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**FIELD IMPACT EVALUATION PROCESS
ON ELECTRONIC TABULAR DISPLAY SUBSYSTEM
(ETABS)**

**THE ELECTRONIC TABULAR DISPLAY SUBSYSTEM
EVALUATION ASSESSOR SUBGROUP**



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Prepared for

**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Systems Research & Development Service
Washington, D.C. 20590**

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16. Abstract This report describes the process used in conducting a field impact evaluation of the Electronic Tabular Display Subsystem (ETABS). Various group structural and process techniques are described. These include a diagonal slice approach to team formulation and several different methods of team building, process control and conflict management.			
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
sq in	square inches	6.5	square centimeters	cm ²
sq ft	square feet	0.09	square meters	m ²
sq yd	square yards	0.8	square meters	m ²
sq mi	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsps	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.96	liters	l
gal	gallons	3.8	liters	l
cu ft	cubic feet	0.03	cubic meters	m ³
cu yd	cubic yards	0.76	cubic meters	m ³

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	1.1	yards	yd
		0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
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*1 in. = 2.54 (exact). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10-286.

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EXECUTIVE SUMMARY

At the suggestion of the Deputy Administrator, a Diagonal Slice Team of affected field personnel was commissioned by the Director of the Systems Research and Development Service to conduct a field impact evaluation of the Electronic Tabular Display Subsystem (ETABS).

The final result of the Evaluation Team is a Field Impact Evaluation Report showing various impacts, feasible alternatives, advantages, and disadvantages of these alternatives with recommendations. The purpose of these recommendations is to minimize the impact of ETABS on the work force. Upon completion of the Field Impact Evaluation Report, the main portion of the Evaluation Team was dissolved.

The evaluation process was broken down into five phases:

- Phase I - Generation of Impact Statements
- Phase II - Verification and Analysis
- Phase III - Quantification of Impact Statements
- Phase IV - Alternatives, Recommendations, and Conclusions
- Phase V - Disposition of Recommendations

The Evaluation Team met for 1 week of intensive meetings, approximately every 6 weeks. The first two meetings represented a learning process on group dynamics, and also about each others perspectives. The fact that we had done some learning became readily apparent at a subsequent meeting when we were able to break up into subgroups and still be sensitive to all of the perspectives reflected by the entire team.

"Homework" associated with the ETABS assignment consumed about 15 percent of each member's time, when back at his home facility.

The team was lead by two separately selected individuals. The "Team Leader," who acted as moderator for the team also performed administrative functions.

The facilitator taught the team group dynamics and helped to keep the team within the operating guidelines of those dynamics.

It is recommended that a subgroup continue, until the implementation of ETABS, to monitor the recommendations of the Evaluation Team and to determine the success of the process. The Evaluation Assessor Subgroup within the team had generated methods to improve the evaluation process for similar projects in the future.

A field impact evaluation enjoys the advantage of surfacing deficiencies early enough in the program that it becomes an improvement to the engineering model rather than a modification to the production model after it is in the field. The savings in this area alone, more than compensate for the expense of a Field Impact Evaluation.

Each participant is richer for his experience as a member of a Diagonal Slice Group. The additional perspectives attained make the individual a more valuable employee to the FAA.

INTRODUCTION

1. PURPOSE. This report describes how to construct an Evaluation Team and perform an assessment of a new technology or system.
2. BACKGROUND. The information in this report was generated by the Electronic Tabular Display Subsystem (ETABS) Evaluation Team and is designed to assist future evaluation teams. The report includes the rationale of the Team's response to the pitfalls they encountered. This report has three chapters. The first chapter describes how to construct an evaluation team, and the second chapter describes how to perform the evaluation. Chapter three describes how to assess the evaluation process.
3. SELECTION OF THE EVALUATION PROCESS. The evaluation process does not duplicate any existing procedure, policy, or function performed by any segment of the organization. However, it does interact with the organization's responsibility in the procurement of the new system. This new concept of having field personnel participate during the development phase of a new system may be met with resistance by personnel in headquarters. The inter-departmental conflict (headquarters versus field) should not be avoided. This energy must be channeled to produce the best product.

One major advantage of an evaluation team over a committee or staff group is objectivity. Since they are analyzing someone else's project, they do not have any preconceived ideas. By virtue of its makeup, an evaluation team can surface a greater number of viewpoints with more candor. A staff group tends to have a "staff view." Also, a staff group or committee feels pressures of hierarchy that do not exist with a diagonal slice group.

In addition, the short, part-time existence of the group prevents the development of the "staff view" and "empire building."

4. COST OF EVALUATION PROCESS. The cost would vary according to the magnitude of what it is to be evaluated. The cost of the ETABS Evaluation Team in employee hours, travel, and per diem is estimated at \$120,000 (1979 dollars). This is insignificant compared to the overall cost of the project and the possible rewards which could outweigh the cost many times over. The cost of future evaluations should be considerably less since the initial evaluation was a learning experience.

5. RECOMMENDED PROCEDURES. This report has various recommendations on how to perform the evaluation of new technology or systems. These procedures were recommended based on the experience of the ETABS Evaluation Team. They are only suggested procedures and any future evaluation team may deviate from these recommendations as much as required to accomplish the assigned task.
6. ATMOSPHERE OF EVALUATION PROCESS. It may be impossible to define the true atmosphere of the evaluation process.

Since ETABS was the first use of the evaluation process, everything was being designed and tried dynamically. The amount of frustration experienced by each member was at times very high. Meetings and activities were conducted with much conflict, tension, and frustration. In addition to the responsibility of evaluating a new system, being placed in a "fish bowl" caused an increase in the amount of pressure experienced.

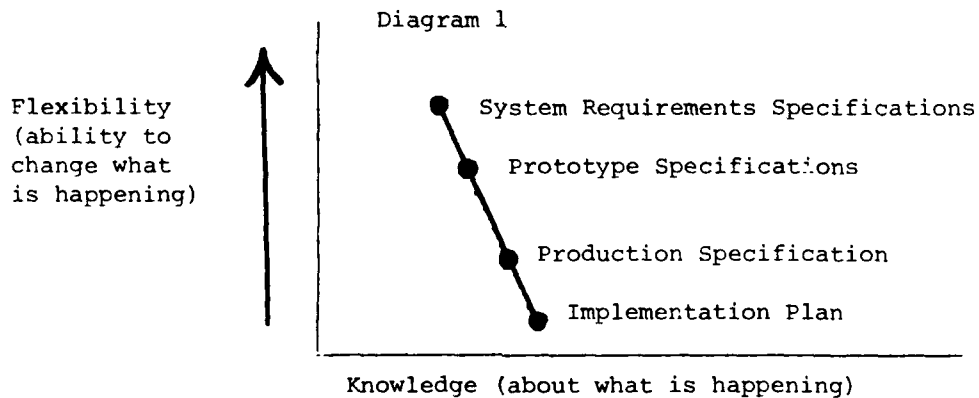
The whole evaluation process was a difficult learning process for everyone involved. However, despite these difficulties, the overwhelming majority of participants acknowledge the need for the process and their willingness to participate in future evaluations.

This report was generated by the following individuals: Brad Cook, Denver Center; Gerald Mikuenski, Houston Center; and Ron Seppala, Boston Center.

Point of contact for questions or comments regarding this report is Bill Koch, FAA Washington, AEM-301, FTS 426-8794.

CHAPTER 1. STRUCTURE AND IMPLEMENTATION OF EVALUATION TEAM

- 1.0 GENERAL. This chapter describes how to organize, construct, and implement an evaluation team.
- 1.1. INITIATING OFFICIAL. The initiating official should be the highest affected manager responsible for the operation impacted by the new technology. (The ETABS Evaluation Team was initiated by the Deputy Administrator. If the evaluation team process is to become the normal or accepted way of doing business, the authority to initiate the process can be delegated down.) The initiating official shall identify the major objectives and any boundaries or limitations. The initiating official shall select the moderator and facilitator.
- 1.2 TIMING OF EVALUATION PROCESS. The evaluation team should be assembled anytime a change or a new technology comes to the surface which would affect a wide range of the overall organization. In the case of technology, the team should be established as soon as possible after prototype specifications are generated. The team should be dissolved after generation of its recommendations. This should be prior to the generation of the production specifications. A subgroup should continue to exist until the disposition of recommendations is determined. This subgroup would watchdog the recommendations to determine the results of the evaluation team process on the project.



The ETABS Evaluation Team stayed in existence for approximately 8 months. During that period, only 6 weeks of nonconsecutive time was spent on team activities. When back at their facilities, members will spend in the neighborhood of 15 percent of their time on team related work. The rationale for having an approximate 6-week break between meetings is to keep team members in touch with the real world and test their progress after each phase.

- 1.3 OUTPUT OF EVALUATION PROCESS. The output of the evaluation process is a Field Impact Evaluation Report with recommendations regarding a new technology. This report indicates both the positive and negative impacts of this new technology and makes recommendations with quantized alternatives which are intended to be acceptable to the agency. This report will have a higher degree of credibility than can be obtained via any other method currently in use.
- 1.4 MODERATOR. The moderator has a multi-function role. This individual should have to some degree both technical knowledge and responsibility for the project. This person shapes the attitude and environment of the team activities. Thus, the moderator is the designer of team functions. The experience gained as a member of the evaluation team can be used as the basis to convert that member to a moderator for a subsequent evaluation team. It would be undesirable to have full-time moderators (i.e., carry over from team to team). The chance of them developing fixed perspectives and curtailing creativity would increase if they were permanent moderators. The following items indicate the major functions performed by the moderator:

- .Performs administrative functions for the team and is the focal point between meetings.
- .Ensures timely completion of the task within established constraints, without suppressing creativity.
- .Helps to keep some of the more heated discussions on track and also frees the facilitator to function unhampered.
- .Selects the evaluation team's composition and membership.
- .Coordinates establishment of evaluation team with all interested parties including headquarters, regional, and field personnel.
- .Ensures all necessary information, material, and techniques are provided to the team.
- .Recommends the elimination of unproductive members who are undermining or interfering with the accomplishment of the objectives. The major responsibility to remove this element from the team rests with the team members.
- .Encourages an energetic and productive team.
- .Recommends members to form assessment assessor subgroup.

- 1.5 FACILITATOR. The facilitator has a multi-function role. The facilitator teams up with the moderator to participate in the design of the evaluation team functions and activities. In addition to being a designer, the facilitator is an expert in the area of information transfer. This person does not become involved in the content of the team's task, but oversees the process the team is using and helps to keep that process on track. (The ETABS Evaluation Team used a professional facilitator on a contract basis which has several advantages. One such advantage is that the service is available on an as needed basis. This type of facilitator would not be contaminated by the way the administration has previously managed new projects.) The following items indicate the major functions performed by the facilitator:
- .Exposes the team to various methods in accomplishing specific tasks. If team members have little or no experience in team action dynamics, the facilitator provides the basic information.
 - .Provides the external force to steer unproductive conflict into constructive conflict and assists the team in developing their approach in resolving conflict.
 - .Provides a variety of techniques which can be used to resolve problems.
 - .Forces the evaluation team to identify and examine the methods it uses in decision making along with the quality of these decisions.
 - .Participates in the establishment and selection of evaluation team composition.
 - .Participates in the selection of the assessment assessor subgroup.

- 1.6 COMPOSITION OF EVALUATION TEAM. The key to the success of the evaluation process is field personnel participation at the appropriate time.

The evaluation team should be composed of people from a diagonal slice of the field organization. A diagonal slice is a selection of personnel representing as many organizational perspectives as possible. This allows for a highly creative and productive atmosphere. The team is limited in size to prevent it from becoming cumbersome. From 5 to 12 people seems to be a manageable size. An essential ingredient of the diagonal slice is equal status within the team for all members. Each member of the team must participate. In this fashion, all viewpoints are surfaced allowing all members to "see" all facets. This also prevents domination by one or two members of the group. Any attempt to withdraw from the team should be dealt with in a positive manner.

During the Verification and Analysis Phase, the concept of the rolling diagonal slice is implemented. Several team members are replaced by individuals who have direct responsibility of the project being evaluated. These new team members should have participated from the beginning of the evaluation process as information sources, but not as active team members. (ETABS experience: The new members had not participated from the beginning. The modification of the team composition caused a great deal of confusion. It required some time for the new members to establish themselves as part of the team.) The rationale for having the new members is to ensure the recommendations would not get discarded because of the lack of ownership or involvement by the personnel responsible for the project. The replaced members become the evaluation assessor subgroup who are available as information sources. This is in addition to their new role.

- 1.7 ESTABLISHMENT AND SELECTION OF TEAM MEMBERSHIP. The moderator as the focal point shall request nominations from as wide a spectrum of the affected areas as is practical. The moderator and facilitator shall select the team members from the available candidates. Participation on the evaluation team is an excellent opportunity for personal growth. Exposure to such a wide range of viewpoints and expertise will improve the individual's overall performance. In the selection of team members, certain qualities are desirable. The following items indicate these qualities and some rationale behind them:

- .A member must be able to function in a group, be creative, intelligent, and able to handle ambiguity and conflict in a constructive fashion. Each member must be honest, open, candid, dedicated, flexible, and have the ability to participate under pressure.
- .Despite the large variation in status between team members within the FAA, each member has equal status within the team. No individual member has the power or can control the team's activities as long as the membership enforces this internal quality.
- .Team members should be experts in their specific fields. They should be the primary data source, but additional data or feedback can be obtained from their technical peer groups. A minimal amount of their time is used as a data collector.
- .Each team member is expected to use his expertise to make recommendations with alternatives. Some of their administrative functions include writing reports, taking minutes, giving verbal presentations, and making arrangements for meetings. Member's knowledge and perspective must be expressed even in the face of opposition.

1.8 EVALUATION ASSESSOR SUBGROUP. As stated in paragraph 1.6, Composition of Evaluation Team, the assessor subgroup is formed from the rolling diagonal slice.

The evaluation assessor subgroup is charged with the responsibility of improving the evaluation process. Currently, experience is the best method to improve and develop the process. There must be an ongoing evaluation within the team and from team to team to make the necessary changes to perfect the process and update this report. The assessors are charged with the following task: refine the evaluation process and provide a more objective immediate feedback to the team.

The major functions of this subgroup is to write reports and give verbal presentations on their observations of the evaluation process.

This subgroup is to generate an interim report after the generation of the recommendations indicating the results of the evaluation process. Their final report is generated after the disposition of recommendations is determined. Much of the data used to generate these reports is obtained by the assessors as observers of the evaluation process. The moderator and facilitator recommend which members form this subgroup with the team's approval.

CHAPTER 2. EVALUATION PROCESS.

- 2.0 GENERAL. The evaluation process with respect to this appendix is the assessment of new technology by field personnel. The impact on the workforce by this new technology is described by both positive and negative quantized impact statements. Recommendations with alternatives are generated which would be accepted by the agency and minimize the impact on the workforce.

The evaluation process have five phases as follows:

- Phase I - Generation of Impact Statements
- Phase II - Verification and Analysis
- Phase III - Quantification of Impact Statements
- Phase IV - Alternatives, Recommendations, and Conclusions
- Phase V - Disposition of Recommendations

- 2.1 PHASE I - GENERATION OF IMPACT STATEMENTS. The Generation of Impact Statements Phase is probably the most singular important phase. It is comprised of four distinct areas as follows:

- .Development of Evaluation Team
- .Technical Briefing of Team
- .Generation of Impact Workbook
- .Use of Impact Workbook

This phase does not begin or end with the first meeting. It can extend and overlap subsequent phases. (In the case of ETABS, this phase crystallized at the third meeting during the quantification phase.) The entire objective of this phase is to generate clear, distinct, stand alone, positive, and negative impact statements. (In the case of ETABS, the preliminary impact statements were suggestions, recommendations, and alternatives without identifying the exact effect on the workforce.

- 2.1.1 DEVELOPMENT OF EVALUATION TEAM. The development of this evaluation team begins with the selection of team members by the moderator and facilitator. After soliciting nominations from the appropriate organizations, the candidates are screened and selected to ensure a balanced diagonal slice composed of the proper qualities.

The moderator schedules the first meeting and selects the location based on the required technical orientation of the team. Included in opening briefings should be one by a high level manager indicating his interest/support/goals for the group.

The moderator and facilitator generate an information package and distribute it to team members prior to the first meeting. This advance material should contain the prototype specifications and an executive summary of the new technology being evaluated. In addition, any appropriate information on the evaluation process.

The first few days of the first meeting are used to develop the evaluation team. This is accomplished by informal presentations by the moderator and facilitator on the history and background of the project, along with the purpose and goals of the evaluation team.

The facilitator should present various tools and concepts on group dynamics. Some of major items presented by the facilitator should be use of diagonal slice groups, the nature of highly effective groups, giving and receiving feedback, methods of conflict resolution and problem solving, and constructive conflict in discussions. Several team development exercises can be employed to develop the required awareness and skills. (The ETABS Evaluation Team was introduced to the Nominal Group Technique (NGT) with an in-depth exercise in its use and application. The team was also exposed to PIT (Polemics·Inquiry·Theorizing) sessions which became a continuously used tool.)

The objective of the team orientation process is to integrate a group of individuals into a productive team. Any method which generates a high trust and acceptance level within the team in the shortest possible timeframe can be employed. (In the case of ETABS, during the first meeting, long hours and continuous contact were successful in diverting energy away from keeping up personal appearances to bringing out the true personal characteristics of the individuals. Once it was evident that the trust and acceptance were present, each individual became more open, candid, and productive.)

It is recommended that all meetings be held away from official offices, preferably in hotels or motels. (A portion of the second ETABS meeting was held at a regional office. This period of time was not effective. The rationale to hold the meeting at the regional office was based on the fact that the Regional Director was assigned overseer responsibility of the ETABS project. It is suggested that

one of the members of the evaluation team be from that particular regional office. This individual could provide the Director with any required information. In addition, this individual should seek assistance from the Director if serious problems threaten the performance of the evaluation process. The Regional Director's involvement in the evaluation process should be limited to the evaluation and disposition of the recommendations.)

The development and growth of the team is an ongoing process, which ends with the termination of the team.

- 2.1.2 TECHNICAL BRIEFING OF TEAM. The technical orientation begins with the advance material and briefing by a knowledgeable individual. The amount and depth of technical information presented about the new technology should be of sufficient proportion to ensure an understanding of its functional capabilities and the basic design philosophy behind it. Each member will need a different level of information based upon his expertise and perspective.

A demonstration of a prototype, model, mock-up, or bread board version of the new technology is extremely beneficial. A series of presentations or briefings by knowledgeable personnel including question and answer periods is very useful. The team should be given the means to obtain further technical information as the need arises. The members to be added by the rolling diagonal slice concept could provide this additional technical knowledge or at least the means to obtain it.

- 2.1.3 GENERATION OF IMPACT WORKBOOK. The generation of an impact workbook is the first goal of the evaluation team. The purpose of an impact workbook is to provide the evaluation team a common format to assemble field impact information regarding the new technology. The workbook should contain all possible factors of impact to be investigated by the team. The data collected is assembled and verified in Phase II, Verification and Analysis.

- 2.1.4 USE OF IMPACT WORKBOOK. The individual members of the team are to take this workbook back to their facilities and decide if these preliminary impact factors have any validity and to what degree. (In the case of the ETABS Evaluation Team, the previously generated technology assessment workbook was expanded and adapted as the basic tool to collect data. The method to collect this data was discussed, but it was left up to each member to perform this task as it seemed appropriate.)

It is recommended that the nominal group technique be used to generate the impact factors to be considered. (In the case of the ETABS evaluation, the decision to use the previously generated technology assessment workbook was challenged by several members. Despite the fact that many factors in this workbook were inappropriate, not one single fact or question was removed from it in generating the ETABS workbook. It was repeatedly stated by one of the originators of the technology workbook that nothing in it was sacred but the ETABS Team still treated it as such. During the third meeting while performing the quantification function, it became clear to the team that the use of the technology workbook was a mistake.)

Early during each meeting, one member of the team should be assigned the role of decision tracker. This individual shall prepare the minutes for that meeting, and record all decisions and unanswered questions generated by the team.

In the generation of the workbook, three items may appear which should be resolved at that time. (In the case of ETABS, the resolution of some of these items was postponed until later meetings.) These items are as follows:

.How decisions are to be made. It is recommended that decisions be made by consensus and that all outputs from the team be acceptable to each member. This does not prevent the generation of any minority report.

.How to handle irresolvable items. (In the case of ETABS, the majority rule technique was established to handle irresolvable items. Once this was established and used on an irresolvable item, the situation never arose again.)

.How to cope with conflict. Many people have a tendency to suppress conflict with people that they are not familiar with. This suppression can reduce the quality of the final product. (In the case of ETABS, the PIT sessions, with its role playing, assisted in surfacing conflict and acceptable methods of handling it. These sessions produced a high level of openness, acceptance, and trust. Several members objected to these sessions and in reality by the third meeting the PIT sessions had accomplished enough to render their use unnecessary.)

After the generation of the workbook, the team should clarify exactly what their homework assignment between meetings is.

The assignment is to return to their facility and answer the questions in the workbook. As the experts, they can answer these questions or collect additional data from their peer group. During this task, they can generate additional items of impact they may discover. (In the case of ETABS much confusion was encountered in performing the homework assignments. This was based on a lack of clear understanding of assignments; despite the fact that during each meeting everyone indicated a complete understanding of their assignments. During the third meeting, an exercise was used to determine how well individuals understood their assignment and to reinforce their understanding. This exercise assumed that they had completed the assignment and then the data was applied to the task at hand.)

As this point, the team should decide on the goals, location, and dates of the next meeting. The recommended goals are stated in Phase II, Verification and Analysis.

- 2.2 PHASE II - VERIFICATION AND ANALYSIS. During the Verification and Analysis Phase, all the collected data on the various preliminary impact statements and questions are consolidated, examined, and substantiated. The result of this phase is the final impact statement document. This phase begins by collecting data (remember, a team member can be the sole source) and verifying the preliminary impact statement at the team member's facility. It continues with the consolidation of each member's input into a substantiated impact statement that has been analyzed and accepted by the team. It ends with the generation of the final impact statement report.

A majority of the work in this phase is performed at the second evaluation meeting. This meeting has three major activities.

- .Consolidation
- .Team Modification
- .Introduction to Quantification

The previously indicated activities are performed to accomplish the two goals for the second meeting.

- .Generate a draft impact evaluation document which describes the nature and extent of all known impacts.
- .Develop an understanding of quantification in terms of total system performance.

- 2.2.1 CONSOLIDATION. The consolidation activity combines all the various input data and comments presented by team members into a draft impact evaluation report. During this activity, the data is analyzed and verified by team members to ensure its accuracy. (In the case of ETABS, over 600 individual comments were discussed and processed in the preparation of the rough draft report.)

The moderator and facilitator as the team's designers will prepare a schedule of the team's activities. This schedule should have enough flexibility in it to allow any required changes. The flexibility should allow for the possibility of increasing and decreasing the number of days for any given meeting. The moderator and facilitator should present various methods of how to consolidate and evaluate all the available data. (In the case of ETABS, the moderator and facilitator forced an unacceptable method on the team. This method was to break the team into small groups which would consolidate and verify specific factors and areas of impact. This approach caused confusion and questionable results and was abandoned after a short period of time. The method may have been unsuccessful because of the diagonal slice with its numerous different perspectives. A group discussion was held on each and every factor, comment, and question. The information was analyzed, consolidated, and verified by the entire team. This method took a great deal of time and the first few items received much more attention than the last items. The technique of working in small groups was attempted unsuccessfully several times and was finally used successfully during Phase IV, Recommendations. The reason for its eventual success may have been an increase in the trust level between members and confidence that team members thoroughly understood each other's position.)

The consolidation impact evaluation statements are then organized and form the rough draft impact evaluation report.

- 2.2.2 TEAM MODIFICATION. The purpose of modifying the team's composition is to accomplish the required objectives using the most efficient method.

As many subgroups as required can be formed. In paragraph 1.6, Composition of Evaluation Team, the rolling diagonal slice method of modifying the evaluation team is described. (In the case of ETABS, this was performed to accomplish the two assigned objectives.) The addition of headquarters personnel should not reduce the validity of the field impact statements since they are added after the generation of the rough draft impact evaluation report.

During this activity, the creation of the evaluation assessor subgroup is accomplished. The detail data concerning the purpose and responsibility of this subgroup are identified in chapter 3 of this document.

It is envisioned that the need for this particular subgroup would decrease and be eliminated by future teams as the evaluation process is optimized. (In the case of ETABS, an edit subgroup was formed to revise the rough draft impact statements into a near finished product. All members of the team were to provide this subgroup with any additional data. The edit subgroup was to meet just prior to the next meeting. The subgroup was to have complete rewrite license to revise all the statements. The approach is excellent; however, it was unsuccessful because of the lack of direction given and received. The edit subgroup did not take full advantage of their complete rewrite license.)

2.2.3 INTRODUCTION TO QUANTIFICATION. The purpose of the introduction to quantification activity is to prepare the team for Phase III, Quantification of Impact Statements.

This activity is intended to identify all the possible terms which would express the size of an impact statement in relation to the total system performance. The quantifiers should be defined by the team during this activity. In the case of ETABS this was to quantify the various impacts of the evaluation report in terms of the following items:

- .Staffing
- .Workload
- .Availability
- .Reliability
- .Labor Management Relations
- .Manpower
- .Operational Impact
- .Dollars

Quantifications were to be considered on a reasonable worst case basis.

2.3 PHASE III - QUANTIFICATION OF IMPACT STATEMENTS. The purpose of the quantification phase is to take each impact statement and determine how significant this impact is in understandable and/or measurable terms.

Phase III begins during the second meeting with the introduction to quantification. The majority of the work is performed prior to the third meeting in the form of homework. Team members calculate the size of the impact at their facilities. It is completed at the third meeting where all the data is consolidated and verified.

At the completion of this phase, the evaluation team should have generated a document which contains quantized impact statements.

Some forethought should be given to the format of this document. (For example, in the case of ETABS, delaying a decision for an acceptable format until Phase IV, Recommendations, caused serious problems in writing both the original impact statements and the quantized statements.)

Each quantized statement that is generated goes through a verification process.

2.3.1 QUANTIFICATION. Each team member, who has expertise or other sources of expertise available on specific impact statements, generates a sizing (quantification) statement. In most cases, the resources to calculate accurately the sizing of these impacts is limited to the human resources within the team.

These sizing statements are expressed in the terms generated during the introduction to quantification activity in Phase II.

Since much of this data is generated between meetings, this permits investigation and analysis of the sizing statements.

2.3.2 VERIFICATION. The purpose of the verification process is to ensure that the sizing statements are as accurate and realistic as possible.

This is performed using the complete resources and expertise of the entire team. Each quantized statement is tested and analyzed in an impartial and honest manner.

2.4 PHASE IV - ALTERNATIVES, RECOMMENDATIONS, AND CONCLUSIONS. The purpose of this phase is to select from feasible alternatives the best recommendations to reduce and/or eliminate unacceptable impacts generated by the new technology.

The phase begins after the completion of the third meeting as an assigned homework task. Each team member is to generate feasible alternatives with cost estimates where possible, to reduce and/or eliminate undesirable impacts.

The phase is completed with the selection of the most realistic alternatives to make the new technology as acceptable as possible to the workforce.

There are three parts to Phase IV as follows:

- .Generation and consolidation of alternatives
- .Feasibility
- .Selection of alternatives

The generation of the recommendation is only second in its importance to the generation of the impact statements. This phase completes a majority of the work of the evaluation team and produces the final product, i.e., how to resolve the problems of impact.

- 2.4.1 GENERATION AND CONSOLIDATION OF ALTERNATIVES. Prior to the fourth meeting, each member prepares a list of alternatives to resolve the problems identified by the quantized impact statements. Then they generate the best cost/feasibility data available.

During the fourth meeting, the alternatives are consolidated and clarified.

This activity is by far the most creative and innovative in the entire evaluation process. Members using their expertise and understanding as to what field personnel really need, and have an opportunity to propose new ways in which to do business.

- 2.4.2 FEASIBILITY. The purpose of the feasibility activity is to analyze and verify suggested alternative solutions to undesirable impacts. During this activity, team members will start to put forth a determined effort for acceptance of alternatives which will be of greatest advantage to their particular specialty. (In the case of ETABS, Air Traffic Control and Airway Facilities personnel took extremely strong opposite stands on the feasibility of certain alternatives.)

All alternatives which are considered to be unfeasible are discarded. The determination of feasibility is reached by team consensus after completely understanding the alternative.

- 2.4.3 SELECTION OF ALTERNATIVES. At this point the problems have been clearly identified and all feasible solutions have been verified. The next step is to recommend the best alternatives. During this activity all the special interest within the team will again attempt to sway the team in making recommendations

most advantageous to them. The possibility exists for compromise between various factors within the team in making the final recommendations or for dual recommendations. (In the case of ETABS, the selection of the final recommendations was made by consensus. Much discussion and testing of the different perspectives occurred prior to final selections.)

The final step is to establish the priority of various recommendations. From the field's perspective, all the recommendations should be implemented. Some recommendations will have a more substantial positive impact to field personnel as compared to others and should be given more emphasis.

This concluded the evaluation process except for Phase V, Disposition of Recommendations.

2.5 PHASE V - DISPOSITION OF RECOMMENDATIONS. If the evaluation process was to end with Phase IV, two very important questions would remain unanswered.

1. Was the evaluation of the new technology successful?
2. What action has to be taken to improve the process?

The purpose of Phase V (Disposition of Recommendations) is to answer these questions. The following is purely theoretical since the ETABS evaluation process is only in Phase IV, Alternatives, Recommendations, and Conclusions.

To ascertain the value of the evaluation process, the results must be evaluated from an objective viewpoint. It must be determined if the process has any merit or if it is a waste of time and energy. Regardless of the results of any individual evaluation, some action should be taken to improve the process. To accomplish these goals, two activities are required.

.Monitor Results

.Improve Evaluation Process

To perform these activities, a special subgroup is formed whose chief purpose is objectivity. This subgroup should exist until the implementation of the new technology. This subgroup will spend very little time in performing this important task.

2.5.1 MONITOR RESULTS. During this activity, the subgroup shall determine which recommendations were implemented. In addition, they shall determine if the recommendations were worthwhile. The subgroup will investigate and trace exactly what happens to each recommendation. The subgroup will also determine if the predicted quantized impact statements were valid. The results of this activity will indicate if the evaluation process was successful. It may also verify that the normal way of doing business is also valid.

This information should be documented by generating a supplement to the field impact evaluation of the new technology.

2.5.2 IMPROVE EVALUATION PROCESS. The purpose of this activity is to improve the evaluation process by a thorough critique of the process after the fact. This Monday morning quarter-backing activity should generate a supplement to this appendix. This supplement should indicate pitfalls to avoid and successful procedures to use. In addition, it should indicate the emotional climate of the evaluation process.

CHAPTER 3. ASSESSMENT OF FIELD IMPACT EVALUATION PROCESS

- 3.0 GENERAL. The purpose of the Field Impact Evaluation (FIE) Team was to identify the impact that the Electronic Tabular Display Subsystem (ETABS) will have on the workforce. The Evaluation Assessor (EA) Subgroup is charged with the mission of overseeing the functions of the FIE Team and recommending changes to the evaluation process.

This chapter is a guideline for establishing an evaluation assessor subgroup and assessing the field impact evaluation process.

- 3.1 BACKGROUND. The EA Subgroup associated with ETABS was composed of three members of the Field Impact Evaluation Team. The EA Subgroup is commissioned to recommend procedures and further development of the FIE process. Historically, the FAA has suffered from poor field acceptance when implementing new systems. The Field Impact Evaluation procedure is a realistic method of addressing field consideration in a systematic manner.

The potential for enhancing field acceptance of new technology through its use looks very promising.

- 3.2 EVALUATION ASSESSOR SUBGROUP OBJECTIVES. Once the Field Impact Evaluation Project Initiating Official has determined that an ongoing assessment within the evaluation team is required, the EA Subgroup objectives should be well defined. EA subgroup reports and presentations should be clearly specified when orienting the EA Subgroup Members. Time tables and resource limitations should be included.
- 3.3 EVALUATION ASSESSOR SUBGROUP ASSEMBLY. The size of the EA Subgroup may vary proportionally to the size of the Field Impact Evaluation Team. For example, the ETABS EA Subgroup consisted of 3 of the 13 members. The subgroup was formed using the rolling diagonal slice concept. A variety of procedures may be employed to determine who should serve as subgroup members. It is suggested that a list of qualification requirements, personal attributes, and characteristics be established to aid in identifying potential candidates.

- .A high level of commitment to the project
- .Writing skills
- .Good oral communication skills (public speaking)
- .Time availability
- .High conceptual ability
- .Experienced in field operations
- .Have a high tolerance level for frustration and ambiguity

Participation by the Field Impact Evaluation Team is considered essential in selecting the subgroup membership. In the case of ETABS, the moderator and facilitator nominated individuals but selection was by team consensus. There was no specific leader assigned or established in the subgroup, but general guidance was provided by the team facilitator.

The timeliness of the selection of the subgroup membership and the initiation of their activities is critical to the effective outcome of the assessment project.

The subgroup membership selection must be made after all evaluation team members have gained the fundamental experience of the subject evaluation process. It must not occur so early as to distract interest or weaken their commitment to the project.

- 3.4 EVALUATION ASSESSOR SUBGROUP ASSESSMENT FUNCTIONS. The following list of functions were developed and employed by the ETABS Assessor Subgroup. It is presented as a guideline. It may not be the best or most complete list, but is a starting point for future subgroups.

- .Participation in the field evaluation process
- .Observation of the methods employed by field evaluation team
- .Examination and validation testing of the FIE Team report and its supporting data
- .Interview FIE Team members
- .Generation of questionnaires to collect data from FIE Team members
- .Provide constructive feedback to the evaluation team and raise questions pertaining to the validity of the process including its conclusions and recommendations
- .Initiate action to ensure a procedure be established to track the recommendations generated by the evaluation team

- 3.5 EVALUATION ASSESSOR SUBGROUP PROCEDURES. The following list of initial and ongoing procedures served the purposes of the ETABS Team well. These procedures can be tailored to meet the needs of any evaluation assessment.

- 3.5.1 INITIAL ACTIVITIES. The Evaluation Assessor Subgroup must generate an initial assessment plan which should include the following activities.

- .Determine if final assessor reports are required and if so, when and in what form
- .Prepare oral presentations
- .Determine a method of data verification
- .Determine and assign assessor functional workloads
- .Develop a procedure to maintain the interface with the evaluation team
- .Establish an interim coordination and communication procedure to assist each other with homework assignments

3.5.2 ONGOING EVALUATION. Critique of the ongoing Field Impact Evaluation sessions is an essential activity of the assessor subgroup.

The following items illustrate the ongoing evaluation process:

- .Meeting separately from the FIE Team, the subgroup critiques the team progress. Including the value of each session or meeting.
- .Feedback is given to the ETABS Evaluation Team after a review and analysis of a completed task.
- .Recommendations are made to improve the evaluation process.

3.5.3 DATA COLLECTION. Early implementation of procedures to gather and preserve a wide variety of data is considered a must activity for the assessor subgroup. The suggested methods are listed below:

- .Arrange for the subgroup to have copies of all reports and working documents of the FIE Team.
- .The subgroup members should make a complete set of notes to ensure group memory. The notes should capture the mood, feelings, commitments, and productivity levels of the FIE Team.
- .Use questionnaires designed to capture specific data. This should provide statistical information that may be useful in formulating future decisions.
- .Confidential written and oral critiques about the process with individual team members.

3.5.4 PRESENTATIONS. The Evaluation Assessor Subgroup is tasked to provide various presentations. These presentations will be concerned with both the evaluation of new technology and the evaluation process. The following items indicate the required activities to achieve this:

.Correlate all appropriate data in final written report

.Develop the required visual and oral presentation package

.Prepare guidelines and changes for use by future evaluation teams as required

CHAPTER 4. ETABS FIELD IMPACT EVALUATION OBSERVATIONS

4.0 The original concept that selection of ETABS Evaluation Team Members was a critical phase of the process has proven to be well founded. The feelings and emotions of team members ran very high during most meeting sessions. The candor required by members of the ETABS Evaluation Team to arrive at consensus on high interest issues forced all members near their limits of patience on numerous occasions. Different team members threatened to leave the team at times when progress seemed impossible. On some occasions, members withdrew physically and mentally for short periods of time, only to rejoin the team of their own initiative or to be drawn back by other team members and then to make greater contributions than before toward the resolution of the current issue. Emotional reactions to some issues resulted in agreement to delay some discussions and decisions until a later time when members could be more objective.

The selection criteria served well in this case since the team was never dominated by any single member and peer pressure control was never necessary, but the importance of membership selection is to be highly emphasized.

Likewise, great care must be exercised when selecting team members to serve as evaluation assessors. Additional workload and stress of the dual role can easily exceed the commitment level of some team members.

The assessor subgroup functioned primarily as a leaderless group, which appears to have been the correct procedure for this group. We recommend it be employed by future teams.

The assessment procedure included keeping data records of the evaluation team activities, observing the progress of each team session while making notes of the depth of concern, feelings, logic used, and data presented in support of each impact issue. The assessors attempted to identify the pitfalls and traps that triggered the highly emotional responses of team members. Personal attacks, polarization by technical specialties, lack of expertise, unexpected boundary conditions, and inattentiveness of some members always resulted in a loss of productivity. The assessors observed in contrast, that when the task at hand was well defined and understood, with adequate data, expertise, and harmony, the quantity and quality of the output was greatly enhanced.

Decision making by consensus was agreed to by all ETABS Field Evaluation Team Members with majority vote to be employed only when consensus could not be reached. Majority vote was used only twice in 5 weeks of meetings of the ETABS Field Evaluation Team. Any team member could halt the action on any issue presented when strong feelings were expressed and/or convincing supporting data was provided.

All team members agreed: their experience while participating in this evaluation would benefit the FAA by making them more capable and valuable employees; the field acceptance of ETABS would be greatly enhanced by the improvements to the systems resulting from the Field Impact Evaluation Team recommendations; that field acceptance would also be good as a result of the credibility gained by involving field employees in addressing field impact problems in the early stages of systems design.

All ETABS Field Impact Evaluation Team Members expressed feelings of confusion and frustration when directions were unclear or boundary conditions were not well defined. It was necessary to struggle with the team task definition at the beginning of each series of meetings following a 5- or 6-week break between meetings. In some cases, new data or points of view gained between meetings required discussion and evaluation before progress could proceed on the subject task at hand. However, trying some sessions seemed, all members of the team said they would serve on other evaluation teams if requested.

Outbursts of emotional frustrations were not limited to field team members. The team facilitator became involved on two occasions when progress lagged and team members felt they were being manipulated or some guidance was lacking or misleading and some lack of trust resulted and the team facilitator and moderator had to prove themselves and regain the confidence of the team members. As observed during this Field Impact Evaluation Process, the facilitator role was a very demanding one because the team members, at times, were very goal oriented and impatient to proceed with the project at the risk of sacrificing performance quality. However, the team facilitator's keen observations and rational logic persisted and resulted in a strong project commitment by all team members as was the complete commitment in evidence by the team facilitator and moderator. The evaluation assessor group rated the overall facilitator performance as excellent in the ETABS Field Impact Evaluation Effort.

The moderator role appeared equally as difficult as that of the facilitator during the ETABS Field Impact Evaluation. Observations revealed that great expectations for suggestions and new techniques to progress were directed toward the moderator by team members when team activities were bogged down, and in most cases, problem summaries, objective redefinition, and critique were just the ticket for renewed emphasis and productivity.

Role playing was employed as a critique technique in a process referred to as PIT sessions following each ETABS session for the first three meetings of the team. Two team members were selected to present and discuss the Pro's of each session and likewise, two would present and discuss the Con's of each session while acting a role. This technique provided the acceptable cover, enabling open discussion of

the sensitive areas limiting progress in the group and complementing the productive contributions of specific team members. The group tired of this process and initiated a modified version of PIT without the role-playing procedure for the last two series of meetings. It was felt that sufficient trust existed among team members to enable open and candid discussions of the most positive and negative aspects of team performance at this point in time. Therefore, it is agreed the modified PIT was a successful form of critique since the confidence level was sufficiently high.

Most ETABS Field Impact Evaluation Team Members expressed concern that removal of the three evaluation assessors from the mainstream of activity during the second meeting to initiate the assessment functions resulted in an adverse effect on the team progress due to this loss of experience and data resource. They suggested that specific assessors be assigned to conduct the assessor functions if assessment is considered essential and leave all original evaluation team members in the team. Likewise, it was recommended that headquarters and technical resource members participate as full team members from the first meeting.

Field testing of some of the ETABS concepts and how ETABS would be accepted in the field was less than encouraging since the system procurement and installation is so far in the future. Most field employees interviewed, concerning the field impact of ETABS, lost interest in discussing the system's merits and impacts when informed that systems installation would be some time in 1984 or 1985.

The Field Impact Evaluation Team Members endorse the evaluation process as a useful tool with many applications in FAA.