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COMMUNICATION TRAINING FOR AIRCREWS:
A REVIEW OF THEORETICAL AND PRAGMATIC ASPECTS OF TRAINING PROGAM DESIGN

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Abstract

This study is the final report of a project studying methods for communications training applicable to both civilian and military aviation personnel, including multiperson teams of single pilot fixed wing or rotary wing aircraft. A review is provided of a number of theories which have been proposed as relevant for producing training materials on improved communications. Criteria are given for evaluating the applicability of training programs to the aviation environment, and these criteria are applied to United Airlines' Resources Management Training, as well as to a number of commercially available general purpose training programs. The report considers in detail assertiveness training and grid management training, examining their theoretical background and the attempts which have been made to validate their effectiveness. The findings are that there are substantive difficulties in assessing the effectiveness of both training programs, as well as problems with the theories underlying them. However, because the aviation environment offers unique advantages for studying the effectiveness of communication training, recommendations are made on the design of appropriate training programs and on procedures that might be used to validate them.

Table of Contents

List of Figures

1. Introduction

This is the final report of a project studying methods for communications training applicable to both civilian and military aviation personnel, including multiperson crews, and teams of single pilot fixed wing or rotary wing aircraft teams.

It is well known that a high percentage of aviation accidents are caused wholly or in part by problems of communication and human resource management; for example see (Murphy, 1977, Ruffell-Smith, 1979). In its investigations of a number of commercial aviation accidents, the National Transportation Safety Board has recommended assertiveness training for crew members as one way to reduce the number of such accidents, for example, (NTSB, 1976). Previous and current research at NASA have attempted to determine more exactly the nature of the communication problems that lead to accidents (Goguen and Linde, 1983), (Murphy *et al*, 1984, Foushee and Manos, 1981). For aviation crews, accurate and timely information transfer is essential, and improper communication habits may impede or compromise such transfer. Therefore, various forms of trianing have been proposed for crew members. The current project investigates available training programs and techniques that could apply the results of such research to the practical problem of training air crews to communicate in more effective ways. The aim would be to design a training experiment using a currently available training package as a framework to support the specifics of appropriate communication suggsted by NASA research.

This report gives criteria for evaluating the applicability of training programs in the aviation context, applies these criteria to United Airlines Resources Management Training, as well as to a number of commercially available general purpose training programs, and also reviews a number of approaches which have been considered as possibly relevant to devising optimal communications training packages for use in aviation contexts. The report focuses on assertiveness training and grid management training for a number of reasons.

1. Of the approaches examined, these two are most directly involved with the practical issue of altering the nature of communication in small group situations.
2. Assertiveness training has been targeted by the NTSB as a possible training method for commercial aviation crews.
3. Assertiveness training, in the context of cockpit resources management, has been considered as the basis for the development of experimental training programs in communications skills at NASA. (See (Cooper et al, 1979) *passim*.)

1

4. Grid management training is currently in use as the basis of United Airlines' Command/Leadership/Resource Management program, and hence has demonstrated applicability to the aviation context.

This report examines the theoretical background of assertiveness training and grid management training and the attempts to validate their effectiveness. It also offers a critique of the relationship between both forms of training and some larger social and linguistic issues.

To summarize, we have found that there are substantive difficulties in assessing the effectiveness of both training programs. However, it seems posisble to overcome these difficulties, and training in the aviation context appears to offer particular advantages for studying the effectiveness of communications training programs. Since we have found that there is no appropriate training program in use which has been properly validated experimentally, the report also offers recommendations to NASA on the design of a training program that might be appropriate, and on procedures that might be used to validate such a training program.

2. Review of Theories

As discussed above, the specific area considered in this report is training to alleviate problems caused or exacerbated by poor communication or crew coordination. This section examines a wide array of theories of communication and management which might be relevant for this purpose, chooses two of them, assertiveness training and grid management training as most immediately relevant, explains the reasons for discarding the others, and provides a critical review of these two approaches.

2.1 Review of Communication Studies

In order for a theory of communication or effective management behavior to be relevant to the problems of communication in the aviation context, it must have the following properties:

1. It must be concerned with areas of communication which appear to cause problems in aviation communications.

2. It must be concerned with aspects of communication which are demonstrably trainable.

3. It must be concerned with actual linguistic performance, rather than with theoretical aspects of language or communication. This criterion is established because there are many valid theoretical formulations of language and even of communication which have no consequences for understanding practical communication problems and the design of communication training.

4. It must be concerned with short term patterns of communication. Flights can last from 10 minutes to 24 hours, and, at least in the commercial aviation situation, crews rarely work together on a long-term basis. Therefore, any theory concerned with long-term patterns of communication or management style, or with problems that develop over a long history of interactions will not be relevant.

5. It must be concerned with spoken language specifically, rather than with other modes of communication. In the aviation context, although communication occurs through written language, and through non-linguistic modes such as body language, the primary method of communication is spoken language, and the majority of problems occur in spoken language.

Theories and programs which have been proposed as relevant to aviation communications include: Communication theory, general systems theory and cybernetics, theoretical linguistics, theories of nonverbal coding, interpersonal communications theories (including

theories of perception and listening), small group communication, organizational communication, team development, leadership training, assertiveness training, and grid management theory. We will consider these in turn, discussing first the unsuitable theories, and then the theories which will receive further consideration.

There are a number of general theories of communication, including information theory (Shannon and Weaver, 1949), (Berlo, 1960), (Schramm, 1963), (Barnlund, 1968), (Barnlund, 1970), and General Systems Theory (Von Bertalanffy, 1962). These theories attempt to specify the necessary mathematical properties of information transfer, and of systems in which information transfer takes place. They are not of immediate concern to aviation communications training, since they do not satisfy criterion 3: they are concerned with the theoretical nature of communication rather than with empirical variations in performance.

Theoretical linguistics considers the structure of language, and so might appear to be a fruitful area to examine for insight into problems of communication. Howover, from its beginning, (Chomsky, 1957), to the present, (see for example, (Chomsky, 1986), (Gazdar et al, 1985), (Sells, 1985)) such research is concerned with the theoretical structure of language and the best formal means of describing it, rather than with performance and its successes and failures. Such studies are thus not relevant by criterion 3. More promising are studies in sociolinguistics (for example (Linde et al, 1987), (Trudgill, 1974)), pragmatics (Levinson, 1983), and discourse analysis (Linde, 1981), (Brown and Yule, 1983), which do focus on language in use. Work in such fields can suggest formulations of processes which may cause difficulties in communications, and thus may serve as input to studies directed towards research in aviation communication problems and as eventual input to communication studies. (Note that (Goguen and Linde, 1983) uses sociolinguistics and discourse analysis in just this way.)

There are a number of theories of non-verbal communication, which include kinesics (the study of body activity) (Birdwhistell, 1952), proxemics (the study of space) (Hall, 1959), and paralanguage (the study of vocal or physical aspects of delivery that accompany language, such as pitch, volume, quality, inflection, rate, and vocal characteristics including laughter, yawning, etc.) (Trager, 1958). These are rejected because they do not satisfy criteria 1 and 5: they are not areas which have been shown to be a major source of difficulty in aviation contexts, and therefore there is no need to include them in a training program.

Turning from a focus on the theoretical nature of communication to its psychological aspects, there are theories of perception, which consider the processes of selection of stimuli from the environment, and the effect of self concept and self awareness on perception ((Argyle, 1969), (Schneider *et al.*, 1979), (Vernon, 1970), (Luft, 1969)). In a related area, theories of interpersonal communication, such as are presented by (Goss, 1982), (Mortensen, 1972), and (Schroeder *et al.*, 1967), consider the processes by which a person examines and evaluates any interaction between himself and others, and the ways in which an individual's background, memory, and cognitive organization affect the ways in which incoming information is received and understood. Although questions of this sort are certainly important in the aviation context, it is difficult to specify their effect on aviation communication, and even harder to provide training for improvement. This area remains undecided on criteria 1 and 2.

An area which might form a part of communication training for aviation in the future is training in active listening. Theories of listening consider the difference between passive and active listening and the factors which interfere with the ability to listen ((Barbara, 1957), (Gibb, 1961), (Clark, 1980)). There is at least anecdotal evidence to show that listening problems form a part of difficulties in aviation communication. Further research would be required to show this and to investigate the demands on listening that are peculiar to the aviation context before incorporating a major component of listening training in an aviation communications training program. This area thus remains undecided on criterion 1.

There have been many studies of the nature of small groups and their process of interaction ((Durkheim, 1933), (Lewin, 1948), and (Cartwright and Zander, 1968)). These would appear to be extremely relevant to the question of improving aviation communication, since any aviation crew, whether civilian or military, fixed wing or helicopter, fits the definition of a small group, as formulated, for example, by (Shaw, 1981):

> Two or more people who are interacting in such a way that each person influences and is influenced by each other person. (p. 6)

However, these studies operate at the theoretical level, and do not consider the actual details of how communication in small groups takes place; they are thus excluded by criterion 3.

More promising are the studies, beginning with (Bales, 1950), which attempt to provide a taxonomy of all possible small group behaviors, so that all utterances made by a group

member can be identified as a specific type of action ((Bales *et al.*, 1979), (Fisher, 1980), (Tuckman, 1965)). These studies are relevant in that they are concerned with the moment to moment details of small group communication. However, they are primarily designed as a research tool for the theoretical investigation of small group behavior, and so do not offer accounts of optimal behavior, or how to train for such behavior. Thus, they fail on criteria 1, 2 and 3.

There are, of course, studies that are focused specifically on small group communication and decision making, but these too are concerned with either theoretical descriptions of the nature of small group communication or with long-term patterns of information flow within the group. Thus, they fail on critieria 3 and 4. For example, (Farace *et al.*, 1977), (Leavitt, 1963). (Dewey, 1910), (Bennis and Shepard, 1956), and (Brilhart, 1974) offer models of the process of group decision making which apply at both the immediate and long-term levels. These models are related to the one used in grid management theory which is discussed in Section 2.4.

On a somewhat larger scale than the study of small group behavior, there is a great deal of investigation of management styles, developed at least in part because of the recent interest in the Japanese management approach. Most of these studies attempt to provide a description of long-term managerial styles and strategies ((McGregor, 1960), (Likert, 1967), (Hersey and Blanchard, 1977), (Ouchi, 1981)). These fail on criterion 4.

The two approaches which have been chosen for more detailed analysis are assertiveness training and grid management training. Assertiveness training, originally developed from behaviorist psychology, is considered here because it has been proposed as a solution to certain types of communication problems in the cockpit, both by the National Transportation Safety Board (NTSB, 1976), and by NASA researchers who have considered using assertiveness training as a framework which could be tailored to include the results of specific research on communication problems in the cockpit. Grid management has been chosen because it forms the basis of the United Airlines Command/Leadership/Resource Management training, a program which United Airlines feels to be a success, and which has been widely copied by other airlines. Since grid management theory is already being used for training in the aviation context, it is clearly and immediately relevant as a subject of detailed study. We discuss these in turn, beginning with assertiveness training.

6

2.2 Assertiveness Training

This section first defines assertiveness training, and considers its theoretical background and the relation of this background to the actual practice of assertiveness training. Section 2.3.3 then provides a critical assessment of this research, and its social and linguistic assumptions. We may summarize this discussion of assertiveness training by noting that this approach has a number of problems which render it unsuitable for use in the aviation context:

- Focus on individual communicative style, and individual needs, rather than on effective group communicative functionning.
- Lack of full validation of the effectiveness of assertiveness training methods.

2.2.1 Definition of Assertivness Training

We define assertiveness training to include any technique or program which claims to bring people into a better relation with others by teaching them new techniques of communication or social interaction[1]. The distinguishing characteristic of assertiveness training (as opposed to most psychotherapeutically oriented techniques) is that it attempts to work with behavior only, rather than with assumed underlying causes or with the historical genesis of behavior.[2]

Before discussing assertiveness training methods, let us consider what is meant by assertiveness. A review of definitions of assertiveness is given by (Rich and Schroeder, 1976):

> The early definitions of assertiveness are vague and general. (Wolpe and Lazarus, 1966), for example, defined *assertive behavior* as *all socially acceptable expressions of rights and feelings* (p. 39). In addition to expressions of anger, irritation, disagreement, and annoyance, positive expressions of joy, praise and love were included. Other general definitions, such as ability for self expression (Lieberman, 1972) and habit of emotional freedom (Lazarus, 1971), have also been offered. In an attempt to provide a more behavioral and transactional definition, (Alberti and Emmons, 1974) defined *assertiveness* as

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[1]Note that in the last few years, the term *assertiveness training* has begun to be challenged by broader terms such as *social skills training* and *social competence training*. This change in terminology is based on a change in the underlying model of why people behave unassertively, from a psychological trait model to a social skills model. However, the techniques used have not changed markedly. We use the term *assertiveness training* since it is still the single most commonly used term

[2]This is also true of other behavior modification techniques, such as treatments for addictions, phobias, and sexual dysfunctions; however such techniques are not relevant for the present study.

"behavior which enables a person to act in his own best interest, stand up for himself without undue anxiety, to express his rights without destroying the rights of others" (p. 3). Other attempts to define assertiveness have resulted in operational definitions and identification of specific response classes of assertiveness. (Lazarus, 1973) proposed that assertive behavior be divided into four separate and specific response patterns: (a) the ability to say No, (b) the ability to ask for favors or to make requests (c) the ability to express positive and negative feelings and (d) the ability to initiate, continue, and terminate general conversation. (Galassi *et al.*, 1974) identified three response classes of assertiveness: expression of positive feelings, negative feelings, and self-denial. *Self-denial* was defined as the tendency to have exagerated concerns for the feelings of others. Other operational definitions include the ability to express opinions and disagree with opinions contrary to one's own (Lawrence, 1970), the ability to initiate and maintain social interactions (O'Connor, 1969), and the ability to make self-enhancing rather than self-denying responses and decisions in conflictual situations (Goldstein *et al*, 1973). (pp. 1081 – 1082)

The theoretical background of assertiveness training, like many other forms of behavior modification, is behaviorist psychology, or more specifically, learning theory (Emmons and Alberti, 1983). All works on assertiveness training which give any theoretical basis for it at all (and many do not) cite classic works in behaviorist psychology. Their fundamental assumption is that the primary focus of therapy should be overt, observable behavior. By bringing about a change in the targeted behavior, the person is changed. Therefore, there is no need to posit underlying structures, such as the unconscious and its mechanisms, or even complex cognitive structures. Such constructions have the status of epiphenomena: they may be present, but in fact they have no effect on behavior, and so they can profitably be ignored. A very strong statement of this position is given by (Salter, 1949):

> The human animal, intelligent as he may be, can no more think his way out of
> an emotional problem than the monkey in the zoo. He can only be trained out
> of it. We are no better than our equipment, and our equipment is primitive. ...
> Only the drilling into the human tissues of healthy habits will yield "good"
> thinking and feeling. We are meat in which habits have taken up residence.
> We are a result of the way other people have acted to us. We are the
> reactions. Having conditioned reflexes means carrying about pieces of past
> realities. (p. 36)

2.2.2 Relation of Theory and Practice

Let us now consider the relation between the underlying theory and the practices actually used in assertiveness training. Although behaviorist psychology is cited as the basis of assertiveness training, it is not at all clear that this claim of atheoretical basis is actually necessary to justify the techniques used. (Emmons and Alberti, 1983) offer the following list of techniques used: journal keeping, record keeping, guided practice, role-reversal, psychodrama, behavior rehearsal, mirroring, modeling, audio, video and verbal feedback, token feedback, flooding, desensitization, covert practice, coaching, self-management, homework, contracting, nonverbal exercises, self-disclosure, small group discussion, group assignments, field trips, films, and selected readings. Clearly, a number of these techniques (such as value clarification and small group discussions) are unrelated to behaviorist psychology, and may indeed be contradictory to its assumptions. Furthermore, these techniques are employed in many other forms of training which have no explicit behaviorist orientation. For example, the grid management technique that forms the basis of United Airlines' training claims General Semantics (Korzybski, 1933) as its theoretical basis (see (Blake and Mouton, 1985), Appendices A and B), a theory that differs radically from behaviorist psychology. Nevertheless, grid management employs many of the same techniques (e.g behavior rehearsal, coaching, etc.).

A similar point is made by (Rathus, 1975) about the combination of assertiveness training techniques with conventional methods of psychotherapy:

> There is no need to see AT [assertiveness training] as being theoretically rooted in any particular school of personality or psychotherapy. It is certainly true that the major credit for the development of AT must be given to men such as Andrew Salter and Joseph Wolpe, and that the large body of literature has been written primarily from the behavioral point of view. However, as this paper has been written in broad, eclectic terminology, so is it possible for therapists who identify with any school to use AT techniques on an empirical basis. The ten techniques presented in this paper may be used as a client's central treatment modality, or they may be used as an adjunct with any other form of treatment. (p. 19)

2.2.3 The Validation of Assertiveness Training Techniques

This section discusses attempts to validate the effectiveness of assertiveness training techniques, and the relevance of such validation studies to possible training programs in aviation.

2.2.3.1 Literature on Validation of Assertiveness Training Techniques

Attempts to validate the claims of assertiveness training have lagged behind the explosion of books, articles, and training programs that advocate it. Assertiveness training, like all psychotherapeutic techniques, is difficult to investigate. Although some assertiveness training programs attempt to provide a definition of success in terms of behavioral change, its effects are still difficult to assess. (McFall and Marston, 1970) suggest the following areas of difficulty:

1. An adequate definition or specificity of the response classes of assertiveness is lacking.

2. The components of assertive behavior have not been identified.

3. Assertiveness training, as typically described, appears to be a complex, unsystematic, and unstandardized procedure that employs a variety of *brand name* (modeling, behavior rehearsal, role playing, etc.) treatment packages in combination.

4. Reliable and objective laboratory and real-life measures of assertive behavior have not been developed.

(Rich and Schroeder, 1976) concur:

> Despite a variety of advances in assertiveness training, the major problems identified by (McFall and Marston, 1970) have not been dealt with directly. Although behavior therapists have paid lip service to situational determinants of behavior, they have treated assertiveness as a trait. Research needs to recognize that different response classes and different situations need to be treated separately. Being able to say No to the boss apparently has little transfer to being able to ask him or her for a raise or the ability to compliment a friend. (p. 1094)

(Linehan and Egan, 1979) focus on the fact that the effects of assertive behavior are untested:

> As described earlier, the effectiveness of any interpersonal response can be evaluated in terms of its objective effectiveness (in achieving the objectives of the response), its relationship effectiveness (in maintaining the relationship with the other person), and self-respect effectiveness (in maintaining the self-respect of the actor). Promotion of the direct style of interaction in assertive situations is based on the assumption that when individuals state what they want in a clear concise manner, they are more likely to obtain it than if they give an ambiguous, indirect message or, unassertively, say nothing at all. Amazingly, this assumption has no data to support it. Virtually every assertion-training
> , program currently in existence, however, operates as if it were true. (p. 259)

(Galassi *et al.*, 1981) point out that assertiveness training techniques have not been fully validated:

> From our perspective, the most pressing need in social skill outcome research is for demonstrations of generalization of laboratory gains to behavior in the natural environments based on unobtrusive behvioral measures of known reliability and validity. Much of the support for assertion and social skills training has been built around behavioral role-playing tests. To the extent that those tests continue to be shown to possess limited validity, the data generated from them will continue to build only an analogue case for the effectiveness of assertion and social skills training. (pp. 329 – 330)

(Emmons and Alberti, 1983) pose this issue in a way directly related to the issue of the value of training programs for a domain such as aviation:

> Do the gains in assertive behavior from participation in workshops, groups, or individual therapy hold up in real life? This is the key research issue facing assertiveness training today. Do good results transfer out of the laboratory or therapy setting into the person's actual everday living situation? To date, the results are equivocal. Some studies indicate success in generalization to real life, whereas others do not. Part of the difficulty involves setting up valid ways of measuring transfer. Gathering adequate followup information is crucial, yet doing so is difficult. (p. 128)

2.2.3.2 Match Between Validation Studies and Training Programs

This section assesses the relation between existing validation studies and the commercial assertiveness training programs which might be used as the basis for aviation training programs. In general, validation studies have focused on assertiveness training in a therapeutic model, which involves repeated sesions with a therapist or trainer, over an extended period of time, either individually or in a group. As far as we have been able to determine, there have been no studies using the seminar model, in which one to three days of intensive training is offered[3]. Another important difference between existing studies and possible training models for the aviation situation is the identity of the subject population.

Let us first consider length of training. In general, commercial assertiveness training progams last between one and three consecutive days, with no followup training available. As noted above, most of the assertiveness training programs whose effects have been studied are structured more like therapeutic encounters, typically involving one

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[3]Commercial training firms, when questioned about validation, offer only customer testimonials as proof of the effectiveness of their training.

hour sessions over periods of from 2 weeks to more than 6 months. (Ruben, 1985) in an annotated bibliography on assertiveness training research from 1973 to 1983 shows *no* research using the seminar model, in the 892 articles and 81 books surveyed. The therapeutic model permits review of how the training is working in the subjects' real world situations, discussion of how to handle developing problems, and reinforcement by the therapist for initiation of assertive behavior. It remains an open question whether the results obtained from testing long-term assertiveness training can be generalized to short, intensive programs.

Let us now consider the characteristics of the subject population studied in the materials reviewed above, and compare them with the characteristics of the potental population for aviation training studies. The issue of subject selection in research on assertiveness training has been discussed by (Curran, 1979):

> The description of subject-selection procedures in many studies on social skills training is vague and unclear. In many cases it does not appear that any valid criteria were used other than convenience. In many cases it is unclear whether the selected subjects were actually performing inadequately in social situations, regardless of whether this poor performance was due to an actual deficit or the result of some inhibitory process. Often sujects are "nominated" as being eligible candidates for social skills training, but it is unclear what criteria the various individuals doing the nominating were using and whether these criteria were consistent across nominators. In those cases where subjects were assessed on purported measures of social skill prior to treatment, the lack of normative data still leaves it unclear whether these subjects were socially incompetent. Even if the subjects selected for a study are socially incompetent, they may be judged incompetent for different reasons; that is, one individual may have been nominated because of a low rate of positive behavior while another individual may have been nominated because of a high rate of obnoxious, antisocial behavior. The selected subjects may also be heterogenous with respect to many other variables. (p. 342)

In the studies we have examined, there appear to be three basic sources of subject populations for assertiveness training studies.

1. Self-referred patients, who have sought therapy because they perceive some problem with their social relations (see, for example, (Eisler *et al.*, 1975)).

2. Institutionalized patients, chosen to be the least deteriorated of the available patient population. Given the conditions for psychological institutionalization, these are usually severely disordered or psychotic patients (see, for example, (Wagner, 1968), (Nydegger, 1972)).

3. College students, of course, are the most commonly used subjects. They may be

randomly chosen from undergraduate psychology courses (sse, for example, (Young *et al.*, 1973), (McFall and Lillesand, 1971)). They may be partially self-referred by being given the opportunity to volunteer for an experiment in which they will recieve some assertiveness training (see, for example, (Rimm *et al.*, 1974)). Or they may be selected from the general population in undergraduate psychology courses by some measure of deficit in assertiveness (see, for example, (Friedman, 1971)).

In contrast, training in the civilian or military aviation context does not admit self-referral. Subjects are required to take the training as part of their ongoing career training, whether or not they may feel that they have any problem in communication or social relations. It might be argued that this situation is analogous to experiments studying a random sample of college students, since such students are also not self-referred. However, the two situations are not comparable, since adolescents' reception of social skills training is likely to be more favorable than that of adult professionals. Therefore, it can not be assumed for the aviation context that the results of such obligatory training would be the same as that of voluntary training. Although this factor may make it difficult to generalize the results of exisiting evaluation studies to an aviation population, it could also be an advantage for research on the effects of communiations training on aircrew members, since lack of self-referral would eliminate one source of subject selection bias.

2.2.4 Conclusions

As the above discussion indicates, asertiveness training has not been subjected to a thorough and controlled evaluaiton. Differences in the definition of assertiveness, and difficulties in defining the desired results have resulted in a wide variety of inconclusive or non-generalizable studies. Furthermore, the applicability of assertiveness training to the aviation context is unclear, since there there are great differences in the characteristics of the subject population and the model for delivering training. Finally, assertiveness training focuses on individual communication, and therefore has little or nothing to contribute to the smooth functioning of group communication.

2.3 Social and Linguistic Assumptions of Assertiveness Training

Thus far, we have considered the psychological background of assertiveness training, and attempts to validate it as a therapeutic method. We turn now to wider issues: the relation of assertiveness training to the linguistic and social context in which the assertive behavior is to be performed.

2.3.1 Social Assumptions of Assertiveness Training

The basic assumption of assertiveness training is that interpersonal problems are problems of communication; that is, people fail to get what they want because they fail to communicate clearly and assertively. It is assumed that if someone can learn to present his needs and wants clearly and assertively, he can be assured of accomplishing them, or at least of suffering no negative consequences for having spoken out. People's fears of communicating clearly are treated as neurotically based.

These assumptions presuppose that many, if not all, conflicts are in fact misunderstandings; that is, if we all understood one another, we would have no real differences of interest. This is a strong statement of a line of thought which is an unstated assumption in all assertiveness training literature. It is necessary to make this assumption explicit and to examine it directly, in order to determine the potential applicability of assertiveness training to the aviation training situation.

Consider the following example, from (Zuker, 1983) (p. 62), which is typical of assertiveness training publications and programs:

> Suppose that your boss has asked you to work overtime several nights this week. You feel put upon and think that your boss has no concern for your personal life. You might approach the boss in this way.
>
> I SEE (*what you objectively perceive in the situation*) that you've asked me to work overtime three times this week.
>
> I THINK (*what you think or imagine is true; your assumptions*) that you are not aware of or concerned about my personal life.
>
> I FEEL (*your feelings or reactions to the thought*) pressured, exploited, taken advantage of, upset, anxious.
>
> I WANT (*a positive, clear description of what you want*) to be given at least four days' notice when you need to have me work overtime.
>
> I INTEND (*what you are prepared to do to see that you get what you want*) to remind you every Friday to review and estimate the workload for the next week and fill me in on what your anticipated needs will be.[4]

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[4] This example does not take into account tone of voice, which clearly could have a major effect on the success or failure of the communication.

Notice that this example focuses on the boss's potential misunderstanding of the worker's desires. If the worker does not explain that he/she is unwilling to work late, the boss can not know. As it stands, this may or may not be true. However, it leaves out a wide variety of larger social and economic issues, including:

- Is the worker paid for overtime?
- Was there an agreement about overtime work at the time of hiring?
- Is the corporate culture a 9 to 5 culture, or is the assumption that everyone works longer hours to prove that they are dedicated members?
- Is there a union, and is the worker a member?
- What influence does the boss have on the worker's career path?

Without considering the answers to these questions, it is naive to assume that improved communication is all that is necessary to improve the situation.

Consider the application of this critique to the aviation training situation. Previous research (Goguen and Linde, 1983) found that subordinates tend to be more indirect, thus less assertive, than superiors. Assertiveness training has been proposed as a remedy. However, we must consider not only the nature of the communication, but also the social context. First, assertiveness training does not take account of the operational reasons for the hierarchical command structure of both military and commercial aviation, or the ways in which it should function to facilitate brief and efficient communication. By focusing entirely on the individual, assertiveness training is not able to consider differing group organizations and their optimal modes of functioning. In addition, we must know what the social and career consequences are for a subordinate if he speaks assertively, whether in an emergency situation, or during normal flight. It is likely that subordinates fear that their assertive communications will be perceived as insubordinate by superiors, and therefore we must also consider what the consequences are of being perceived as insubordinate by superiors.

- Does the captain or other leader have the right to report him for insubordinate behavior?
- To make note of his behavior on his permanent record?
- To influence his career path through informal communications networks?

Answers to these questions could help us determine whether a subordinate's indirect communication is the result of a neurotic fear of directness, the result of a lack of social skills, or is perhaps a well-considered conclusion about the nature of the social situation.

2.3.1.1 Research on the Effects of Assertive Behavior

In general, works on assertiveness training have concentrated on the value of assertiveness for the person being trained, and have ignored the issue of how assertive behavior is perceived by others, that is, the effect of assertive behavior on both interpersonal relations and objective job performance. A number of recent studies have attempted to investigate the impact of assertive behavior, and have found that people exhibiting such behavior are judged as competent, but less likeable.

- (Rosen and Jerdee, 1975) found that managers judging the effectiveness of employees presenting a grievance recieved more favorably a polite, pleading approach by male employees than an aggressive, threatening approach.

- (Kelly *et al.*, 1980) and (Kelly *et al.*, 1982) found that undergraduates, in rating a videotape showing a male or a female model behaving either assertively or unassertively, viewed the assertive models as more skilled and able, but as less likeable.

- (Keane *et al.*, 1983) found that two patient samples, psychiatric and nonpsychiatric, viewing videos of males and females behaving passively and assertively, judged the assertive behavior to be skilled and capable but significantly less likeable than passive behavior.

- In a similar study, (Keane *et al.*, 1983) found that black nonpsychiatric subjects, viewing videos of males and females behaving passively and assertively, judged the assertive behavior to be skilled and capable but significantly less likeable than passive behavior. (Note that the expected differences between black and white subjects were not found.)

These results suggest that fears of behaving assertively in a professional situation may be well-founded, particularly if, as in most aviation situations, one may be dependent on superiors' assesments of one's personality and suitability for the job, as well as one's technical competence.

A similar assessment has been made by (Linehan and Egan, 1979):

> The research suggests, then, that those individuals who use a direct, unembellished style of communication may be enhancing short-term, objective effectiveness at the same time that they are sacrificing relationship effectiveness. Relationship effectiveness is ill-served by the use of direct assertion; the individual using this style is not well liked immediately following the response, nor do others anticipate the continuation of the relationship on a long-term basis. Objective effectiveness, in contrast, seems to be facilitated by the use of the assertive direct style, at least on a short-term basis. However, long-term, objective effectiveness is dependent on maintenance of the relationship. (p. 261)

2.3.1.2 The Theory of Communicative Rights

A further social issue is the rhetoric of one's *rights* to communicate assertively. The notion of an individual's right to a given communication style is found in (Salter, 1949), in (Wolpe, 1969), and is more fully developed in (Alberti and Emmons, 1974) as *behavior which enables a person to act in his (her) best interest, to stand up for himself (herself) without feeling undue anxiety, to express his (her) honest feelings comfortably or to exercise his (her) rights without denying the rights of others.* (p. 3) This rhetoric is extremely common in current popular literature and training programs on assertiveness. For example, (Bloom *et al.*, 1975) gives the following typical list of rights.

Everywoman's Bill of Rights

1. The right to be treated with respect.
2. The right to have and express your own feelings and opinions.
3. The right to be listened to and taken seriously.
4. The right to set your own priorities.
5. The right to say *no* without feeling guilty.
6. The right to ask for what you want.
7. The right to get what you pay for.
8. The right to ask for information from professionals.
9. The right to make mistakes.
10. The right to choose not to assert myself [sic].

Lists of rights like these are always taken as given; there is no discussion of what the ground might be for such rights, why people might have them, or what type of social organization might guarantee such rights. Clearly the rhetoric is derived from the Declaration of Independence, and the Constitutional Bill of Rights. These documents, however, declare and discuss *political* rights, that is, the permitted and forbidden behavior of the state to the individual and the individual to the state. The framers of the Constitution drew on several centuries of philosophical and political debate about the nature of political organization and the means for establishing a just state and avoiding the problems of existing political organizations. In this debate, as in the Constitution, it is made clear that these rights must be established and maintained by a political organization which is itself supported by the people. In contrast, the rights discussed by assertiveness training involve relations between single individuals, or among the individuals in a small group. However, in spite of this difference in context, the rhetoric remains the same, apparently assuming that the political grounding given in the Constitution extends to the relation of individuals.

In spite of the lack of grounding, this rhetoric of rights may be convincing and hence effective in a therapeutic or quasi-therapeutic context, whose purpose is to encourage socially inhibited people to behave more boldly. It is not clear what relevance such a rhetoric of rights might have in a military context, which is organized primarily on the basis of hierarchically organized duties rather than of rights. This critique is also applicable to commercial aviation, since the social organization of commercial aviation is derived from the military model and retains many of its features. Since in both military and commercial aviation, effective team behavior is of primary importance, the focus on individual rights to a communicative style is irrelevant and possibly even counter-productive.

2.3.2 Linguistic Assumptions of Assertiveness Training

The social context, as discussed above, is reflected directly in the linguistic form of communication. Many assertiveness training programs pay some attention to specifying forms of speech which will state the speaker's feelings without blaming the hearer. For example, one frequently cited recommendation is the use of °I° statements rather than °you° statements. Thus (1) is said to be preferrable to (2), because it contains no element of blame.

> (1) I get angry when you are late.

> (2) You are rude to be so late.

In the discussion of examples like this, the more general issue of the expression of the social situation is not addressed at all within assertiveness training. Generally, we may say that any utterance accomplishes two types of communcation:

- Statement of some proposition about the world.
- Statement about the relation of the participants in the speech situation.

Thus, linguistics distinguishes between the referential component and a relational component of any utterance[5]. The referential component is that aspect of the utterance which makes some direct predication about the world. The relational component expresses the relation between the interlocutors, their group membership, the speaker's feelings about the speech situation, etc. (Of course, it is possible to convey such information directly by encoding it as part of the referential component; for example, an

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[5]Using different terminology for the same distinction, (Lyons, 1977) describes these as the descriptive and interpersonal aspects of language.

utterance like "We're still friends, aren't we?" Even so, such an utterance has its relational aspect, in this case arising from the presupposition that the friendship may have been threatened in some way.) One of the fullest discussions of this issue is the examination of pathologies arising from a mismatch of propositional and relational messages given in (Bateson, 1972).

The distinction between the propositional and the relational aspects of communication suggests some serious issues for communications training in aviation. For example, in some situations, a subordinate's speaking assertively might be seen as challenging the hierarchical relationship of crew members. If this is so, simple training in the direct expression of matters of concern would not be sufficient. It would also help to train in forms of communication that can challenge a superior's assessment of a situation, while indicating respect for the superior's position. At present we know very little about how subordinates respectfully and successfully challenge superiors. This is a subject that warrants further study, before training crew members in forms of linguistic directness which might in fact be counterproductive. Our previous research (Goguen and Linde, 1983) has shown that subordinates do vary the level of directness of their utterances to superiors, depending on their perception of the situation as normal, problem or emergency. The existence of such variation shows that the level of directness is not wholly determined by the hierarchy of rank, but is at least partially under the control of the speakers. This indicates that training in linguistic directness could be successful, once we understand what forms to train, and how they depend on context.

2.4 Grid Management

This section considers the theoretical background of grid management, reviews the literature attempting to validate grid management, and provides a critical assesment of these studies. In the discussion of grid management theory, a general reference to Blake and Mouton's claims will refer to the following works, which contain much repeated material ((Blake and Mouton, 1964), (Blake and Mouton, 1980), (Blake and Mouton, 1978), (Blake and Mouton, 1985), (Blake and Mouton, 1968), (Blake and Mouton, 1982a), and (Blake and Mouton, 1982b)). Note that although grid management training has been applied in many contexts, the underlying theory and method of training does not vary.

2.4.1 Grid Management Theory

Grid management is a theory of leadership and management based on two axes of behavior: concern for productivity and concern for people. Possible management styles are located on the grid produced by these two axes. The five most common styles described by this theory are shown in Figure 2-1, given in (Blake and Mouton, 1985) (p. 12).

High

9 — **1,9**
Country Club Management
Thoughtful attention to needs of people for satisfying relationships leads to a comfortable friendly organization atmosphere and work tempo.

9,9
Team Management
Work accomplishment is from committed people; interdependence through a "common stake" in organization purpose leads to relationships of trust and respect.

5,5
Organization Man Management
Adequate organization performance is possible through balancing the necessity to get out work with maintaining morale of people at a satisfactory level.

1,1
Impoverished Management
Exertion of minimum effort to get required work done is appropriate to sustain organization membership.

9,1
Authority-Obedience
Efficiency in operations results from arranging conditions of work in such a way that human elements interfere to a minimum degree.

Concern for People

Low 1 2 3 4 5 6 7 8 9
Low High
Concern for Production

Figure 2-1: The Managerial Grid

According to this theory, each person has a dominant leadership style, and may also have a backup style which is used as a retreat position when the dominant style is not effective. As is clear from the descriptions of the five styles given in figure 2-1, "9,9" team management is targeted as the preferred style. Much of the effort of grid management training is devoted to training participants in how to change their current style to 9,9 style. The relation of this theory to the training is described in the materials developed for United Airlines (Blake and Mouton, 1981):

The Grid framework is a tool, a device for describing attitudes and behavior. It is not a psychological assessment or evaluative mechanism and it it not intended to categorize people or place them in •slots•. It would be a misuse to label individuals as consistently adhering to single Grid positions. People adopt different methods or display different levels of concern at various times and during various circumstances. As an organizing framework it permits persons to study and describe behavior and thereby understand more clearly and precisely the attitudes underlying that behavior and the results produced.

The Grid numbers 9,1, 1,9, etc. serve as a kind of shorthand to represent a general pattern of behavior. It is unreasonable to expect that a Grid style will predict every single feature of behavior for any given individual. Individuals are likely to be aware of their own dominant Grid style but are also able to recognize inconsistencies that do not precisely fit the assumptions of that dominant Grid style. What can be expected is explicit patterns of basic behavior for which the Grid style is an apt description, The Grid numbers facilitate understanding of behavior patterns; they are descriptors of general behavior and are not intended to be used to label individuals. (Book 2, p. 22.)

Grid management theory also presents a breakdown of resource management into four steps: communication, coordination, conflict and critique, and taxonomizes the elements of leadership into: problem definition, inquiry, advocacy, and decision making. Participants in the training are taught techniques for making these steps conscious and possibly explicit.

2.4.2 Theoretical Background of Grid Mangagement

Research in many social science disciplines is cited by grid management theory as support for its claims (e.g. management theory, psychology, anthropology, etc.). Specifically, general semantics (Korzybski, 1958) is cited in (Blake and Mouton, 1985) as the theoretical foundation for grid maanagement theory. The argument appears to be that most extant theories of leadership behavior have been developed according to (incorrect) Aristotelian logic, by assuming the existence of discrete leadership traits and behaviors, attempting to isolate them, and then finally combining them additively. (Blake and Mouton, 1985) comment:

> By way of summary, Korszybski might observe •The Aristotelian langauge [applied to leadership theory] perpetuated what I call 'elementalism' or splitting verbally what cannot be split empirically.[6]• (p. 206)

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[6]Quoted from (Korzybski and Kendig, 1942).

In contrast, grid management theory is said to focus on processes of interaction, rather than discrete traits of leadership, and thus utilizes the the non-Aristotelian description of the "unsplittable" phenomena of nature. (Blake and Mouton, 1985) summarize this as follows:

> Much of the confusion and many of the apparent contradictions between leadership theorists are removed through systematic examination of the logic on which theoretical explanations are constructed. Aristotelian logic compels one to construe leadership as based on isolatable elements which are then combined by adding them together. This has been shown to produce faulty theory which does not permit adequate representation of Level I [Silent, nonverbal, unspeakable, internal or external] happenings that are the most effective for achieving results with and through others. By comparison, theory derived from non-Aristotelian logic pictures leadership as a double loop interaction process which cannot be divided into components, elements, or fragments. The 9,9 leadership orientation emphasizes participation as an interaction process based on openness and candor, strong initiative, thorough inquiry, effective advocacy, confrontational approach to conflict solving, appropriate delegation, sound teamwork, and two-way critique. It provides a positive alternative to Aristotelian logic as the basis for constructing a valid theory of sound leadership. (pp. 222 -- 223)

It is not clear what the relation is between general semantics as a theoretical foundation and the actual design and practice of grid management theory. The claim that only general semantics permits a view of whole systems is not true, since other theories, most notably cybernetics, have provided extended formal descriptions of the operation of whole systems, feedback loops, etc. Furthermore, since there has been very little critical attention paid to general semantics, it is difficult to determine exactly what its relation is to grid management theory, and whether using it as a theoretical basis improves or detracts from grid management theory. (Note that general semantics is discussed only in the appendix of (Blake and Mouton, 1985) and in none of Blake and Mouton's other, numerous publications.]

2.4.3 Validation of Grid Management Theory

Grid management theory has been widely applied in a variety of contexts including aviation, business, hospital administration, sales, military, social work, education, etc. In all their publications, Blake and Mouton claim that there is fifty years of research to support the effectiveness of grid management. This research may be divided into three types.

2.4.3.1 Research on Other Theories

Blake and Mouton point to studies of other theories which contain elements parallel to elements of grid management theory, or which describe as desirable management behavior which is equivalent to the 9,9 style recommended by grid management theory as desirable. (Blake and Mouton, 1980) assert that:

> Another test of the relative value of various Grid styles is made possible by comparing leadership style options as they have been studied and characterized in various disciplines within the behavioral science area. The behavioral sciences incorporate some twenty disciplines. These are aeas of scientific investigation of behavior and organization in which efforts are made to identify (1) conditions favorable to effective human behavior and (2) conditions that are likely to produce ineffectiveness.

> In these disciplines we find the 9,9 orientation identified as the soundest basis for effectiveness. This repetitive conceptual *discovery* of a 9,9 orientation in discipline after discipline is a source of strong support for the view that there are sound principles of behavior, and that these have been detected and described, regardless of the subject matter of the discipline under examination. ... Since scholars in any one behavioral science discipline are unlikely to be familiar in depth with other disciplines, this widespread recognition of the 9,9 orientation can be treated as something approaching a series of independent discoveries. (p. 222)

Note that although many studies are cited which are claimed to recommend the equivalent of the 9,9 orientation, no demonstration is given of the nature of this equivalence. Without such a demonstration, the claim of equivalence remains unsupported. Therefore, Blake and Mouton's statement that grid management theory has received extensive validation by other researchers can not be accepted.

2.4.3.2 Research on Grid Management Theory

In their publications, Blake and Mouton repeatedly refer to the results of field studies on grid management. However, only one study is actually described (Blake and Mouton, 1980) It shows the effects of grid management on profitability.

> Figure 2-2 illustrates the profitabilty of two autonomous corporations operating nationwide on opposite sides of the United States-Canada border. Corporation A engaged in Grid Organization Development. Corporation B did not. They are owned by the same parent, located in a third company. They engage in similar businesses and face the same character of competition in comparable markets.

Starting in 1961, the comparisons show that for five years prior to the

FIGURE 14.2
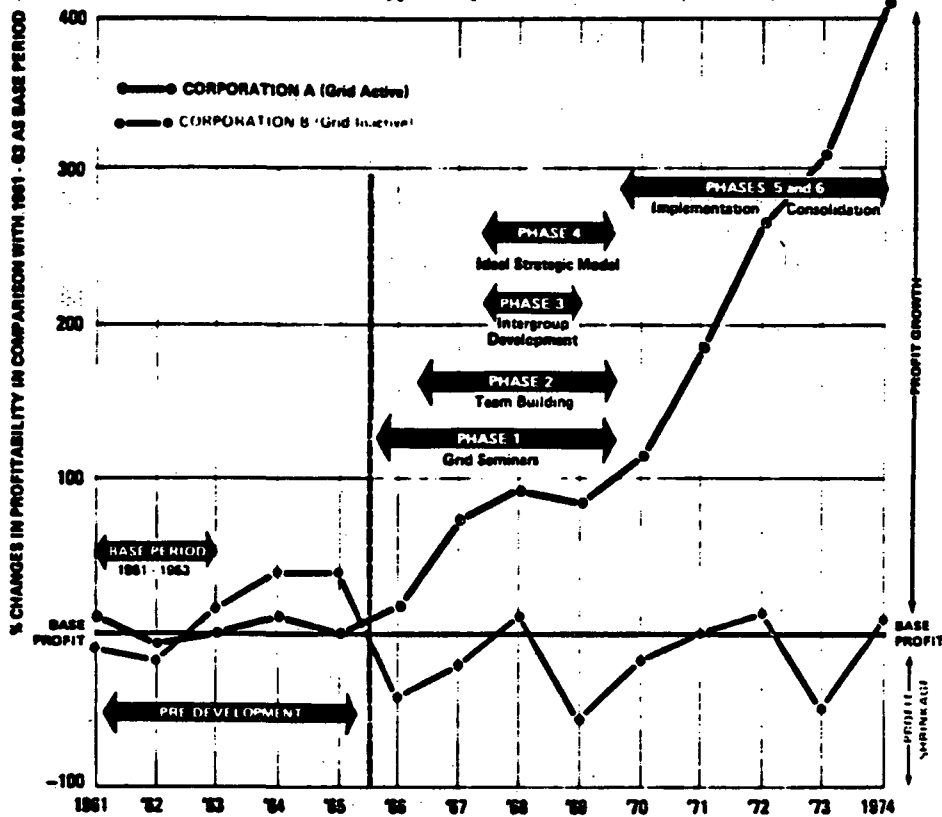Typical Impact of Grid Organization Development

Figure 2-2: Typical Impact of Grid Organization Development

introduction of Grid development, the control corporation, B appeared to to be obtaining somewhat better economic performance, but the results were well within the range of chance fluctuations.Then, after introduction of Grid organization development, Corporation A experienced a continuous and rising curve of profitability during the next nine years. By 1974, the profitabilty in the Grid company was 400% greater than in Corporation B, which had not engaged in Grid organzation development. Corporation B had just managed to hold its own over the fourteen year period.

No further details are given on how this study was conducted.

A report on the effect of grid management training is given by (Blake *et al*, 1964). The training was given to the 800 managers of a 4000 member industrial plant (whose type is not specified). Improvements were recorded both by changes in the profitability of the plant, as well as by self reports and questionnaires which indicated changes in group performance which improved the working environment. However, it is not possible to determine from the description of the program given what actual changes took place in the communicative behavior of the participants.

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Information is also presented to demonstrate the helpful effects of grid management training on the career paths of individual managers and on behavior changes in the workplace (Blake and Mouton, 1985), but no account is given of how this information was obtained.

One study which is somewhat related to the aviation context, (Malouf, 1966), investigated the results of a one-week grid management training seminar on eleven managers. The participants, their subordinates, and their bosses were given a questionnaire on changes in the participants' behavior five months after the training. By these measures, most participants became more effective in terms of discussing work-related topics with others, conducting better meetings and functioning more effectively as a member of meetings, listening better, and getting more contributions from others. The improvement was noted more by participants and subordinates, and less by bosses. This study suggests that self evaluation and evaluation by co-workers is a measure which shows lasting results of grid management training. However, it is not entirely possible to evaluate this measure, since the test instrument is not fully described.

2.4.3.3 Research on Grid Management in the Aviation Context

Grid management training has been utilized as the basis of United Airline's Command/Leadership/Resource Management program since 1981. While Blake and Mouton claim that there is research showing the success of this program, the only research cited is (Feaver, 1982), a story in the Washington Post on National Transportation Safety Board public hearings on a Pan American Airlines crash in Kenner, Louisiana, near New Orleans, on July 9, 1982. As part of a discussion of airlines management training, the United Airlines program was described, and a United Airlines official was quoted as stating that since the program was started, United Airlines crew members have had much lower error rates on flights with FAA inspectors. This, of course, does not constitute acceptable evidence in either a scientific or an applied context, and it is not legitimate to cite it as such.

United Airlines training personnel have told the researchers in this project that no studies have been done since the time of the story mentioned above, and that they would like to see controlled studies of the Command/Leadership/Resource Management program. However, they said that it is not possible for United Airlines to conduct such research in-house because of crew members' fears that such evaluatory studies could be used to influence individual career paths. They would prefer to see such a study done by an independent agency such as NASA.

2.4.4 Conclusions

As the above discussion indicates, grid management has not been subjected to a thorough and controlled validation. The one controlled study does not give details on its design and execution. Furthermore, this study is not directly relevant to the aviation context, since it examines long-term patterns of profitability, involving change over eight years. In contrast, training in the aviation context must influence communication patterns characteristic of relatively short term interactions (although, of course, such patterns may persist over a long period). It is not at all clear what transfer can be expected from a study of large scale management changes to the moment to moment communication patterns which are dominant in the cockpit.

Similar assessments have been given by a number of works on management and organizational communication. (Huse and Bowditch, 1977) conclude that

> Although the managerial grid is one of the popular approaches to leadership and grid training is worldwide, there seems to be little independent research evidence that this approach, as a *one best way,* is effective.

A more detailed assessment is given by (Sanford et al, 1976):

> There are basically two types of evidence concerning the effectiveness of organizational Grid styles. One type is symbolic, and the other is an overall empirical test. (p. 237)

> While it tends to be piecemeal, there is substantial evidence that the team style is the most effective organizational leadership described by the Grid, if it is a true, sincere style, and not a facade. Evidence also indicates that other styles are less effective, both concrete data on the relative effectiveness of the various styles are still not available. Common observation leads us to believe that all of the styles, with the possible exception of the impoverished style, can achieve some measure of effectiveness.

> One partial test of the organizational Grid styles was done by (Blake et al, 1964). The managerial personnel of a relatively large organization were trained in an effort to move the organizational style toward the team style. Rough measurements indicated that the organization did move significantly toward this style. There is also evidence that this move increased the effectiveness of organizational communication and organizational effectiveness, as measured by several factors. The data are certainly not conclusive and more tests of the other Grid styles need to be done, but it does seem that organizations can change styles and that some styles are more effective than others. (p. 146)

Given the state of research in grid management, there are a number of questions which remain open on its effectiveness.

1. What evidence is there that management styles are stable, especially since the existence of several possible backup styles is posited? Blake and Mouton cite field experience on this point, but do not validate it.

2. If management styles *are* stable, what evidence is there that they can be changed? Blake and Mouton claim that management style is *not* related to personality style, which appears to be relatively fixed. However, there is no demonstration of the relation or lack of relation between management style and personality style, so this question remains open.

3. What evidence is there that self report of management style is reliably related to any other criterion for determining management style?

4. What evidence is there that the 9,9 style is the only effective style?

5. Perhaps most important, what evidence is there that the Effective Cockpit Management program indeed produces long range changes in crew members' behavior?

Given the state of the research, and the existence of these questions, we must conclude that grid management, like assertiveness training, is a widely used training model, with many attractive features, but it has not yet been given proper experimental validation for the aviation context. The lack of such validation is not surprising, since grid management training is a commercially marketed training package, not an abstract scientific theory. It is unlikely that any firm marketing such a package will conduct rigorous research on its own product.

2.5 Social and Linguistic Assumptions of Grid Management Training

Thus far, we have considered the theoretical foundations of grid management training, and the attempts to validate it. We turn now to the issue of the social and linguistic assumptions which underlie it.

2.5.1 Social Assumptions of Grid Management Training

One of the most basic assumptions of grid management training is that an individual's management style is not determined (at least not wholly determined) by his/her personality type. Rather, a major determinant of management style is the nature of the team and of the larger organizational context in which it works. Disfavored management styles are at least partially the result of a poor working environment or a disfunctional corporate culture. Therefore, grid management training attempts to change the

communicative behavior of the whole organization , not just of the individual. This contrasts with the focus of assertiveness training on individual behavior.

In the United Airlines' training program, training is given only to cockpit crew members, and to pilot managers, but it is not extended to higher levels of management, and hence does not change the corporate culture in which crew members function. Thus, although there is an attempt to change behavior in the cockpit, crew members must function in a larger environment which includes people who have not received the training given to the flight crew members, and who presumably do not behave in the ways recommended by this training.

Blake and Mouton also assume that proper management eliminates conflict between deffering sectors of the corporation, and hence obviates the need for unions. (Blake and Mouton, 1978) describe the reasons for unionization as follows:

> Subordinates who find themselves ignored or offended by arbitrary treatment and who are unable to redress what they regard as injustices or wrongs pursue other, more militant, ways of correcting problems. Given effective leadership, they can achieve through numbers what they are unable to accomplish individually. Recognizing their individual helplessness, workers, foremen, supervisors and professional employees (engineers, etc.) join together to force upon employers the recognition of their common strength. There are many reasons why people join unions, but such a commitment is almost always antiorganizational. This means that the reason for joining the union is to *resist* the organization's attitudes and treatment of its employees. The recent rush toward unionization among whie-collar technical workers, school teachers, and government employees indicates that this trend is accelerating. (p. 27)

The assumption is that that when management is functioning properly, there are no substantive difference of interest which would lead workers to unionize. Although airline pilots are already unionized, this assumption is still problematic. The assumption is that conflict is due to misunderstanding, and can be eliminated by improving these factors. This has never been proved, indeed, has not been argued explicitly, and can not be taken as a given.

2.5.2 Linguistic Assumptions

One possible function of training is to provide a metalanguage which trainees can use for reflection and discussion of their own behavior and that of their associates. Grid management does provide such a metalanguage. This is valuable, since ordinary language does not provide rich resources for such discussion. But it is not clear how or

under what conditions such reflective discussion is expected to happen. Perhaps more importantly, no attention is given to the question of the social implications of initiating such discussion. That is, is it actually possible for a second officer to begin a discussion about problems in the captain's style of decision making, even if they share a vocabulary for such discussion?

3. Review of Applications

3.1 Evaluation Criteria for Communication Training Programs

This section proposes criteria to be used for evaluating communication training progam. These criteria may be applied either in the development of a training program in-house at NASA or to evaluate existing programs for use as the basis for such an in-house program, assuming additional development and customizing by NASA.

3.1.1 Theoretical Basis

To understand a communications training program, it is important to understand what theory it is based on, if any. As indicated in Section 2.1 there is a wide array of theories of communication, as well as many theories of organizational dynamics and management. In evaluating a training program, we wish to know whether it is based on one of these theories, on several, or whether its methods are a-theoretical and *ad hoc*.

3.1.2 Domain Specificity

A training program may be extremely general, intended to apply to a wide range of communicative domains. Or, it may be extremely specific, intended to teach a particular class of person how to perform a particular communication task better. For example, some assertiveness training programs claim that they will teach assertive behavior for all appropriate situations in the trainees's personal and professional life. Some management training programs are offered as seminars for the general public and claim to be relevant to management of any type of organization. In contrast, there are other types of programs which are domain specific. For examples, a program may attempt to teach a psychiatric patient how to deal with a particular type of phone call from his or her mother, or attempt to teach an employee how to respond to a specific type of supervisor's request. Management training programs may be tailored to a specific industry or to a specific company. Both extremes on this scale of specificity are currently being practiced, as well as many intermediate positions. From our observation of several training programs, it appears that domain specificity is extremely important in determining the success of a training program .

3.1.3 Peer Identity of Trainer

To evaluate a communications training program, it is important to know whether the trainer or teacher is a peer, a member of the same professional field as the students, or whether the trainer's expertise is in some other field. In general, it appears that the more intense and closed the professional culture of the target community, and the more training it takes to become a member of that community, the more important it is that the trainer be a peer[7].

3.1.4 Identity of Trainees

To evaluate a communications training program, it is important to know the identity of the targeted participants. Specifically, the value of training for improved team communication will be determined at least partially by whether the entire team is trained or whether only managers or subordinates, receive training. Note that most commercially available management training programs target only one member of a team (e.g. a manager, secretary, or intermediate level personnel.)

In the commercial aviation situation, this question is somewhat complicated by the fact that crews do not normally stay together as a team. Thus, even if all crew members were trained, rather than at only captains or only flight engineers, such a program still could not train the members of a specific existing team together. In contrast, joint training of actual crews might be possible in military or non-commercial aviation situations.

3.1.5 Duration of Training

The duration of training obviously has a significant effect on effectiveness. We must consider not only how long the training lasts, but also whether any followup training and discussion are offered, and whether such followup is offered only once, or on a recurrent basis.

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[7]There is some evidence, that apprentice members of a closed community, specifically medical residents, can profitably be given training by a non-member. However, this is much more difficult to achieve with full members. Prof. Richard Frankel, Wayne State Medical School, personal communication.

3.1.6 Training Methods

Major training methods in use include:
- Lecture
- Written exposition
- Video demonstration
- Behavior modelling
- Role playing
- Programmed instruction, using either computer or workbook presentation
- Simulation

These methods may be combined in a variety of ways, and each may be used with various degrees of interaction between trainer and students.

3.1.7 Evaluation

It is important to consider whether any validation or evaluation studies exist for a given training program, training method, or communication theory. As Sections 2.2 and 2.4 show, such studies have generally lagged far behind the development of training programs. It is unusual to find anything more than customers' testimonials offered to validate commercially available programs.

3.2 Review of the United Airlines Training Program

This section reviews the United Airlines Command/Leadership/ Resources Management (CLR) training program[8]. This program has been chosen for review because United Airlines has pioneered in training pilots in human resource management, which includes training in communication. The company is currently marketing its training program to other airlines both in the United States and abroad, so the CLR model will probably have a significant impact on aviation training generally.

3.2.1 Description of the Program

Newly hired pilots are given a three hour overview of the CLR program. They then begin the program by working through 7 self-study books at home over a period of 14 weeks. These books include:
- Scenarios of 3 flights and discussion of these scenarios.
- Explanation of the management grid, the theoretical foundation for the CRL training.

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[8]CRL is the current term for the program known in 1986 as Effective Cockpit Management (ECM).

- Accident and incident reports used to identify variables in resource management and communication.
- References and additional readings.

Each book includes expository material, examples, quizzes or questionnaires, and discussion of possible answers.

After the self-study has been completed, a three day course is offered, which reviews the material and allows teams to solve problems and then reflect on their individual and team styles, using the vocabulary offered by the self-study and seminar presentations as a medium for such introspection. Thereafter, pilots return yearly for a three day recurrent training session, which includes a review of CLR material and several LOFT (line oriented flight training) simulator sessions, with followup discussions which work with a video replay of the simulator session. The followup discussions may include issues of resources management and personal management style. (Note that training in CLR is only part of the recurrent training; most of the training is in operational and technical skills.) This review of United Airlines' CRL program is based on

- Review of the self-study materials, plus the materials for trainers.
- Discussion with United Airlines personnel involved in the development and administration of the training program.
- Observation of the second day of the three day recurrent training session, the day in which CRL is reviewed.

We had intended to observe the initial training session, but United Airlines personnel were unwilling to permit this, since they felt that the presence of an observer would hinder the partipants by making them more self-conscious and less open in their responses. It seems likely that this is true, since during the recurrent training session, the crew members were extremely aware of the observer, even when she sat behind them. One indication of this awareness was the frequency of their apologies for profanity, or substitution of euphemisms, while looking back at the observer.

3.2.2 Evaluation Criteria Applied to United Airlines CLR Program

This section applies the criteria of Section 3.1 to the seminars surveyed.

3.2.2.1 Theoretical Basis

The CRL training is based on the notion of the managerial grid, as presented in (Blake and Mouton, 1964) and (Blake and Mouton, 1978). See Section 2.4 for a discussion of this theory.

3.2.2.2 Domain Specificity

The CLR training is extremely domain specific, designed expressly for commercial aviation crews.

3.2.2.3 Identity of Trainer

The trainers are experienced training pilots. Observation of training made it clear that the trainer's identity as a member of the same professional community as the trainees was crucial to his achievement of rapport and authority. The trainer made frequent references to things *we all know* as pilots. These references were often made as a way of softening apparent criticism by indicating that *We've all made that kind of mistake.*

3.2.2.4 Identity of Students

The students are all current United Airlines crew members. Each training group, for the recurrent training, consists of a current captain, first officer, and flight engineer.

3.2.2.5 Duration of Training

As discussed above, the training consists of:
- 7 self-study manuals, whose combined suggested time is 8.6 hours, plus the time it takes for each individual to read the last manual, which consists of reference material, with no exercises.
- 3 days of intensive CLR training.
- Yearly recurrent training, which includes 1 hour of explicit CLR review, plus discussion of LOFT simulator sessions, which may include use of CLR vocabulary and concepts.

3.2.2.6 Training Methods

The training methods include:
- Written expository materials
- Written exercises
- Lectures
- Videotapes of simulated flights
- Videotaped exposition of CLR concepts
- Discussion of the material presented
- Role playing
- Participation in simulations
- Evaluation by trainer

3.2.2.7 Validation

No explicit validation or evaluation studies exist for the CLR program. United Airlines personnel have stated that in designing the program, they intended to perform evaluation studiers, but were prevented from doing so by objections from ALPA (Air Lines Pilots' Association) that such studies might be used to influence the career path of the pilots who participated in them. Their current indication of the value of the program is the high acceptance rate by pilots of the program; post-seminar evaluation of the program by pilots gives a rating of 3.7 of a possible 4. Such reports, of course, can only be suggestive; they can not provide evidence for the effectiveness of the project. The United Airlines personnel who discussed this issue felt that a full scientific evaluation study was extremely important, and believed that NASA was the proper agency to conduct it.

3.3 Evaluation of Commercial Communication Training Seminars

One possibility for developing a training study at NASA would be to use some existing training program as a skeleton, and adapt it to include the findings on aviation communication developed in previous NASA studies: (Goguen and Linde, 1983), (Murphy *et al*, 1984), (Ruffell-Smith, 1979), (Foushee and Manos, 1981). In order to explore this possibility, we have reviewed a great deal of promotional literature and contacted those organizations which appeared to be the most promising. We concentrated on programs that offer management communications training, team development, and assertiveness training. We telephoned representatives of the selected programs, and attempted to evaluate them on the criteria given in Section 3.1. This section presents that evaluation, based on the information each company was willing to give. [Note that the answers to many items on our list were considered proprietary information, not to be disclosed except to actual attendees of the program.]

3.3.1 Evaluation of Seminars Surveyed

This section applies the criteria of Section 3.1 to the seminars surveyed.

3.3.1.1 Theoretical Basis

Of the seminars surveyed, only Neuro-Linguistic Programming has an explicitly stated theoretical basis. The theory is that different people have different preferred sensory modalities which determine the way in which they see the world. The effectiveness of communication is influenced by the sensory modality of the encoding and the way in which it interacts with the preferred sensory modality of the trainee. However,

independent attempts to document the existence of these sensory modality preferences and their effect on communication have as yet failed (Coe and Sharcoff, 1985).

3.3.1.2 Domain Specificity

All the seminars surveyed are generally available to the public, and hence are not at all domain specific. The following companies offer seminars which can be given on-site for organizations wishing to train large numbers of employees; they will attempt to tailor the presentation to the needs of the client organization:
- Center for Professional Development
- Associated Management Institute: Assertiveness Training for Managers

3.3.1.3 Identity of Trainer

In no case are the trainers members of the professional communities to which the training is offered.

3.3.1.4 Identity of Trainees

All the seminars studied targeted employees at a given level of management, rather than training an entire team.

3.3.1.5 Duration of Training

The seminars studied ranged from 1 to 4 days in length. None offered any followup training.

3.3.1.6 Methods Used

In general, seminar sales personnel were extremely unwilling to provide information on the training methods used, viewing them as company secrets. However the following companies did provide some information:
- Padgett-Thompson: Lecture style with some workbook material. Some exercises. No video.
- Center for Professional Development: Experiential program which reviews current skills, gives general exercises, and then applies them to the real-life situation of concern.
- Associated Management Institute -- Team Building: Role-playing.
- Associated Management Institute -- Assertiveness Training for Managers: Speaker plus cassettes and workbooks.

8.3.1.7 Validation

None of the seminars surveyed offer any form of validation other than testimonials from previous customers.

8.3.2 Evaluation Criteria Applied to Commercial Assertiveness Training Seminar

In order to gain first hand experience in the techniques used to teach assertiveness training, one of the researchers attended a one-day public seminar entitled "Assertiveness Training for Women" offered by the Women's Resource Center of Palo Alto. This seminar was selected because it appeared to be typical in its use of teaching techniques, and because it consisted of a single day of training. This design appeared to be the most appropriate and convenient for a NASA training project.

We now apply the evaluation criteria of Section 3.2 to this program.

8.3.2.1 Theoretical Basis

This seminar is based on assertiveness training, whose theoretical foundations are given in Section 2.2.

8.3.2.2 Domain Specificity

The seminar is extremely general, and does not focus on any specific professional domain. (This is necessarily true for all commercially available seminars, except those which can be tailored to a specific domain requested by the client organization.) There is somewhat more attention paid to work situations rather than home situations, but both are discussed.

8.3.2.3 Identity of Trainer

The trainer has a master's degree in counseling psychology, and is employed as a trainer. Given the lack of domain specificity of the seminar, she is not (and could not be a member) of the professional communities of the students in the seminar.

8.3.2.4 Identity of Students

The class consisted of eleven students (all women) who had chosen to take the class. They were all employed outside the home, although this was not required for enrollment in the class. In two cases, the participants' employers had suggested that they enroll.

Note that this seminar is aimed at people who have chosen to attend because they have have some awareness that they have communication problems. In contrast, the United Airlines program, and indeed many company sponsored programs, is obligatory for all personnel. Thus many participants may indeed not have communication problems, or may believe that they do not, even if they do.

3.3.2.5 Duration of Training

The seminar was given from 9 am to 3 pm, with a half hour break for lunch. No specific followup training was offered, although other seminars at the center were suggested.

3.3.2.6 Training Method

The training methods include:
- Lecture.
- Discussion of the material presented in the lecture.
- Imagining alternate scenarios for one's communication problems, using communication models presented in the lecture. This was done both orally and using pencil and paper.
- Role playing possible scenarios with other participants.
- Suggested further reading.

3.3.2.7 Validation

As discussed in Section 2.2.2, there have been no studies which attempt to validate the seminar training model.

4. Conclusions and Recommendations

This report has found that, although several forms of communication training are potentially relevant for training in aviation, there are still many open questions about their effectiveness and about the transfer of techniques and results from one population to another. Despite these general difficulties, we believe that the aviation setting actually offers some particular advantages for rigorous and effective research on communications training for the following reasons:

- The specificity of the problem, and the possibility of quantifying the effectiveness of outcome behaviors for aviation safety, using the description of communication patterns given in (Goguen and Linde, 1983).
- The widespread utilization and acceptance of flight simulators as part of ongoing aircrew training, so that an artificial laboratory setting need not be used for the research or training.
- The relative homogeneity of the subject population, in terms of the tasks which they must perform, and the training which they have received.
- The fact that training and evaluation is already an ongoing part of professional life, in both the military and private sectors of the aviation community.

These factors should facilitate research in communications training which is both scientifically rigorous and relatively cost-effective.

4.1 Review of Findings

As discussed in Sections 2.2 and 2.4, assertiveness and grid management appear to be the most immediately relevant to aviation training: assertiveness training because it has been suggested both by NASA researchers and by the National Transportation Safety Board, and grid management because it already forms the basis of United Airlines' cockpit management training program. Both approaches appear to provide an array of potentially useful training methods. However, neither one has been subjected to rigorous scientific validation. Although some tests have been performed, the design and duration of the training programs that were tested and the desired behavioral goals were quite different from those relevant for aviation training. Since there is no evidence that the effects of these training methods transfer to aviation, these attempts at at validation remain interesting but not conclusive.

Both theories contain specific training methods that are at least partly atheoretical. Both make use of lectures, role-playing, videotaped examples of good and bad communication,

discussion, etc., methods that can convey a wide array of content. However, it should be noted that these methods have not been tested, so that simply devising a training program using them would not obviate the problem that the theories themselves have not been tested.

In attempting to decide which of the two theories should be tested first, there are a number of factors to consider.

1. **Focus of training.** Training may focus either on individual or group communication. Assertiveness training focuses on the individual as the locus of possible change: an individual is trained to overcome his neurotic fears of speaking out in order to communicate his concerns clearly and professionally. Grid management training also focuses on the individual in its account of five different management styles. However, it also attempts to give an account of different ways that teams function. This is important, since it appears that the most likely source of communication problems in the cockpit is not individual neurotic malfunctioning, but rather poor crew coordination and communication.

2. **Scope of the training.** Here again, the scope of the training may differ: a single individual may be trained or an entire group may take the training together. Assertiveness training focuses on the individual. Grid management training includes all members of a group. However, in the commercial aviation context, the crews that are trained together do not then fly together as a team.

3. **Duration of the training.** We may also ask how long a given type of training takes, and whether the training is given once or recurrently. Assertiveness training is delivered in packages as short as a single six hour session, or may last as long as six months to a year. Grid management requires a minimum of five full days, although these need not all be consecutive, and includes followup training.

4. **Nature of the metalanguage.** One function of any type of training is to provide a metalanguage which trainees can use for reflection and discussion of their own behavior and that of their associates. We may then ask whether a given training program teaches a metalanguage which is sufficient to describe both actual and desired behavior, and whether trainees actually use this metalanguage. Both assertiveness training and grid management appear to include training in a metalanguage, but grid management's metalanguage permits a more extensive description of the process of group decision making.

These criteria suggest that both approaches have advantages and disadvantages as

candidates for further research. Grid management has the advantage of a group focus and scope, but has the disadvantage of requiring a more extensive training period. We suggest that grid management is a good first candidate for testing, if either some shorter training testbed could be arranged, or if it became possible to use United Airlines' already existing training program for research.

4.2 Further Research

As this report has attempted to show, further research is necessary; there is no current training program which is in turn-key condition for aviation applications. Furthermore, we can not expect such research to be performed either by commercial training firms, or by the companies which hire such firms, since the demands of scientific research and the demands of marketing a program are different and perhaps contradictory. Therefore scientifically valid research on training can only be expected to come from either university researchers or a neutral government agency such as NASA.

Although such research is necessary, the full-mission simulations which are required to do the research properly are expensive and the research is difficult and time-consuming to perform. However, there are a number of preliminary research strategies, which could be initiated immediately. The results could determine whether it was worth continuing the research with full-mission simulations.

1. Test the results of training in a part-task screen simulation. It would be possible to use the linguistic measures developed in (Goguen and Linde, 1983) to determine how close the communication patterns before and after training are to actual aviation and full mission simulation communication.

2. Use an existing training program. It might be possible to use existing commercial or military training programs as a site for testing. Although union regulations have prevented testing in commercial programs, a study sponsored by NASA rather than by an airline might be acceptable. Such a study could use already existing research techniques for having some acceptable third party de-identify the data before it is given to researchers for examination. One study which could be done without altering the content of an existing training program would be a "before-and-after" study of the use of the metalanguage taught by the training program. Although use of the metalangauge does not itself indicate the effect of the training on communication problems, absence of any use of it would suggest that the program had no impact on the crew members trained.

3. Use existing training programs with some modification. It might also be possible to

insert a segment on communication training into existing military training programs which would test the findings of NASA studies on effective communication.

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16. Abstract

This study is the final report of a project studying methods for communications training applicable to both civilian and military aviation personnel, including multiperson teams or single pilot fixed wing or rotary wing aircraft. A review is provided of a number of theories which have been proposed as relevant for producing training materials on improved communications. Criteria are given for evaluating the applicability of training programs to the aviation environment, and these criteria are applied to United Airlines' Resources Management Training, as well as to a number of commercially available general purpose training programs. The report considers in detail assertiveness training and grid management training, examining their theoretical background and the attempts which have been made to validate their effectiveness. The findings are that there are substantive difficulties in assessing the effectiveness of both training programs, as well as problems with the theories underlying them. However, because the aviation environment offers unique advantages for studying the effectiveness of communication training, recommendations are made on the design of appropriate training programs and on procedures that might be used to validate them.

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