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**Paper No. 3A:  
Group Problem Solving --  
How to Matrix**

U.S. DEPARTMENT OF THE NAVY  
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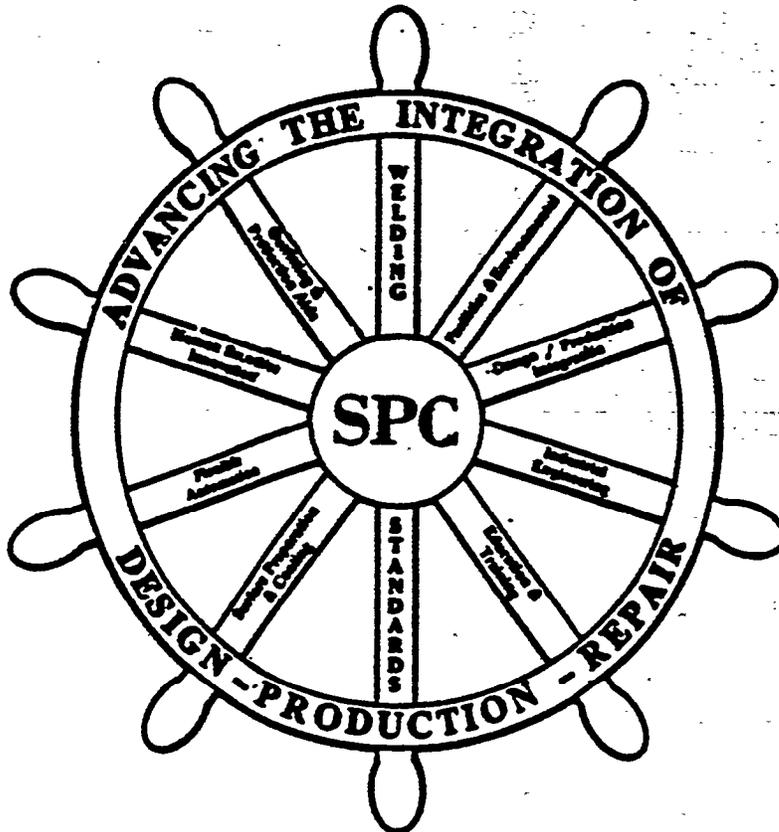
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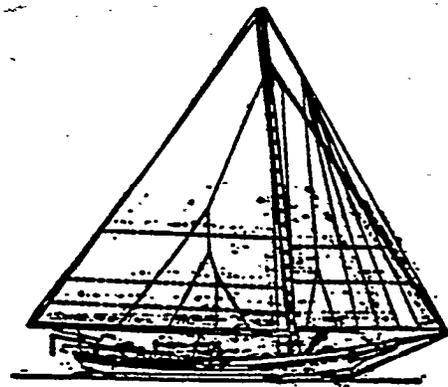
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# Group Problem Solving-How to Matrix

No.3A

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## ABSTRACT

PROBLEM-SOLVING GROUPS HAVE LONG BEEN PART OF SHIPYARD MANAGEMENT CULTURE, THE TRADITIONAL TITLE FOR THESE GROUPS HAS BEEN THE TASK FORCE. WITH ADVENT OF CHANGES IN CULTURE TO EMPLOYEE-INVOLVEMENT/PARTICIPATORY-MANAGEMENT, MANAGERS INSERTED QUALITY CIRCLES IN THEIR PROBLEM-SOLVING TOOLBOX, QUALITY CIRCLES AND TASK FORCES TYPIFY DISPARATE SITES ON THE GRID OF PROBLEM-SOLVING GROUPS, THE INCONGRUITY OF THESE GROUPS ENTREATS DEVELOPMENT OF ADDITIONAL PROBLEM-SOLVING GROUPS FOR THE MANAGERS TOOLBOX.

THE PAPER PROVIDES DEFINITION/CHARACTERISTICS OF FOUR PROBLEM-SOLVING GROUPS: TASK FORCES, QUALITY CIRCLES, STUDY CIRCLES, AND SPECIAL STUDY TEAMS, THE LATTER TWO GROUPS - STUDY CIRCLES AND SPECIAL STUDY TEAMS, REMEDY MANY OF THE DEFICIENCIES OF THE FORMER TWO GROUPS - TASK FORCES AND QUALITY CIRCLES. WITH THESE FOUR GROUPS THE SHIPYARD MANAGER HAS AN EXPANDED TOOLBOX TO TACKLE PRODUCTIVITY PROBLEMS.

## GROUP - PROBLEM SOLVING

A matrix is introduced to assist employee-involvement/ participatory-management groups determine the most effective problem solving methods given parameters of staff/budget/time, which are scarce resources.

## PROBLEMS

A problem may be defined as a source of perplexity, distress or vexation. A problem may also be characterized as a mystery. The shipyard manager may prefer a different definition of problem. To the manager problems fall upon a definition continuum - from distinguished to vague. Another definition continuum is from trivial to vital.

Once the shipyard manager has defined the productivity problem, the manager needs to select the solution process to fit the problem. When the productivity problem is distinguished (well-defined) and trivial, an individual should be dictated to solve the problem. Additional productivity problems - other than well-defined and trivial - need to be solved by groups.

## SOLUTIONS

Solutions to these productivity problems fall upon a continuum. The range of this continuum is from quick fix to root cause. The quick fix solution mends the fractured wheel. The root cause solution prevents the wheel from fracturing, and becoming a problem at the shipyard.

## PROBLEM - SOLUTION MATRIX

The problem definition continuum ranges from distinguished to vague (well-defined to ill-defined). See Figure 1. The problem definition continuum also ranges from trivial to vital (work-center to yard-wide). See Figure 1. The solution continuum ranges from quick fix to root cause. See Figure 1.

Lumping these continua stipulates the problem solution matrix. Ignored in this matrix are distinguished and trivial problems, for these problems may be solved by an individual. The treatment of quick fix solutions to vague problems is also ignored as being beyond the scope of the paper. A visual representation of the problem solution matrix is in Figure 2.

DISTINGUISHED ..... VAGUE  
 TRIVIAL ..... VITAL  
 QUICK FIX ..... ROOT CAUSE

FIGURE 1.

VAGUE	DISTINGUISHED
TRIVIAL	VITAL
ROOT CAUSE	ROOT CAUSE
VAGUE	DISTINGUISHED
VITAL	VITAL
ROOT CAUSE	QUICK FIX

FIGURE 2.

**RESOURCES**

Problem solving by a group compels allocation of scarce resources; Time/staff/materials are resources. If resources have a cost; then, resources are scarce. For this paper time, staff, and materials are scarce resources.

Time may be the scarcest resource for many shipyard managers. Budget variances are wontedly incapable of adding time to a schedule. At a shipyard the continuum for allocating time - as a resource - is the workweek - from 1 to 40 hours.

Staff is another scarce resource for the shipyard manager. Staff are those individuals, whether from within the work area or through organizational boundaries, whom develop the group. The limits for staff run from drafted to voluntary.

The continuum for materials is not studied, for costs of materials allocated to the group are insignificant with costs for time or Staff. Stationary-type costs and utility costs allocated for the meeting room are typical material costs.

**RESOURCE UTILIZATION**

Having defined the problem and desired solution, whether quick fix or root cause, allocation of scarce resources is required by the shipyard manager. In the problem solving toolbox are individuals and problem solving groups.

As individuals are dictated, when the problem is distinguished and trivial, the role of individuals is ignored in this paper. Major problems beyond the scope of distinguished/trivial need a group to adequately solve the problem. The group needs to be trained in problem solving skills specific to the group versus the individual. Group-problem solving is not a cookbook approach as with the individual. Well defined, work-center problems only need an individual for resolution. Individuals rotely following steps readily solve these minor problems with minimal assistance from the harried shipyard manager.

The initial problem-solving group was the task force. The traditional management approach to problem solving has been, and continues to be the task force. The participatory approach to problem solving is the quality circle, a generic term used to identify a participatory management approach to problem solving. Although long heralded and long honored in the breach, the quality circle is a revolutionary problem solving group. As these two groups are disparate sites on the problem solving grid, additional groups evolved for the problem solving tool box. Study circles are a hybrid of the task force and quality circle problem solving groups. The special study team is a cross of the task force and study circle.

The four group problem solving tools are: the task force, the quality circle, the study circle, and the special study team. These four problem solving groups for the tool box of the shipyard manager range from traditional to state-of-the-art. - Each problem solving group is now defined for this paper (each appendix provides characteristics, and a stand-alone how-to guide).

Task force - temporary grouping of selected individuals under one leader for purpose of accomplishing a definite objective (see Appendix 1 for characteristics and how-to guide).

Quality circle - small group of employees and their supervisor with same work area interests, who voluntarily form a team receive training in group problem-solving techniques, regularly meet to identify work related problems, recommend solutions to their management for approval, and monitor effectiveness of these solutions (see Appendix 2 for characteristics and how-to guide).

Study circle - systematic study of a common goal, with each member interacting and responsible for the circle, and with sufficient scope/flexibility to adjust activities

(see Appendix 3 for characteristics and how-to guide).

Special study team - temporary and facilitated group of volunteers for purpose of providing specific recommendations on a definite objective (see Appendix 4 for characteristics and how-to guide).

**GROUP MATRIX**

Resource continua for problem solving groups includes time and staff. time continuum ranges from 1 to 40 hours in a workweek. A typical workweek - 8- hours/day, 5-days/week, is considered to be the range of hours. See Figure 3. The staff limits range from drafted to voluntary. See Figure 3.

Lumping these continua stipulates the group matrix. Ignored in this matrix are diametrically posed problem solving groups. As an example having developed a voluntary group meeting one-hour-per-week, the paper will not develop a parallel drafted group. Permutations as a drafted group meeting one-hour/week are ignored, for these groups generally yield inferior solution. A visual representation of the group matrix is in Figure 4.

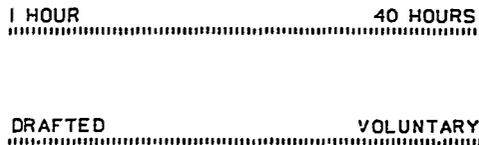


FIGURE 3.

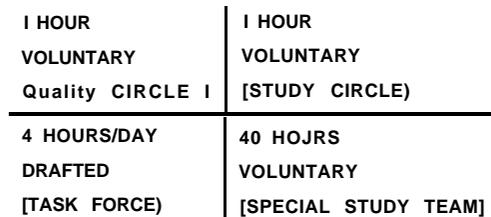


FIGURE 4.

**DRAFTED v VOLUNTARY**

The matrix suggests development of voluntary v drafted groups. Proponents of each group charge abuses and excesses of the other group. The argument of proponents of voluntary groups is ownership of the goal. While many adherents of the task force encourage the voluntary approach, these adherents

disagree with the ownership conclusion. Task force adherents argue against the negative aspect of the task force being involuntary participation. Although adherents encourage the voluntary approach, these adherents of the task force do not agree with the no ownership conclusion. Usually participants in the task force are selected by their respective bosses. While successes of task forces may not always "reap its just rewards," failures rarely go unnoticed by the bosses. When destructive criticism is absent, and arguments against voluntary groups are reduced to a common denominator, the salient objection of the critics is voluntary groups seriously vitiate contribution of the highly trained, well-informed, task force leader. Proponents of voluntary groups afford the reverse of the argument - if I do not recognize the problem then, I will not implement your solution to my problem. Preferring to seriously take rather than deflect criticism the argument posited is mastery of difficult problems may be achieved through voluntary groups, but not with permissive/unstructured approaches.

Experience at Mare Island Naval Shipyard prescribes establishing task forces to solve recurring problems. The initial chore of the task force ritually is to sift reports of prior task forces on the recurring problem. Oft the instance is the task force has admirably put out the fire. In solving the problem at hand, the task force rarely entraps the arsonist or prevents reoccurrence of the fire.

**GROUP PROBLEM - SOLVING MATRIX**

The problem solution matrix was stipulated in Figure 2. The group matrix was stipulated in Figure 4: As lumping continua stipulated the problem solution matrix and group matrix. combining these matrices stipulates the group problem solving matrix. A visual representation of the group problem solving matrix is in Figure 5.

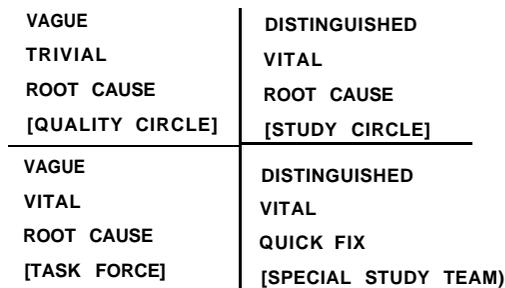


FIGURE 5.

## HOW - TO

The group problem solving matrix provides a rule-of-thumb. Given variances in scarce resources - time/staff/materials, which problem solving group of the matrix is best suited to the problem? The matrix may be utilized via diverse approaches. Defining the problem (vague v distinguished, trivial v vital) and selecting the solution (quick fix v root cause) is an approach to the matrix. Using this approach with the matrix compels allocation of scarce resources. After defining the problem and solution process, the nature of the problem solving group is determined by the matrix.

In another approach to the matrix the shipyard manager allocates scarce resources. With this approach the manager determines the amount of time/staff to devote to the problem solving process. Upon allocating time (1 hour, half-time, full-time) and staff (drafted v voluntary) the matrix again determines the problem solving group. The appendices provide a readily ensued map guiding the group over the problem solving landscape.

## RETROSPECT

Problem solving groups are part of shipyard management culture. These groups are essential in effective solving shipyard productivity problems. The matrix provides a how-to approach utilizing in-house shipyard resources. The user - *the shipyard manager* - should be free to pinch, punch, squeeze, and kick the appendices to best suit the needs of their Shipyard. The guidelines of the appendices are not meant to enslave the group. The guidelines are meant to ensure the greatest scope for development of precious and needed abilities of the group.

## APPENDIX 1

### TASK FORCE

A task force is a temporary grouping of selected individuals under one leader for purpose of accomplishing a definite objective (example - leaking hull valves after reinstallation during an overhaul).

#### CHARACTERISTICS:

**Participant Selection** - individuals are usually assigned to the task force due to being subject matter experts (example - the "cracker-jack" mechanical engineer from fluid systems)

**Participant Involvement** - usually involuntary, individuals are assigned to the task force as representative of higher authority ( example - as cognizant functional areas are identified, someone is delegated from the functional area - the engineer from fluids)

**Training** - individuals assigned due to being demonstrated subject-matter experts (yes), and presumed to be trained in sufficient group problem solving techniques (no - needed)

**Participant Representation** - in generating the task force, determinations are made to assure representation in group covering all functional areas (example - shop, support, engineering)

**Skill Level** - individuals are subject matter experts from various functional areas, skill levels in group are advanced in subject/function (example - general foreman- from the shop, mid-manager from support, engineer from fluid systems)

**Goal Selection** - pre-determined as definite objective of the task force (example - leaking hull valves)

#### HOW - TO

After selecting individuals and leader for the group, what is the next step? Although the group has individual subject matter expertise, group problem solving techniques are deficient in the group. To relieve this deficiency, the group needs a modicum of training in group problem solving. Minimum training should consist of brainstorming and cause/effect analysis. A host of training organizations provide separate modules, which may be presented in-house. These modules will become an accepted addition to training libraries. The training should be introduced at the initial meeting of the group.

Many trainers insist on training before initiating the task force. Several NSRP publications regarding problem solving teams specify classroom training before starting work. That the group receive training is more important than when the group is trained in techniques. Either approach - training before commencing the problem solving process or training-as-you-go, may be used for the group. - The Mare Island experience is the logic of training-as-you-go suggests immediacy of application by the group.

A facilitator needs to be assigned the group. The facilitator would direct the training. The facilitator would be a pro-active resource. The function of facilitation is to help members communicate at about the same level. Oft group members have the frustrating experience of not understanding some aspect of the goal, and being unable to state the source of difficulty. The facilitator serves subject to canons of group development/dynamics. Group interaction inevitably generates communication problems. Group interaction also exposes new potentials for development. The facilitator function is to minimize problem effects, and maximize group potential. A good facilitator adequately handles communication problems, and maximizes the potential of the group. In the task force, the facilitator needs to be pro-active versus an individual literally sitting at the back of the room. The facilitator is part of the group. problem solving process. The facilitator is not a reaction to the problem solving process.

The task force - as a group - meets 4-hours-a-day until solving the problem. Some insist the group meet full-time, 40-hours-a-week. Adherents believe the full-time approach leads to speedier results. Adherents also believe this approach allows the group deeper immersion in the problem. The Mare Island experience has been full-time and half-time groups without any evidence indicating which one is better. Observation with full-time task forces suggest the application of one of Murphy's laws: work expands to fill the available time.

After solving the problem, what is the next step for the task force. Recommendations need to be presented in a face-to-face meeting with those at the lowest level responsible for accomplishing task force recommendations. The Mare Island experience also is to have the boss of the responsible manager at the presentation. At presentation conclusion, more oft than not the boss will train on the responsible manager, and request, "When do you think you will

have that in place, Harry/Mary?" This commits the responsible manager and the boss accomplishing recommendations.

#### STEPS

- I. Selection - team/leader/facilitator
- II. Training - by facilitator in brainstorming and cause/effect analysis
- III. Problem Solving - with pro-active facilitation
- IV. Presentation - face-to-face with responsible manager and boss

#### APPENDIX 2

##### QUALITY CIRCLE

A quality circle is a small group of employees and their supervisor with same work area interests, who voluntarily form a team receive training in group problem solving techniques, regularly meet to identify work related problems, recommend solutions to their management for approval, and monitor effectiveness of these solutions (example - new sewing machines for the sail loft).

##### CHARACTERISTICS

**Participant Selection** - voluntary, the participant is usually expert at the immediate function (example - journey level sailmaker proficient in sewing machine operations)

**Participant Involvement** - voluntary, the participant has same work area interests as rest of the group (example - all group members work in the sail loft)

**Training** - the participants have expertise at immediate function (yes), group problem solving techniques (no - needed)

**Participant Representation** - as group is voluntary all functional areas may not be represented (example - an industrial engineer to determine methods/standards for the new equipment)

**Skill Level** - skill levels vary as participants are only expert at immediate function compared with subject matter (example - supervisor, mechanic, helper, temporary, clerk)

**Goal Selection** - any random goal is appropriate grist for the group (example - relocation/type of consumables carried in vending machines, Pepsi v Coke)

##### HOW - TO

The group problem solving matrix (Figure 5) suggests a quality circle, when

problem definition is vague/ trivial, and solution is elimination of the root cause. Quality circle is a generic term used to identify a participatory management approach to group problem solving. Typical evolution of a quality circle involves the supervisor. The facilitator initially trains the supervisor to become circle leader. It is the assignment of the supervisor to train circle members. Training may be a canned program of about 10 lessons. At minimum each lesson requires a meeting. Weeks in training usually exceed the number of lessons. In circle training, the facilitator literally sits at the back of the room and only serves as a resource person. The Mare Island experience is to incorporate a current work area problem of the circle in the training. The training-as-you-go approach has advantage of immediacy of application by the circle.

Many organizations espouse teams/circles/groups met full-time (40 hours/week) until solving the problem. Adherents believe the full-time approach leads to speedier results. Adherents also believe this approach allows the group deeper immersion in the problem. Adherents argue that the one-meeting-a-week format saves nothing in total hours, but delays the solution for months. Proponents of quality circles even admit the weekly meeting-format retards problem resolution. With the weekly format for quality circles, the Mare Island experience is 6 to 12 months to solve a problem. A circle meeting full-time for one week uses an equivalent time as a circle meeting for 40 weeks in the weekly format. Circles meeting longer than one hour or more frequent meetings - when permitted in the work area - are not exceptional. The Mare Island experience has been circles meeting one-and-a-half hours., twice-a-week, without any evidence indicating disruption of the work area.

After solving the problem the facilitator schedules a management presentation for the circle. The face-to-face meeting allows the circle to present recommendations to those responsible for accomplishing the recommendations. The Mare Island experience is have the boss of the responsible manager at the presentation. When the recommendation is accepted, the responsible manager and boss commit to accomplishing the recommendation. As quality circles are enduring entities, the Mare Island experience is to have the circle brainstorm the next problem while preparing for the management presentation. The brainstorming activity affords a modicum of continuity, and allays post-presentation blues.

## STEPS

- I. Training - of supervisor/leader
  - II. Organization - volunteers with work area interests
  - III. Training - of circle members by leader with facilitator as resource expert
  - IV. Problem Solving - with reactive facilitation
  - V. Presentation - face-to-face with responsible manager and boss, concurrent brainstorming for next problem
- Problem Solving - return to STEP I V

## APPENDIX 3

### STUDY CIRCLE

A study circle is a systematic study of a common goal, with each member interacting and responsible for the circle, and with sufficient scope/flexibility to adjust activities (example - hull patch coordination).

### CHARACTERISTICS

**Participant Selection** - subject-matter experts volunteer to serve on group (example - naval architect from design)

**Participant Involvement** - participants hold ownership as group members share common goal (example - all group members agree have problem needing elimination)

**Training** - group utilizes facilitation, and receives training in group problem solving techniques (example - facilitator trains group in brainstorming and cause/ effect analysis)

**Participant Representation** - in generating group all involved functional areas are assured representation (example - group requests mid-level management member from non-destructive test)

**Skill Level** - participants are subject-matter experts, and receive training in group problem solving techniques (example - GF from shop, mid-manager from support, naval architect from staff)

**Goal Selection** - objective of group is pre-determined (example - lack of coordination between shops causes rework in installation of hull patches)

## HOW - TO

There are two rules the group needs to follow to be effective. The cardinal rule is the study circle is voluntary. The second rule is interest in the goal. Adherence or lack of adherence to these rules determines success or lack of success of the study circle.

It remains for the interested shipyard manager to select goal and participant representation for the circle. After preliminaries (goal selection, participant representation/involvement/selection) are discharged by the manager, an initial meeting should be scheduled by the facilitator.

The initial meeting is an organizational meeting led by the facilitator. Assignment of the facilitator is: to assure all are committed, the group determines the extent of the study

circle, and the group determines regular members. After the initial meeting, the facilitator leads the group in training - brainstorming and cause/effect analysis. Leadership of the circle is given to members after training completion. Leadership of the circle is rotated among members.

Many trainers insist on training prior initiating the circle. That the group receive training is more important than when the circle is trained in techniques. The Mare Island experience is the logic of training-as-you-go suggests advantage of immediacy of application by the group. Many trainers also insist on selecting a leader before starting work. The Mare Island experience on leadership rotation exposes new potentials for members. Rotation enhances the process, assures group communication, adequately handles the problem and realizes members potential.

The facilitator is a pro-active resource for the group. The role of facilitation is to help members communicate at about the same level. The facilitator serves subject to canons of group development/dynamics. In the study circle; the facilitator needs to be pro-active versus an individual literally sitting at the back of the room

Many organizations espouse teams/circles/groups met full-time (40 hours/week) until solving the problem. Adherents believe the full-time approach leads to speedier results. Adherents argue that the one-meeting-a-week format saves nothing in total hours, but delays solution for months. The mean Mare Island experience is study circle accomplished the task in 19 weeks, with 15 meetings, taking 105 meeting-hours. A group meeting full-time for one week uses an equivalent time as a circle

meeting 40 weeks in weekly format. AS an example a group of three meeting full-time uses 120 meeting hours a week.

Rotating leadership in the group requires a pro-active facilitator. For the circle to be effective, the facilitator needs to devote time to evaluating inevitable group process problems. The facilitator needs to diagnose/evaluate circle effectiveness.

The point made is the method suggests the circle budget time for evaluation. The facilitator may be helpful by sharing diagnosis/insights/interpretations, what is occurring in the circle. This will give members a model to follow in the circle.

After resolving the problem recommendations need to be presented in a face-to-face meeting by circle members. At this presentation are those responsible for accomplishing the recommendation. The Mare Island experience is to have the boss of the responsible manager at the presentation. This commits the responsible manager and the boss accomplishing accepted recommendations.

#### STEPS

I. Determine Goal - performed by the sponsoring manager, problem needs to be distinguished/vital, solution is to eliminate root cause

II. Selection - performed by sponsoring manager, team/facilitator

III. Organization - by facilitator; assures all are committed, extent of study circle, regular members

IV. Training - by facilitator in brainstorming and cause/effect analysis

V. Problem Solving - rotating leadership with pro-active facilitation

VI. Presentation - face-to-face with responsible manager and boss

#### APPENDIX 4

##### SPECIAL STUDY TEAM

A special study team is a temporary and facilitated group of volunteers for purpose of providing specific recommendations on a definite objective (example - accurate job-order charges).

##### CHARACTERISTICS

Participant Selection - subject-matter experts volunteer to serve on group (example - industrial engineer from production)

Participant Involvement - individuals hold ownership as members share common goal (example - all participants have problem needing solution)

Training - individuals have subject-matter expertise (yes), group problem solving techniques (no - needed)

Participant Representation - in generating team sponsor assures all function areas are covered (example - shop, support, engineering)

Skill Level - individuals are subject-matter experts, skill levels in group are advanced in subject/function (example - supervisor from shop, project manager from support, engineer from production)

Goal Selection - pre-determined as definite objective of group (example - charging accuracy)

##### HOW - TO

The stipulated goal of the special study team is quick fix solution to a distinguished problem vital to the shipyard. Elimination of the root cause of the problem requires a study circle. The special study team is a full-time for one week assault on the problem. At end of the week, the team has composed a report, and ready to make a presentation.

The problem needs to be distinguished, and comprehended by all participants. Upon defining the problem representation areas need to be determined by the sponsor with aid of the facilitator. The representation areas need to be under control of the sponsor. This control assures volunteers will not be impeded team members. After selection the facilitator provides members all available background information on the problem before commencing team meetings.

At commencement the facilitator has each member state their comprehension of the problem. Upon concluding this activity the sponsor is introduced, and welcomes the team. The sponsor peruses the statements, and reconciles their comprehension to the goal. Upon sponsor departure the team states their goal. Having the team reach consensus on the goal reduces hidden agenda.

At this pass it is noted there is no leader, neither selected nor appointed by the sponsor or the team. This absence of a specific leader endures throughout the tenure of the team. The facilitator guides the team through the problem solving process versus is the leader of the team. With continuous pro-active facilitation, the team does not need a leader to solve the problem.

Training is embraced in the 40 hours allocated to the team. Training is provided by the facilitator. Upon reaching consensus on the goal, the team enters training in group problem solving techniques. The team is trained in brainstorming and cause/effect analysis. Depending upon prior group experiences of members, the team should complete training after 4 to 8 hours into the study.

In the special study team, there is continuous facilitation. Literally sitting at the back of the room, only serving as a resource person is not an apt description of this team facilitator. The role of the facilitator retains goal direction of the team and minimizes dysfunctional group roles. Pro-active facilitation is needed for the team to match the 40-hour goal. The facilitator guides the team over the problem-solving landscape.

The Mare Island experience has been full-time (40-hour week) and half-time (20-hours per week for 2 weeks) special study teams. The experience is without any evidence indicating which duration is better.

As the week unwinds, the team composes a report. A sole sheet cover delineates the problem, identifies the enclosed body of the report, and lists recommendations. The body ensures the cover detailing how/why of the recommendations. Each member signs the cover at study conclusion.

To close the study, the facilitator arranges a face-to-face presentation with the sponsor. This presentation is arranged within a week ensuing study conclusion so the sponsor may have occasion to peruse the report. At the presentation any report ambiguities are clarified by the team/sponsor.

## **S T E P S**

**I. Determine Goal - performed by sponsoring manager, problems needs to be distinguished/vital, solution is quick**

**II. Selection - performed by sponsoring manager and facilitator**

**III. Organization - background information provided members by facilitator prior commencing study**

**IV. Training - by facilitator in brainstorming and cause/effect analysis**

**V. Problem Solving - team guided by Continuous pro-active facilitation during study**

**VI. Report - signed by members at study conclusion**

**VII. Presentation - face-to-face after report perusal by sponsoring manager**

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