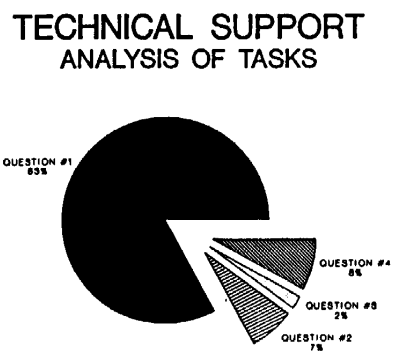

Figure 2 A

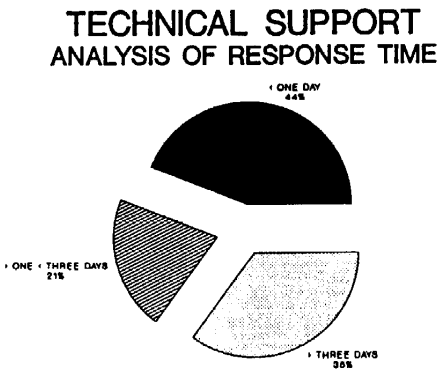

Figure 2 B

A further question, developed to measure the TS personnel's understanding of "internal customer" for the services they provided, was:

- Who do you perceive is the internal customer for the services of TS that you or your group provide?

Fig.#3 shows three categories of "internal customer" identified by respondents. These categories were:

- Department Interface
- Corporate Interface
- Maintenance of Equipment

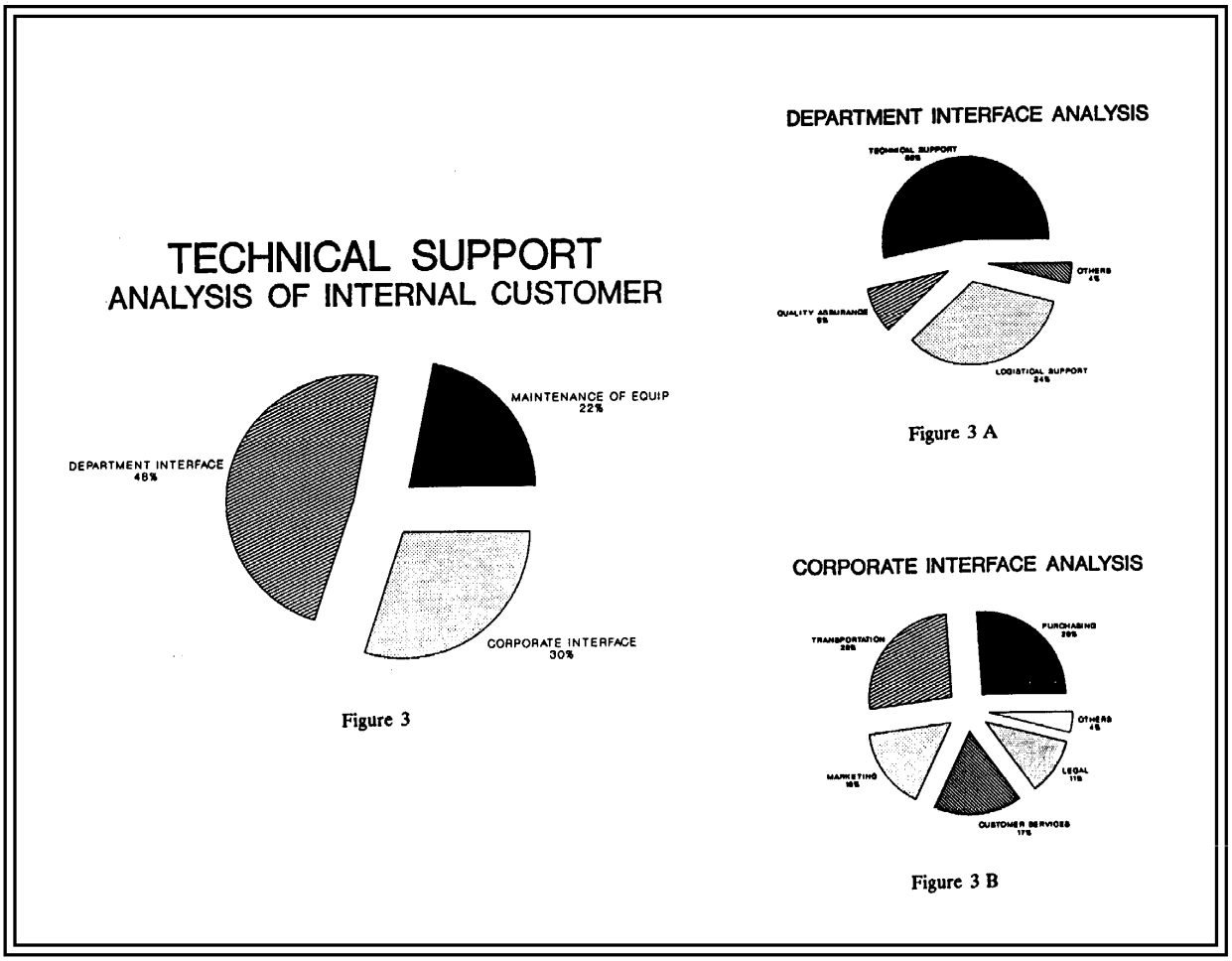

Figure 3

Figure 3 A

Figure 3 B

Figs.#3A & #3B further illustrate results obtained.

A final question posed related to the time taken to produce an answer to a technical problem in the maintenance of equipment. The question asked:

- How long does it take to provide a satisfactory answer to a technical question asked of you? i.e. same day, one to three days, more than three days.

Fig.#2B illustrates typical response times.

Other Passenger Railroads:

Additionally, the VM facilitation team, sought information from other national passenger railroads in respect of their organizations in general and specifically equipment maintenance and the provision of TS. Fig.#4 provides a comparative analysis of the data obtained.

Site Visit:

As further background preparation, the facilitation team

OTHER PASSENGER RAILROADS

COMPARATIVE ANALYSIS – PHYSICAL CHARACTERISTICS

RAILWAY COMPANY	EQUIPMENT OPERATED (NO OF ITEMS)	EQUIPMENT CLASSES (NO OF)	MAINTENANCE CENTRES SUPPORTED	TECHNICAL SUPPORT PERSONNEL (NO OF)	RATIO PERSONNEL/ EQUIPMENT	RAILROAD OPERATING SPEED (MPH)
RAILROAD #1	2000	6	2	54	0.027	<150
RAILROAD #2	6120	4	5	290	0.047	<150
RAILROAD #3	738	2	1	132	0.179	>150
RAILROAD #4	600	4	5	89	0.148	<150

visited two of the five maintenance centers to observe operations first-hand. These visits afforded the opportunity to observe TS in action and also the opportunity to obtain maintenance staff opinions as to the effectiveness of TS.

Team Selection:

The final stage of the initial planning was the selection of the team to participate in the project. This is a key element to the success of any VM study. Two factors were considered:

- "The problem or opportunity determines the talent mix needed for it's resolution".[1]
- "The selection of people (team participants) to represent that talent and proficiency should be compatible with the results expected".[2]

Considering the foregoing and the perceived problem outlined by the Steering Committee, a representative team capable of contributing to the resolution of the problem was selected. These same persons would be directly affected by any proposals approved and implemented as a result of the project.

THE INFORMATION PHASE:

Team Briefing:

The selected team was briefed by a member of the SC with respect to the committee's perception of the problem and the objectives set for the team to reach. The team was also given an information package for their review comprising:

- The existing organization structure (Fig.#1).
- The analysis of the survey conducted (Fig's.#2 & #3).
- The comparative analysis of other passenger railroads (Fig.#4).

Defining the Problem:

The team was then asked to define the problem in terms of three questions posed by the facilitation team. Below are the questions and the team's responses.

- What is the problem we are about to discuss? [3]

  To clearly define effective maintenance technical support functions, which provide efficient, consistent and accountable support; responsible to it's clients, measured by equipment performance and in conformance with the objectives of the corporate business plan.

- Why do you think this is a problem? [4]

  Because roles, responsibilities and accountability are not clearly defined or perceived.

- Why do you believe a solution is necessary?[5]

  Ineffective and inefficient use of technical support resources will not succeed in building a team with mutual respect; consequently failure to meet business plan objectives would result.

The team's defined problem seem's to directly contradict the results of the survey conducted (Figs.#2 & #3). As may be seen, there was no indication that roles, responsibilities oraccountabilities were not clearly perceived and understood by TS personnel. But the team which included both providers and users of TS clearly identified a problem pertaining to roles, responsibilities and accountability.

Goals:

The team set the following goals:

- To clearly define the roles and responsibilities of TS in the maintenance of equipment;
- To create an organization to support the recommended solutions;
- To develop an implementation plan for the recommended solutions;
- To obtain a team commitment to the proposed solutions and to those implemented.

Function Analysis System Technique "FAST":

The team initially used the technique of Random Function Analysis to determine functions of TS and maintenance of equipment. By asking how and why dependant functions to be considered in the construction of the "FAST" diagram were identified. "FAST" had been selected as the most appropriate "method of displaying all subject-orientated functions in an organized manner so that their relationship and relative importance are understood".[6]

It was decided to construct five "FAST" diagrams each of which was an essential element to the end product (contribution) that EM made to the business of the corporation. The five elements, all of which were perceived as requiring TS interaction were:

- How does a Maintenance Center perform maintenance of equipment?
- How do we prepare a business plan?
- How do we perform major overhauls and repairs?
- How do we modify equipment?
- How do we conduct "Root Cause Analysis"?

The resultant "FAST" diagrams were tested for intuitive logic and function dependency; by asking how and then why. Then the five "FAST" diagrams were combined into a single diagram representative of necessary functions essential to maintenance of equipment.

Sensitivity Analysis:

"FAST" diagrams are typically produced without dimension, "SA", is a technique that dimensions the functions of a "FAST" diagram considering value criteria (eg. costs, time, responsibility, decisions, etc.) and indicates the sensitivity of functions to a selected value criteria. In the context of an organizational structure or of organizational effectiveness it allows determination of relative participation or contribution in the achievement of functions by departments, groups, sections, etc. Through examination and discussion of these function interactions, "ultimate" or "secondary" responsibility for the achievement of functions can be determined.

It was considered important to fully understand the functions identified on the "FAST" diagram in relation to the current perceived responsibilities. To achieve this it was decided to apply "SA" to the "FAST" diagram, producing two matrices to consider:

- How do we function now and who has responsibilities?
- How should we function and who should have responsibilities?

The "SA" technique was enhanced and applied to both the critical path and non critical path functions of the diagram to provide a more defined determination of responsibilities. This enhancement required the development of a new method of producing the "SA" matrix to facilitate the cross referencing of the "SA" matrix to the "FAST" diagram functions. Fig.#5

illustrates details of the enhanced technique as applied to the "FAST" diagram.

- Technical Support (The necessary functions of TS).

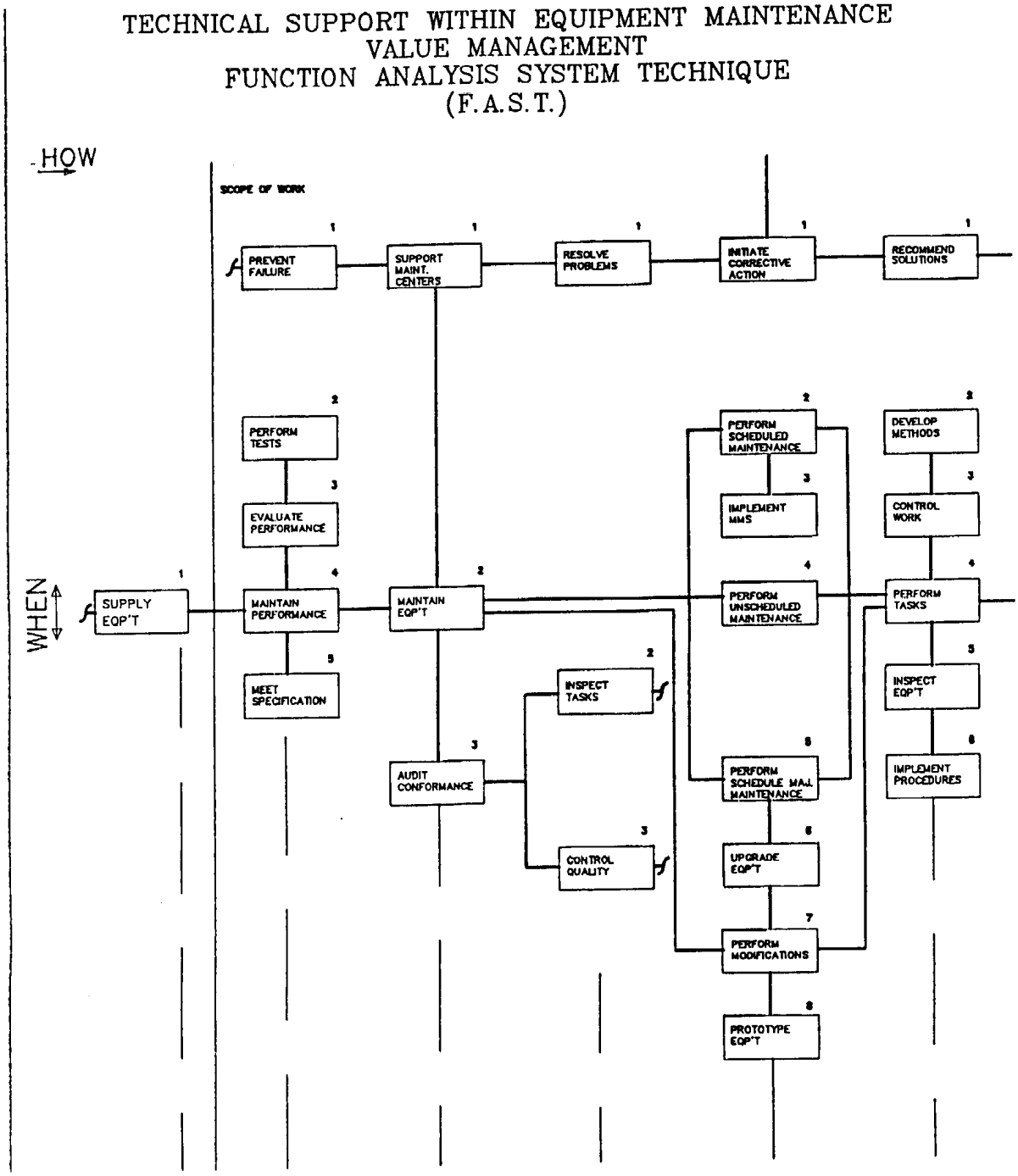

Figure 5

Through the application of this technique it was evident that there were three distinct roleswithin EM:

- Line Maintenance (The actual performance of maintenance functions).
- Fleet Management (The necessary functions associated with the management of the fleet performance).

Having identified three distinct roles and the associated necessary function interactions relative to elements of the organization through the use of enhanced "SA" ; this subsequently became the foundation for recommendations made

in respect of the roles, responsibilities and an improved organizational effectiveness for TS.

THE SPECULATION PHASE:

Problem Sensitivity:

At this stage a review of the project accomplishments to date was conducted to ensure an understanding and awareness of the problem (Problem Sensitivity). To test this the team was asked to list key words contained in the Problem Statements and Goals that they considered essential to be addressed in the development of solutions. The words listed were:

- Roles and Responsibilities
- Accountable performance (measurable)
- Efficient, Consistent and Responsive
- Effective

Additionally, the team was asked to select from the "FAST" diagram the functions that they considered, if improved, would contribute significantly towards an improvement in the organizational effectiveness of TS. The functions selected were:

- Resolve Problems
- Support Maintenance Centers
- Implement Procedures
- Measure Performance
- Control Documentation
- Improve Technical Skill
- Qualify Vendors

Brainstorming :

"Brainstorming is a deliberate effort to separate divergent thinking and convergent thinking"[7]. Ideas are generated in a "Brainstorming" session without constraints, where sensitivity to the problem combined with fluency, flexibility and originality of ideas (the divergent thinking elements) can freely mix with logic and analysis (the convergent thinking elements).

Relative to the functions and problems identified, the team generated in excess of 400 ideas as a result of the "Brainstorming" technique. Judgment of each idea's relative worth or contribution to the resolution of the problem statements was deferred for detailed analysis and evaluation.

PLANNING, EXECUTION AND PRESENTATION:

Evaluation Screening:

Using the qualitative evaluation technique "Delphi - Gut Feeling Index (GFI) " to evaluate random ideas generated, the team initially grouped similar ideas. Team members were then requested to sponsor ideas they thought would contribute to solutions and were willing to champion through a further stage of evaluation. Ideas without a sponsor were discarded.

Surviving ideas relative to functions were explained by the sponsor for each, to ensure the team understood the principle of the idea. Using the quantitive criteria "yes if", the following three characteristics were used as a further evaluation of the remaining ideas. Again ideas thought not to contribute sufficiently were discarded.

- Can it be made to work?
- Can it be implemented in a reasonable time, for reasonable cost?
- Will it contribute to the goals?

A final stage of qualitative screening was applied, using the technique of "Numerical Evaluation by Paired Comparison" the relative importance of criteria contained in the problem statements was determined. Then using thetechnique "Rank & Rate" surviving ideas were evaluated to assess the effectiveness of each in contributing to the resolution of the problem statements. Surviving ideas that indicated the most potential to contribute effective solutions to the problem statements were retained for development into proposals.

Solution and Proposal Development :

The following is a list of the surviving ideas that the team considered worth developing into proposals to present to the SC as solutions to the problem.

1. Revised Organization Structure for TS:

- Redefined, clarified roles(charters) for Line Maintenance, Fleet Management, and TS within the EM as determined from the "FAST" diagram "SA".
- A centralized, consolidated TS under one director in lieu of fragmented elements under four directors (Ref: Fig.1) with increased support directly in the maintenance centers. A matrix organization was the preferred option. The other alternatives considered but not recommended, were centralized non-matrix and a modified decentralized non-matrix organizational structures.

2. "Root Cause Analysis" Procedure:

- Development of a procedure in line with the responsibilities determined from the "FAST" diagram "SA" and the proposed organizational structure for TS.

3. Consolidated, Streamlined Technical Data Base/Information Reporting System:

- The team defined improvements needed to the information systems and recommended a more detailed study prior to implementation. Suggested improvements were:

Redefine and justify the necessity of technical data;

Improve the control, consistency and quality of the data input;

Improve user friendliness of the system;

Streamline and justify the benefits of reporting outputs;

Minimize or eliminate unnecessary distribution of reports.

4. Centralized, Consolidated Technical Document Distribution System:

- With the proposed organizational structure for TS the desired elements of consolidation and centralization could be achieved. Additionally, document standardization and improved, controlled distribution could be attained further improving effectiveness.

5. Improved Communications Forum for TS:

- Again, the proposed organizational structure for TS and the transfer of additional technical resources to the maintenance centers could alleviate some of the communication problems. Specific proposals for periodic meetings, formal conference calls etc. between TS personnel will be reviewed again following implementation of the organizational proposal.

6. Improved Training of TS Personnel:

- The need to explore opportunities for an improved

training of TS personnel by vendors/suppliers of the more specialized equipment or system packages was identified.

7. Improved Methods and Procedures for Modifications to Equipment:

- The team noted that the Modification Program process flow had already been identified as a separate project for VM. However, as a reference point for this future project, the team identified the following points for improving effectiveness:

Improve document distribution;
Ensure all maintenance centers are aware of applied modifications;

Maintenance Centers to be consulted at modification conception;

Ensure maintenance criteria revised following application of modifications;

Improve communication re workload schedules and priorities for application;

Review the potential for FASTRACK of the process flow;

Ensure proper identification of justification and benefits.

CONCLUSIONS:

"We trained hard but it seemed that every time we were beginning to form into teams we would be reorganized. I was to learn later in life that we tend to meet any new situation by reorganizing, and what a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency and demoralization."

Before initiating a study of organization, one would be well advised to consider the above statement. VM, in its application forces identification and understanding of the problem. Remember, "a problem solvably stated is half solved".[8]

However, "It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system; for the initiator has the enmity of all who would profit by the preservation of the old institutions and merely luke warm defenders in those who would gain by the new ones"[9]

When addressing a problem of organizational effectiveness, where the primary resource is people there naturally exists emotion and resistance to change. It is essential to the success of the project to have sensitivity awareness of these concerns. The use of "FAST" and "SA" techniques created an environment of objectivity through the analysis of functions and reduced substantially the elementsof emotion and resistance.

Through the creation of the two "SA" matrices applied to the "FAST" diagram (Fig.#5); the first based upon "how we operate today" and the second upon "how should we operate in the future"; duplications in responsibilities were identified. These were to provide a basis for reductions in resource levels and costs once a revised organization was approved.

The method of applying "FAST" combined with the enhanced "SA" technique has been successfully applied to other projects of a similar nature within VIA. The relationship of organizational elements (departments, sections, positions etc.) as indicated on a "SA" matrix to corresponding functions of the "FAST" diagram determined by interaction responsibilities; simply by shading (colouring) can be used to formalize position descriptions, departmental charters etc. from a perspective of performing only essential functions.

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ACKNOWLEDGEMENTS:
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